

## **Section # 1 Introduction**

The significance and value(s) of the Two Rivers Area's waterways and their watershed/basins have many facets and features. It is a complex set of natural water systems. It is a complex of water systems which still retains a major portion of their healthful water production factors. But it is an area now subject to substantial and rapidly expanding forms of human land use and development. Development can occur, but future development must be based upon a sound understanding of the structure and natural factors which enable the quality of our area's waterways to continue and, in areas, be restored. Informed and forthright intermunicipal, county, private sector and broad citizen engagement and cooperation must be engaged to ensure the healthful maintenance and conservation of this area's waterways and their watershed/basins. The alternative to this is an accelerated rate of ecological decline; theoretically the sequential collapse and loss of healthy, natural water features in our area. Such a loss would be costly in terms of restoration, along with the degradation of the area's attractiveness and quality of life. Such a decline could have a most negative impact on future "quality" economic development. This alternative is one which our citizenry, businesses and levels of government should not have to face. It is out of concern for our area's watershed/basins resources that the Two Rivers Area Council of Governments has undertaken this Two Rivers Area— Watershed Conservation Plan. It is hoped that this plan achieves the principles of approach inherent in the following quote by William Penn, the founder of the Commonwealth of Pennsylvania .

*"It were happy if we studied nature more in natural things; and act according to nature, whose rules are few, plain, and most reasonable."*

*William Penn - late 17th century*

### **The Limestone Belt Aquifer**

Most importantly, the Two Rivers Area River Conservation Plan Area is set within the geologic foundation of water bearing rock strata, its Limestone Belt. This Limestone Belt is regarded as an underground aquifer, by the United States Department of Agriculture. This water value is manifested by the large volumes of water produced in the area's currently active limestone quarries near the Borough of Nazareth. Within Pennsylvania, less than one-third of the Commonwealth's land mass contains underlying rock strata of recognized water-bearing aquifer qualities. The retention and seepage of this area's aquifer waters has a significant benefit to the Delaware and Lehigh's watershed's overall water quality and water volumes, as well as a direct beneficial relationship to the area's Bushkill Creek and Fry's Run. The Two Rivers Area's own awareness and careful stewardship of this limestone aquifer is of the greatest importance. In this plan's geologic section, this water resource factor will be portrayed and assessed in detail.

A. Joe Armstrong, of *Trout Unlimited*, in his recent popular book, Trout Unlimited's Guide to Pennsylvania Limestone Streams (pub. By Stackpole Books, 1992) describes further the value and significance of the Two Rivers Area's water resources in the following popular illustrative quotes:

*"This County (Northampton County) represents the eastern edge of the great limestone belt that runs west and south through the center of the Commonwealth. While it is quite densely populated and relatively near more densely populated areas, it has a number of excellent limestone waters... Overall this county ranks near the top of any list of areas for limestone streams..."*

Armstrong goes on to describe the Bushkill Creek and Fry's (Frya) Run:

### **Bushkill Creek**

*"This is an important stream... especially in the lower sections around Easton with large, deep pools... and some natural pools hundreds of yards long that appear bottomless... the upper sections are somewhat gentler, but there appears to be a good gradient throughout, producing rare habitat, limestone pocket water! The water has excellent clarity."*

### **Fry's (Frya) Run**

*This stony limestone flows along the extreme southern border of Northampton County . . . there are steep sections of pocket water where the stream cascades down over limestone outcrops and meadow... it is great to have wild trout in southeastern Pennsylvania and this stream makes its contribution."*

Armstrong's writings go on to describe the conditions of the area's Schoeneck Creek and Spring Run (both branches of the Bushkill Creek) which begin to portray the expanding stress and problems the water resources within the Two Rivers Area are facing.

### **Schoeneck (Shoeneck) Creek**

*"This is a pretty limestone with loads of aquatic weed. It looks like a classic spring creek. The bad news is that the stream has a severe thermal problem, apparently due to the discharge from a quarry and a sewer plant upstream. At present this is not trout water, but maybe in the future it can be brought back."*

### **Spring Run**

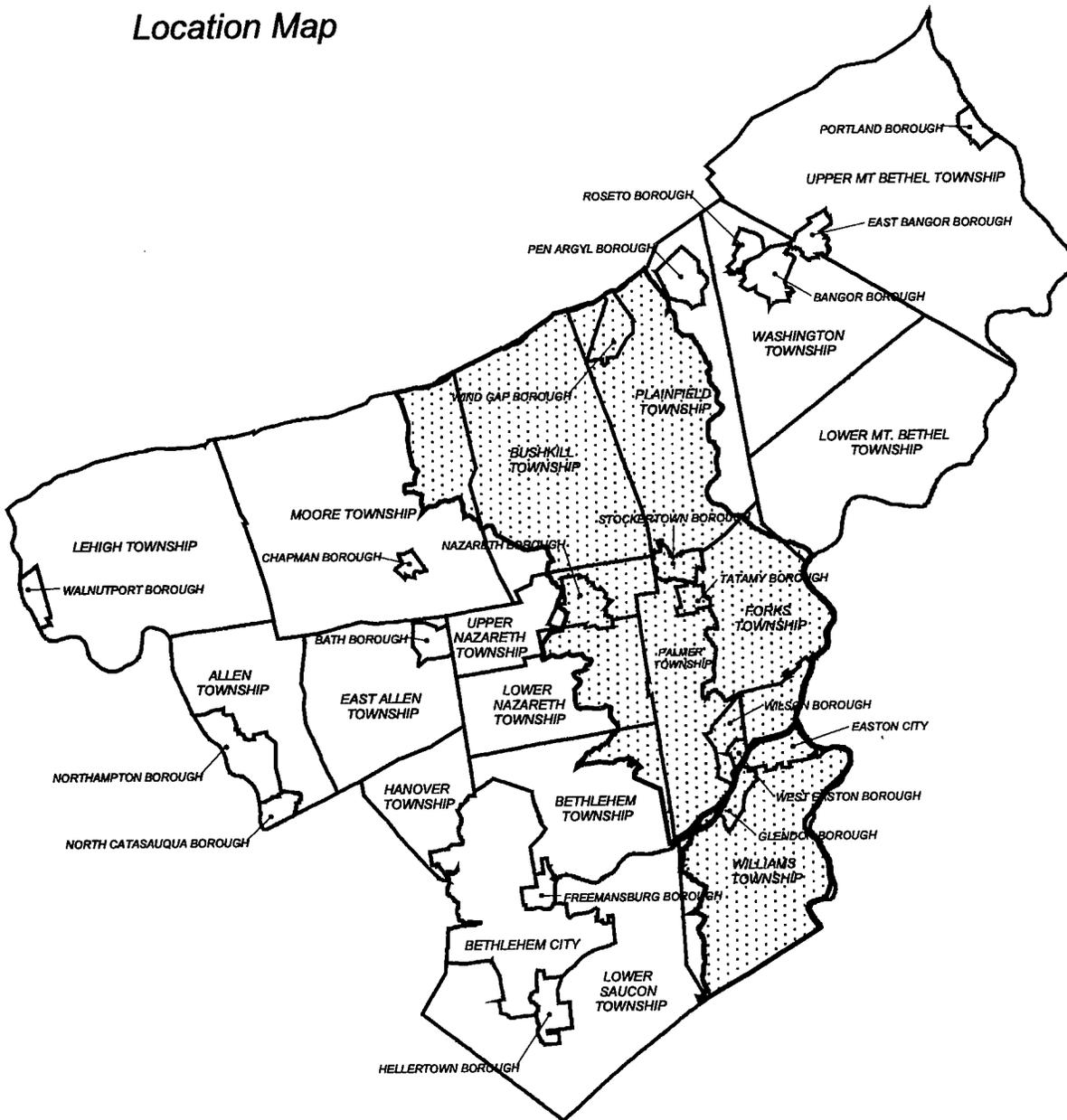
*"This small stream, 8 to 15 feet wide, is a mix of the very good and the very bad. The bad is pretty obvious. It is urbanized and suffers from poorly managed storm water and accumulations of trash. This small treasure needs some love. The good news is more subtle and hopeful: the stream runs cold and gin clear...right in the middle of Easton. Much of the stream runs through a park and is generally under control."*

Armstrong's direct observations and comments begin to reveal the significant natural assets of the Two Rivers Area water resources, and the present challenges to their healthful maintenance. Although Armstrong's work is focused on trout, the healthy presence of trout populations in our area's waters is a good popular barometer indicating the quality and integrity of the waters in the Two Rivers Area.

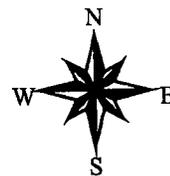
# Two Rivers Watershed Conservation Plan Study Area

Map #1

## Location Map



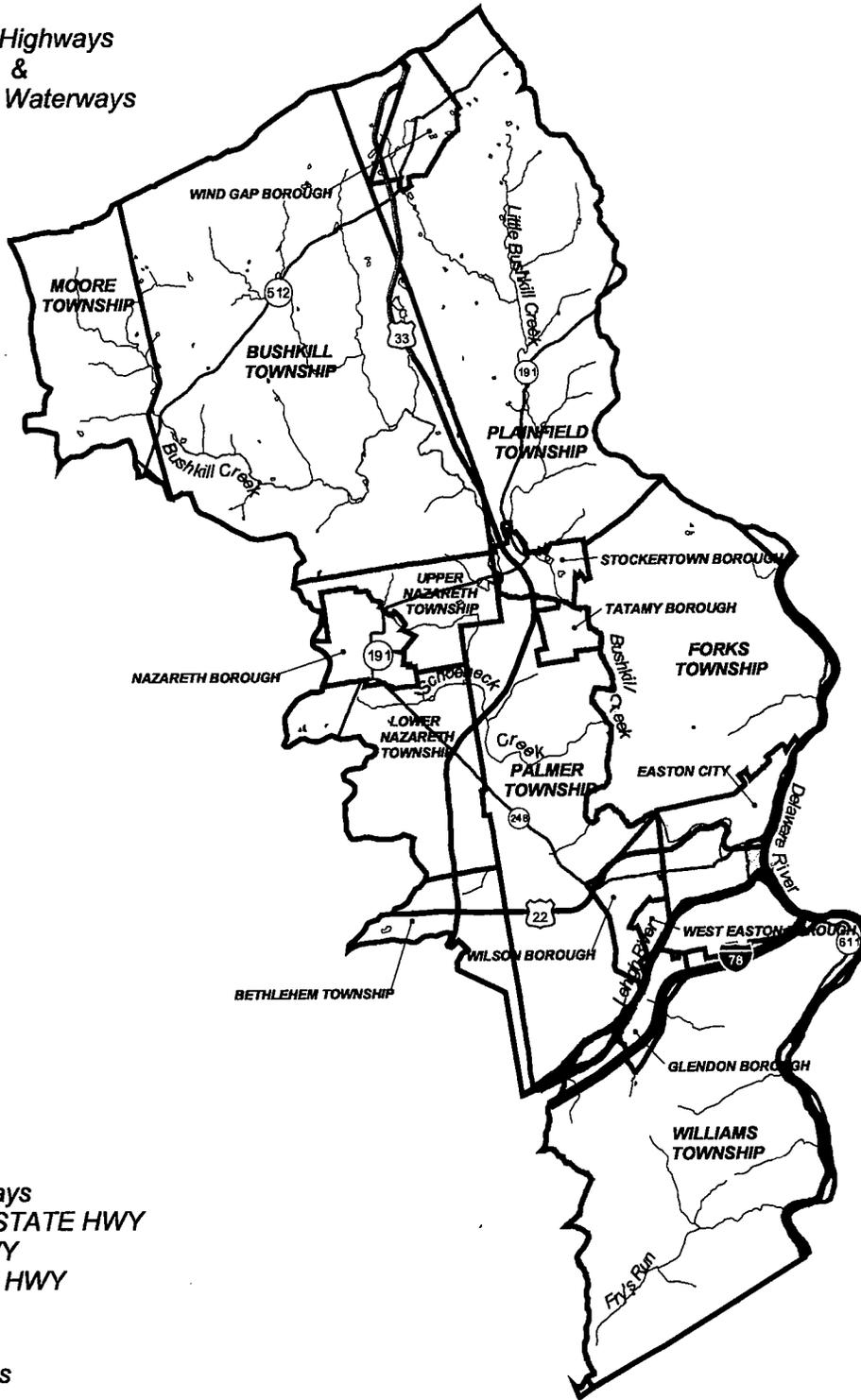
-  Northampton County
-  Two Rivers Conservation Area



**Two Rivers Watershed  
Conservation Plan  
Study Area**

**Map #2**

**Major Highways  
&  
Primary Waterways**



- Major Highways**
- INTERSTATE HWY
  - US HWY
  - STATE HWY
- Rivers**
- 
- Streams**
- 
- Two Rivers Conservation Area**
- 
- Municipal Boundaries**
- 



The Two Rivers Area Watershed Conservation Plan study area is comprised of the following stream/watersheds, along with direct drainage land areas along the Delaware and Lehigh Rivers, as further delineated in the attached map.

<u>Watershed</u>	<u>Square Miles</u>
• Bushkill Creek (Main stem)	82.2
• Unnamed tributaries to Bushkill Creek Basins (except for the Schoeneck Creek)	inclusive of above
• Little Bushkill Creek Basin	inclusive of above
• Frya Run Basin	6.3
• Bull Run	1.1
• Raubsville Run	0.9
• Direct drainage into Lehigh River	approximately 12.8
• Direct drainage into Delaware River	approximately 10.8
• Unnamed stream (Williams Twp.)	1.7

The watershed municipalities within the Two Rivers Area have become increasingly incorporated within the Northeast Corridor's expansion of land development since the 1960's. A signpost of this expansion is the population increase of the Two Rivers Area from 1990 projected into 2020, as follows.

**Population Trends within the Two Rivers Project Study Area**

<b>Municipality</b>	<b>Census 1990</b>	<b>Estimate 1998</b>	<b>2000 Census</b>	<b>2010 Forecast</b>	<b>2020 Forecast</b>
Bethlehem Township *	3,285	3,991	3,742	4,198	4,755
Bushkill Township *	5,512	6,573	6,551	7,568	8,780
City of Easton	26,276	25,361	26,263	27,013	27,443
Fork Township	5,923	7,027	8,419	9,112	11,255
Glendon Borough	391	392	367	408	416
Lower Nazareth Township *	4,483	5,156	5,259	7,322	9,292
Moore Township *	8,418	8,943	8,673	11,465	13,251
Nazareth Borough *	5,713	5,416	6,023	6,257	6,544
Palmer Township	14,965	16,883	16,809	17,361	18,993
Plainfield Township *	5,444	5,805	5,668	7,093	8,138
Stockertown Borough	641	639	687	602	587
Tatamy Borough	873	850	930	871	871
Washington Township*	3,759	4,019	4,152	5,197	6,049
West Easton Borough	1,163	1,141	1,152	1,221	1,250
Williams Township	3,982	4,309	4,470	5,499	6,398
Wilson Borough	7,830	7,521	7,682	7,244	7,013
Wind Gap Borough	2,741	2,859	2,812	2,668	2,638
<b>Totals</b>	<b>101,399</b>	<b>106,885</b>	<b>109,659</b>	<b>121,099</b>	<b>133,673</b>

Source: Lehigh Valley Planning Commission (issued 2001)

\* municipality partially within watershed study area, population number used is restricted to the area of the municipality in watershed project study area only.

In the next 30 years between 1990 and 2020, the Two Rivers Area is projected to experience an over 30% growth of its resident population. This pattern of growth is equivalent to two prior cycles of growth in this region's history, the periods from 1820 -1850 and again from 1900 - 1930, which resulted in significant physical changes to the areas character and land resource base.

In response to this projected growth and its impacts the Two Rivers Area Council of Governments has undertaken this study. In tandem with the data and field analysis presented in this plan, this project undertook a set of public workshops at the inception of the study to derive input on this plan's creation. The following narrative reports the proceedings of these workshops.

## **Two Rivers Area River Conservation Plan — Public Participation Process**

As per the Two Rivers Area-River Conservation Plan Work Program, a preliminary sequence of four (4) workshops were conducted to develop area wide input. These workshops followed the process outlined.

Working with the Client, a consensus building workshop process was specifically planned and conducted involving the following elements:

### **Two Rivers Area - River Conservation Plan**

- Identification of Community Values / with field data input
- Development of Community Goals / with field data input
- Presentation of Community Generated Values and Goals
- Interaction/Response to Leadership Concerns
- Synthesis and Development of Two Rivers Area - River Conservation Plan

These public workshops involving the project area residents and their local governments were conducted as follows:

#### **Workshop #1 (Community-Level):**

##### **Identification of Community Values**

This workshop derived input from the resident population relative to their traditional and local values that they ascribe to their landscape and community area. Resource/values related to cultural resources, natural resources, economic resources, open space, community life, and development patterns.

#### **Workshop #2 (Community-Level): Development of Goals**

This workshop expanded upon the identification of values by the area's resident population. The Consultant Team facilitated the development of these values into goals by participating residents, their goals and vision. The values and goals identified were developed into maps and/or plans for workshop illustration purposes.

#### **Workshop #3 (Leadership-Level): Presentation of Community Generated Values and Goals**

The values and goals were developed by the community as a whole were presented for review and discussion to the Community Leadership. The understanding and vision of their community and/or specific project was heard in a friendly mutual environment. The

Community Leadership provided their response to values and goals presented. The Consultant Team recorded and gathered all thoughts and reactions to the presentation and conducted an evaluation of their synthesis in preparation for Workshop #4.

#### **Workshop #4 (Community- Level): Interaction/Response to Leadership Concerns**

Workshop #4 moved into a basis for program design and implementation with the rural leadership and citizen groups present. The consultant Team facilitated a process utilizing the values and goals developed in the prior workshops to generate into program design elements.

A sequence of statements was developed, as per the conduction of these workshops:

1st — Concerns

2nd — Values

3rd — Goals

Then a set of Goal Priorities was developed and discussed and agreed to by consensus, as

4th — “Goal Priorities”

which was synthesized into three (3) **Priority Goals** the fifteen (15) expressed specific goals.

These statements of concerns, values, goals and priorities are woven into the text of this plan.

From this Workshop process a potential overall “Mission Statement” was developed for discussion, review and adoption by the cooperating municipalities of the Two Rivers Area Council of Governments. This “Mission Statement” can serve as the basic premise for their future intergovernmental cooperation to conserve, manage and develop the Two Rivers Area River Conservation Plan Initiative, This draft “Mission Statement” for consideration is as follows:

*It is a purpose of the Two Rivers Area Council of Governments to cooperate under the Commonwealth of Pennsylvania’ s Intergovernmental Cooperation Statutes to seek to Conserve, Manage and Develop their mutually shared watershed, waterways, natural water resources and their watershed land areas in ways which —*

- *stop any further decline in stream/watershed quality*
- *Improve stream/watershed quality, and seek to reverse previous declines in water quality.*
- *Understand the potentials of the area and encourage growth and development to occur which is sensitive to the natural environment, existing agriculture, residential environments and the area’s streams and water features.*

It should be attendant to this “Mission Statement” that all future activities under this initiative consistently refer to and engage programmatically and physically the more specific derived • Concerns • Values • Goals as developed in these workshops. The major points made in these statements should serve as a constant basis to begin discussions, conceptualize initiatives of cooperation, and to implement the Two Rivers River Conservation Plan - Cooperative Initiative into the future.

## **Workshop Participation**

Workshops #1 to #4 occurred between the time period of latter 1996 through and into late summer of 1997. In tandem with these workshops the consultant conducted the major portions of the field data gathering research, as per the work program. Major portion of this field data were brought into the conduction of these workshops as information for the participants and client. The public and interested organizations were notified of these workshops through a press release and direct mailings managed by the Two Rivers Area Chamber of Commerce staff. Attendance to these workshops was moderate to light, despite repeated personal efforts by the Chamber to develop higher attendance. Workshop participation ranged from a high of 30 people to a low of 10 people. Repeated efforts to get community leadership participation from the Slate Belt municipalities generated sincere expression of interest, but no attendance. Several meetings were held with representatives of the Bushkill Stream Conservancy, and one Conservancy board meeting presentation. Although invited, no active participation from the Bushkill Stream Conservancy occurred during the conduction of these workshops. Additionally through the committee structure of the Two Rivers Area Chamber of Commerce, two report/presentation meetings were given to the area's private business representatives, at which the findings of field data and workshop sessions were presented. These additional meetings averaged 20 to 30 individuals in attendance from leading businesses in the Two Rivers Area.

## **Section # 2 — Geologic Framework, Soils and Critical Areas**

### **Geologic and Soil Framework**

The foundation upon which all of the Two Rivers Area Watersheds rest is a diverse range of bands of subterranean rocks, over which are fitted a complex arrangement of affiliated soil type covers. The composition, arrangement and functioning of these rocks and soils directly determines the character and quality of water supply and water movement within the Two Rivers Area. A thorough review of the current adopted municipal comprehensive plans has revealed, generally, a low to moderate understanding of the area's rocks and soils, of the ways these resources affect our lives daily, and of their relationship to the community development and management process regionally. The following is a more detailed portrayal of these environmental factors.

### **A Brief History of the Two Rivers Area 's Rock Strata Formation**

The varied rock strata within the Two Rivers Area extend in age from those associated with the formation of the earth, to rocks formed up to two million years ago, with the exception of waterway alluvium of the present age. All of the area's geology is represented by five geological period groups.

- Pre-Cambrian • Cambrian • Ordovician • Silurian and • Quaternary

All of the Two Rivers Area's rock strata are influenced by the earth's Tectonic Plate Drift. Locally, this is manifested in the general east-to-west banding of the rock strata, (with the exception of the streamway alluvium of the flood plains), with intense folds and compression within the strata. Current geologic theory professes that the earliest rocks (Pre-Cambrian) of the North American continent were at first a part of a fused together Mega-Continent comprising all the current continents of the world. The rock strata from that period within the Two Rivers Area today is represented by the Pre-Cambrian rocks of the Chestnut Hill/Ridge Formation within the city of Easton, Forks and Palmer Townships, and the fully 5/8ths land area today of Williams Township's hilly mass. These rocks, which consist of bands of the Franklin Formation, Moravian Heights Formation, Pochuk gneiss, and Byran gneiss, range in age from the formation of the earth to 570 millions years ago.

By the next Cambrian period, the current Pre-Cambrian and now Cambrian rocks of the Two Rivers Area and the North American continent were of a separated continent termed Laurentia. The Two Rivers Area of today was the located on or near the Paleo-Equator. The Cambrian Period involves a period of time from 570 to 500 million years ago.

During the Cambrian period, two of the region's three major industrially valued rocks were formed. The first of these is Hardyston quartzite, which exists today in narrow bands within Williams Township. Located within these Hardyston quartzite bands were the area's most valued iron ore deposits, which were commercially exploited through open pit and deep shaft mining from the latter 18th to the early 20th century.

The second valued rock group from the area's Cambrian Period are the broad and deep bands of limestone. Valued as flux for iron making, construction stone, and burnt lime for agriculture and construction, these limestones are Tomstown Limestone and Allentown Limestone.

During the Cambrian Period, the rocks of the Two Rivers Area gradually sank beneath the waters of a vast, shallow inland sea. Enclosed within a larger continental formation, this sea fostered the formation of "practically all the material now constituting the sedimentary rocks" within the Two Rivers Area. The Hardyston quartzite within the area was formed from eroded inorganic Pre-Cambrian material and "a fairly deep cover of soil and rotten rock over the land."

This process is evidenced in the general properties of Hardyston. Hardyston quartzite is a rock composed of sands, generally fairly fine, which over geologic time have been subjected to the great compressive process of the earth's movements.

The Cambrian Limestones, the Two Rivers Area's earliest limestones, were formed initially from sediments deposited within this shallow sea. Gradually, it appears that the area's rock sedimentation process changed from sands to shales and calcareous (calcium carbonate,  $\text{CaCO}_3$ ) oozes. The Tomstown limestone, always located adjacent and within bands of Pre Cambrian rocks, in Williams Township and the Chestnut Hill area, is the first and oldest limestone to be formed here. The major portion of the content of the Allentown (Ca) limestone consists of material from calcareous algae, the "Cryptozoa". Evidence from field analysis indicates that Cryptozoa were abundant and often "withdrew from the (shallow) sea water and built into their structures sufficient calcareous matter to form deposits several feet in thickness."

Additionally during the Cambrian geologic period, the Tomstown and Allentown limestones were subjected to oozes which contained large quantities of magnesia. This presence of magnesia influenced these limestones to become predominantly dolomitic containing (calcium magnesium carbonate  $\text{Ca Mg}(\text{CO}_3)_2$ ). These dolomitic limestones are evidenced by their prevalent crystal formations, which occur in beds formed within the alteration of limestones, and in veins.

Over a 170 million year period, the repetitive process of the dilution of minerals and the deposition of calcium carbonate formed Tomstown Limestone, while the products from the calcareous algae, Cryptozoa, formed the deep bands of Allentown Limestone in Williams, Palmer, Forks and Lower Nazareth Townships, and the City of Easton in major part, the Borough of Glendon in full, and the Boroughs of West Easton and Wilson in full.

The following Ordovician geologic period encompassed the remaining full formation of three limestone rocks and subsequent four shale rocks. The Ordovician Period lasted from 500 to 435 million years ago. During this period the shallow sea continued to exist over the Two Rivers Area. For the next 35 million years the process of species diversification accelerated. An interpretation of the termed "Beekmantown Sea" was that is "was even clearer and mud seldom came upon it" during the Ordovician period. Within the Beekmantown Sea, the Beekmantown Limestone rock of the Two Rivers Area formed, mostly from calcium carbonate ( $\text{Ca CO}_3$ ) and continued Cryptozoa deposition. Today, this Beekmantown Limestone foundation is a broad, deep band of rock substrate which traverses most of Lower Nazareth and Upper Forks and Palmer Townships, and in full the Borough of Tatamy, within the Two Rivers Area.

The following formation of the two Jacksonburg limestones occurred again within this inland shallow sea. One interpretation is that this sea became increasingly muddy and the  $\text{Mg CO}_3$  decreased, while increasingly high calcium oozes accumulated. This process marks generally the formation of the Lower Jacksonburg Limestone. The Upper Jacksonburg limestone was formed in major part by "the deposition of much terrigenous (sedimentary) mud which was mixed with the calcareous oozes." The Jacksonburg limestones are described as "argillaceous low magnesian limestones". The two Jacksonburg limestones have been considered the most economically valuable limestone rock deposits of the Lehigh Valley. It is within these two limestone rock strata that the Portland Cement industry has cut down their vast cement rock quarries. The Jacksonburg limestones are located in two deep, narrow bands in far northern Lower Nazareth, Palmer and Forks Townships, and within full the Boroughs of Nazareth and Stockertown, and in northeastern Upper Nazareth Township.

As the Ordovician Period progressed, the shallow seas increased in muddiness. This activity caused the formation of the argillaceous Martinsburg Strata. This area is known today as the "Slate Belt". The definitive source of the shales of the Slate Belt is theorized "to have been marine plants." The varied changes in the composition of this rock's sedimentation

“resulted in the production of the light and dark layers that are called ribbons by the slate operators.” The Martinsburg Strata is composed of three differing rock bands across the upper portions of the Two Rivers Area today. The first, southern band is the Lower Martinsburg shale. The second, middle band is the Middle Martinsburg Shale. The third, northern band is the Upper Martinsburg Shale which runs immediately south of the current steep rise of the Kittatinny (Blue) Mountain.

Up to this point in time, it is theorized that the geologic processes of 200 million years deposited between 7,500 to 10,000 feet of layered sediments within the region’s shallow seas. At the close of the Ordovician Period a rapid (by geologic time) period of disturbance occurred, often referred to as the Taconic Disturbance. During this disturbance the sediments and rocks in the Two Rivers Area and along the present Atlantic coastline were subjected to complex folding and faulting, and rose, destroying the shallow sea. This period of compression and uplift was a prelude to the “Appalachian Revolution”, the formation of the chain of the Appalachian Mountains. A subject of varied theories, it is the opinion of some geologists that the characteristics of today’s Slate Belt deposits were largely created at the close of the Ordovician Period of geological history.

After a period marked by significant surface erosion, the whole region “sank again below the water of the vast inclined sea.” This event marks the beginning of the Silurian Period, a geologic time period from 400 to 345 million years ago. The Two Rivers Area’s Shawangunk conglomerate rock was formed during this period, consisting of coarse pebbles and sandstones that form Kittatinny (Blue) Mountain. This rock formation is the top (northern) band of rock in the Two Rivers Area, and provides the overburden shelter for the springs that generate the waters of the Bushkill Creek today.

Following the Silurian deposition of the Shawangunk conglomerate the vast tectonic forces of earth created the profound uplift of the Appalachian (Mountain) Revolution. “Thousands of feet of rock were folded by compressive forces from the southeast as though they were mere sheets of paper.” The rise of the mountain ridges of the Appalachian was in the thousands of feet, as high or higher, then, than the Himalayan Mountains of Tibet today. The Appalachian uplift occurred in the latter part of the Paleozoic era which encompassed a time period from 400 to 230 million years ago. This time period was followed by the Mesozoic era, 230 to 65 million years ago. Throughout the Mesozoic era no new rock was added to the extant profile of rock strata within Northampton County and the Two Rivers Area.

Today we are within the Cenozoic era of geologic time, from 65 million years ago to the present. Through the early Cenozoic era, periods of intense erosion washed and crushed down the area’s once uplifted rock material. The most prominent of these has been the sequence of two great ice/glacial sheets:

- Illinoian Ice Sheet
- Wisconsin Ice Sheet

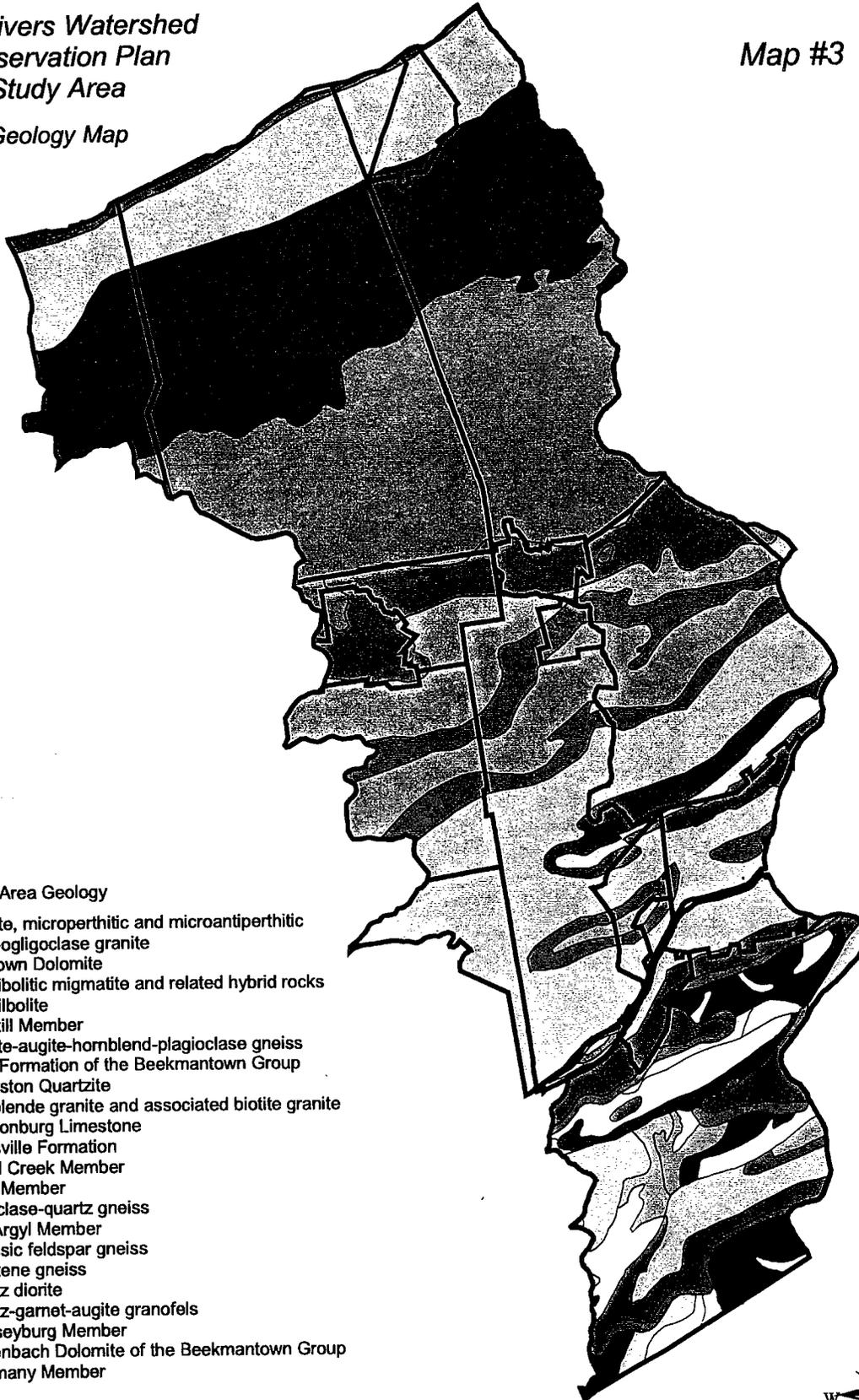
Much of the prominent shapes and forms of the land surface features of the Two Rivers Area we see today were first started by the Illinoian Ice Sheet and finished by the more recent Wisconsin Ice Sheet. These ice sheets are both of the Pleistocene epoch of the Quaternary sub-era of the Cenozoic Era. During the Wisconsin Ice Sheet, in the last 15,000 years of geologic time, humankind began to live within the Two Rivers Area. Their presence, dating back to approaching 15,000 BC, has been confirmed by the scientific excavations at Sandts Eddy, along the Delaware River in Lower Mt. Bethel Township.

By the time of the earliest confirmed human occupation in the area, the major land surface features within the Two Rivers Area were generally established. The river channels of the Delaware and Lehigh, and the stream drainage ways of the Bushkill Creek and Frys Run were becoming situated. With the retreat of the last glacial ice sheet (the Wisconsin Ice Sheet), our present set of land cover and its ancestral flora and fauna began to evolve on top of the region’s matrix of today’s established rock sub-strata.

Two Rivers Watershed  
Conservation Plan  
Study Area

Map #3

Geology Map



Two Rivers Area Geology

-  Alaskite, microperthitic and microantiperthitic
-  Albite-oligoclase granite
-  Allentown Dolomite
-  Amphibolitic migmatite and related hybrid rocks
-  Amphibolite
-  Bushkill Member
-  Epidote-augite-hornblend-plagioclase gneiss
-  Epler Formation of the Beekmantown Group
-  Hardyston Quartzite
-  Hornblende granite and associated biotite granite
-  Jacksonburg Limestone
-  Leithsville Formation
-  Lizard Creek Member
-  Minsi Member
-  Oligoclase-quartz gneiss
-  Pen Argyl Member
-  Potassic feldspar gneiss
-  Pyroxene gneiss
-  Quartz diorite
-  Quartz-garnet-augite granofels
-  Ramseyburg Member
-  Rickenbach Dolomite of the Beekmantown Group
-  Tammany Member

 Two Rivers Conservation Area

 Municipal Boundaries



## **Geologic Framework and its General Ground Water Resources and Water Filtration Characteristics**

The Two Rivers Area River Conservation Planning Area is composed of five general rock water bearing strata. (Refer to Strata Map grouping.) Relative to each of these rock strata the following general ground water characteristics are known to exist, beginning from the North to the South:

### Kittatinny (Blue) Mountain —Silurian Rock Strata

The mountain ridge itself is composed of Shawangunk sandstones and conglomerates.

“This rock contains fairly pervious beds, besides which the opening between the beds and also numerous joints afford easy circulation of water. Where the crest of the mountain is narrow the water level is very deep and only a small supply of water. . . is present. Springs occur along the foot of the mountain but they are generally concealed by thick talus deposits and their presence is determined by marshy conditions or by seepages.”

These rocks and their springs and seepage form the all-important headwaters of the Bushkill Creek, much of which is still in high ecologic integrity but increasingly threatened by development dependent on private on-lot septic tanks and fields.

### Martinsburg Slate Region

“The slates of the northern part [of the Two Rivers Area] permit the rain water to pass quickly through the surficial soil and weathered slate but very slowly through the compact, fresh, fine-grained rock beneath. Percolation through the slate itself does take place but most of the water that goes far below the surface moves through openings of joints and along loose bedding planes and possibly along cleavage planes. These openings are very narrow and are not evidenced by solution...” [within the Two Rivers Area]. The water movement process is “a very slow downward movement of the rain water...”

Throughout the Slate Belt section there is an almost complete absence of large, underground streams. All water tends to move in the Martinsburg shale rock formations as described above.

Because of the slate region’s slow water filtration process, the water, where not directly contaminated by surface sources, is of good quality. In some locales wells are affected by the presence of sulfur derived from pyrite content in areas of the slate. The structure of the Martinsburg shale formations foster a number of springs, usually at surface slope locales. There are more natural springs located in the Slate Belt than in any other rock strata within the Two Rivers Area. Many of these springs are not noted in current regional and local planning documents .

The surface springs in the Martinsburg Shale formations, however, do not supply a large volume of water on a municipal scale. The springs tend to be large enough in natural flow volume for farm and single family use. Most of the springs are subject to prolonged periods of drought. During such drought, most springs’ volume of flow decreases, some disappear. The temperature of the water in these springs tends to be warm, even in cold winter weather. It is not unusual for springs in deep winter, in these shales, to remain at 51 degrees Fahrenheit.

On-site water for farm, businesses and residences depends today on wells to access perennial water supplies. Hundreds of private wells have been dug throughout the Slate Belt. Most wells average over 200 to (increasingly) 400 feet in depth. The deepest wells tend to

"secure water under artesian pressure that will rise above the place encountered and in some instances will flow." The natural processing of water through the Slate Belt is of paramount value to the maintenance of the high water quality of the Bushkill Creek watershed. Without the uncontaminated filtering of water in the Martinsburg Shale formations, the quality of the Bushkill Creek would be highly diminished. To a moderate extent the whole Martinsburg Shale formation is a limited aquifer, in which volumes of water are suspended in the rock pores by a process of seepage. However, the Slate Belt's aquifer properties do not approach the level of aquifer properties of the Limestone Belt of the Two Rivers Area.

If there were no Slate Belt water charge there most probably would be no Bushkill Creek, due to the great porosity of the adjacent limestone belt. The heading of the waters in the Slate Belt for the Bushkill Creek is essential in the creation of the natural surface water supply, which creates the stream as it enters onto the limestone belt.

### Limestone Belt

The U.S. Department of Agriculture regards the Limestone Rock Strata-Belt within the Two Rivers Area as a part of a "Consolidated Rock Aquifer" which stretches from the Hudson River southwesterly along and within the Appalachian Mountain Front, all the way south into northern Alabama. Consolidated, water-bearing rocks are predominantly composed of limestone, basalt and sandstone rock strata. Aquifers have a general capacity of yielding individual wells of 50 gallons per minute and containing not more than 2,000 p.p.m. of dissolved solids. Within the US, only about half of the land mass of the continental United States is underlain with rock strata of aquifer properties. Within Pennsylvania less than one third of its land surface area is situated upon rock strata of aquifer properties. All local and regional planning documents do not mention the recognized aquifer properties of the Limestone Belt in the Lehigh Valley today. A highly complex underground physical structure, the actual functioning between rock and water is not fully understood at present to enable informed public planning to conserve this significant water resource. What is generally known is as follows:

"Ground water in limestone regions flows mainly in well defined open channels formed by solution along ordinary joints or bedding planes, and the surface water passes into these underground channels...the best surface indications of underground streams in the limestone of this region are sinkholes into which the surface water flows to unite with underground streams. Boring in the vicinity of sinkholes or in the line of a series of sinkholes is reasonably certain to encounter water."

Ground water of reasonable supply tends to appear around areas where "Valley Ores", (historically, the location of iron ore mines), typically limonite, are located. Water tends to appear at these locales at a depth of just fifty feet.

"In certain places the limestones have been unduly shattered as a result of complex folding and faulting. At such locales abundant water can be found by drilling." [although drilling in these locales is difficult. The complexity of the limestone belt's structure] "...prevents one from predicting the depth"

and in many cases, the location, of where a perennial supply of water can be found. These complex physical characteristics tend to make the identification and confirmation of regular aquifer water supply, via well drilling, extremely difficult. Most importantly,

"limestone waters are subject to contamination, as the areas are thickly settled and surface waters in many places find ready access to underground channels...if wells are tightly cased for some distance into solid rock the danger of surface contamination is lessened, but it is not entirely removed, as polluted waters may reach great depths through open fissures."

The Bushkill Creek in and of itself functions in a very complex manner within the Limestone Belt. At many points where the stream crosses limestone, its waters are depleted by stream to ground water seepage. At many points the Bushkill Creek is replenished by large intakes from streamside and in-stream cold water springs. The production of this cold water is the contributing quality factor in sustaining its cold water fishes population (native Brook Trout). A highly complex structure, the Limestone Belts' water bearing properties need to be understood with greater clarity in order to define the paths to maintaining its water quality contribution. Easily subject to surface contamination, the conservation of the Limestone Belt's water bearing properties is crucial to conserving the lower distance of the Bushkill Creek watershed's water quality from degradation.

For decades, the natural flow of water in the Bushkill Creek has been highly dependent on the industrial pumping of water from the deep, cement rock quarry cuts in the Nazareth area. In times of drought the pumped supply of these waters to the stream are important to critical, depending on the level of drought. If ever the relationship is closed, or those quarries abandoned, the survival of the Bushkill Creek, and its populations of fish, wildlife and vegetation will be adversely affected and become an immediate intermunicipal and State concern. Such a collapse would be a highly visible and disturbing local ecological disaster.

### Cambrian Sandstones

The narrow band of sandstones and quartzites both along Chestnut Hill Ridge and in bands in Williams Township contain much water:

"The water passes along joints and bedding planes or through the rocks themselves and is seldom concentrated in definite streams...the best place to procure water is at the contact between these rocks and the underlying gneisses [rock strata] . . . the water from the Cambrian quartzites and sandstones is low in mineral content because of the insoluble character of the rocks."

Mostly undeveloped through the 1940's. Many areas of this water bearing rock strata are now being subject to intense suburban and some industrial development near Easton and northern Williams Township. The massive Chrin Landfill is located on top of a major band of this rock strata, the same band of rock underlying the City of Easton wells, which contain significant deep well water reserve supplies. Recognition and conservation of this rock strata is crucial to maintain its natural water quality. An awareness of these water values is moderate within local and State planning bodies at present.

### Pre-Cambrian Gneisses

Located totally within Williams Township of the Two Rivers Area, the water bearing qualities of these rock strata are important. The rocks are:

"typically near the surface are greatly jointed and permit the entrance of water. As the depth increases the joint spaces become narrower and consequently the water moves more slowly. Lines of seeps or springs furnish most of the residents with ample supplies of water" [in areas more down-slope from hilltops and ridges] "The water in the gneiss contains little dissolved mineral water, and when it is protected from local pollution...is very desirable"

[There are geologic faults in this rock] —"wells near faults should obtain ample supplies of good water."

Still predominantly rural, Williams Township is experiencing expanding residential lot development, each lot typically with its own water (well) and septic system. The practical

challenge in the future will be to ensure the maintenance of the area's high quality natural water supply as planned and reviewed development continues. If local pollution increasingly occurs, it could be very costly to correct, due to the dispersed pattern of land surface development.

Overlaying the rock strata of the Two Rivers Area is an extremely varied complex of soil types/covers. Ranging from mountain lands to river bottom soils and bog muck, the soils in this area are intimately related to their rock strata. The following profile of soils identifies the types of soils which are critical in supporting the region's natural water quality. These "Sensitive Soils" deserve coordinated conservation, regulatory and physical programmatic efforts in order, at minimum, to protect the primary set of factors which cause water storage and movement in the Two Rivers Area.

The following narrative describes these soil types and ascribes their scientifically established water bearing properties.

**Sensitive Soil Type/Series within the Two Rivers Area**

The following soil type/series descriptions are derived from Soil Survey of Northampton County, Pennsylvania, by the United States Department of Agriculture-Soil Conservation Service, in cooperation with the Pennsylvania State University College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission, issued July 1974.

All of the following soils have critical to severe sensitivities in relation to their capacity to retain and/or drain water. Most of these soils should have no forms of development upon them. The remaining soils should have substantial restriction to their land development uses. These classifications will follow each soil's description within the following soil groups.

Interpretive Soil Series Grouped by Significant Properties

A. Hydric Soils: Wet, Seasonally Wet, Drainage Ways, Stream Related, Flood Prone and Alluvial Wash

• Slow and Poorly Drained:	Ad, AnA, AnB, BuB, BtA, BtB, ChA, ChB, CmA, CmB, Ho, CIA, ClB, Mu, BaB, Brn, Mb, PhB, Rh, UtB
• Variable Drainage / Urban Land / Flood Prone:	Us
• Slow, Poorly Drained & Extremely Stony:	AoB, BvB, CkB, CnB, BeB
• Well Drained & Extremely Stony:	Bg, LaB, LaD (w/hydric inclusion)

B. Deep Well Drained Soils

• Stony & Rubble Lands: (All Extremely Stony)	
• Sloping Steeply	St, Ru, CrD, CrF, LaF, WhF (rocky)
• Sloping Gently:	CrB
• Steep Lands: ( greater than 15% slope gradient ) (Not Extremely Stony)	BsF, BrD, WkD, WaD, CoD, HnD, CtD, CtF
• Sloping Lands: (8to15% slope gradient) (Not Extremely Stony)	BrC, BoC, WkC, RyC, WaC, CoC, HnC, CtC

**SOIL DESCRIPTIONS**

**Hydric Soils: Wet, Seasonally Wet, Drainage Ways, Stream Related, Flood Prone and Alluvial Wash**

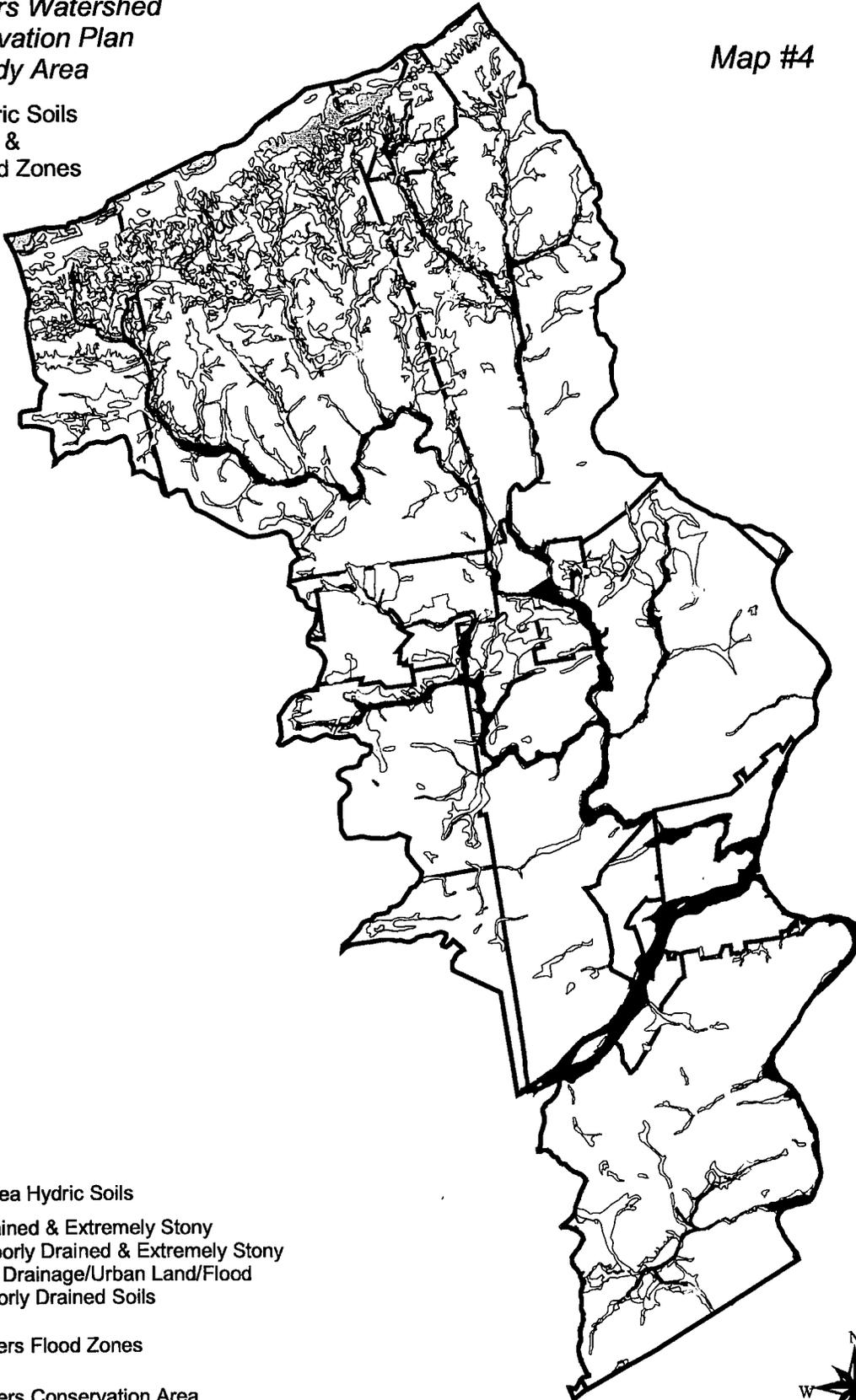
**Ad Alluvial land - Coal Overwash**

Alluvial land, coal overwash, soil material is of varying nature. Shallow pools are common after floods and heavy rainfall. Land is poorly suited to farming and building due to flood hazard. Suited to tree plantings and to wildlife habitat.

*Two Rivers Watershed  
Conservation Plan  
Study Area*

*Map #4*

Hydric Soils  
&  
Flood Zones



Two Rivers Area Hydric Soils

-  Well Drained & Extremely Stony
-  Slow, Poorly Drained & Extremely Stony
-  Variable Drainage/Urban Land/Flood
-  Slow Poorly Drained Soils

 Two Rivers Flood Zones

 Two Rivers Conservation Area

 Municipal Boundaries



**AnA Andover gravelly loam 0-3% slope**

Soil surface layer is generally 7 to 10 inches thick. High water table and slow permeability. Classed as capability Unit IVw-2—poorly to very poorly drained soil, excess water severely limits soil for cultivation.

**AnB Andover gravelly loam 8-8% slope**

Soil surface layer is generally 7 to 10 inches thick, drainage channels or gullies are common where slopes are more than 5%. Soil is poorly suited to crops. Soil has a high water table and slow permeability. The wetness and slow permeability are limitation to most non-farm uses. Classed as capability Unit IVw-2—poorly to very poorly drained soil.

**BuB Buchanan gravelly loam 3-8% slope**

Soil surface layer is generally 8 inches thick, subsoil reaches depth 24 to 43 inches. This soil can mottle, with water table rising to within 1-3 feet of the surface during wet periods. The slowly permeable subsoil and the high water table are limitations to most non-farm uses. Classed as capability Unit IIe-1—Erosion hazard of soil is moderate, soil is somewhat wet, soil affected often by frost heaving.

**BtA Brinkerton silt loam 0-3% slope**

Soil surface layer is generally 9 inches thick with upper part of subsoil about 21 inches thick, the amount of shale content increases with depth. Substratum can extend to depth over 60 inches. Permeability is slow. Available moisture capacity is low. Water table is typically set at or near surface during wet periods. Ponding occurs during periods of heavy rain and spring thaw. Poorly suited to cultivated crops. High water table and slow permeability are major limitation to most non-farm uses. Classed as Capability Unit IVw-2—poorly to very poorly drained soil.

**BtB Brinkerton silt loam 3-10% slope**

This soil is along stream heads in drainage-ways, and at the foot of long toe slopes. Soil surface layer is generally 9 inches thick with upper part of subsoil about 21 inches thick, the amount of shale content increases with depth. Substratum can extend to depth over 60 inches. Permeability is slow. Available moisture capacity is low. Water table is typically set at or near surface during wet periods. Ponding occurs during periods of heavy rain and spring thaw. Poorly suited to cultivated crops. High water table and slow permeability are major limitation to most non-farm uses. Classed as Capability Unit IVw-2—poorly to very poorly drained soil.

**ChA Chippewa silt loam 0-2% slope**

Deep, poorly drained soil, surface layer is black and about 9 inches thick, subsoil is at depth of 17 inches. Permeability is slow, and available moisture capacity is moderate to low. The water table is at or near the surface during wet periods. There is frequent ponding in depressions during periods of heavy rain or spring thaw. Ill suited to most uses. Classed as Capability Unit IVw-2—poor to very poorly drained soil.

**ChB Chippewa silt loam 2-8% slope**

This soil is on broad upland toe slopes and in drainage ways. The soil surface layer is 6 to 9 inches thick. Deep, poorly drained soil, surface layer is black and about 9 inches thick, subsoil is at depth of 17 inches. Permeability is slow, and available moisture capacity is moderate to low. The water table is at or near the surface during wet periods. There is frequent ponding in depressions during periods of heavy rain or spring thaw. Ill suited to most uses. Classed as Capability Unit IVw-2— poor to very poorly drained soil.

**CmA Comly Silt Loam 0-3% slope**

This can be a mottled soil layer, and is located in broad, flat, upland areas, on toe slopes, and in drainage ways and potholes, and along small streams. This soil is silt loam, about 9 inches thick, with a subsoil depth from between 9 and 26 inches. Permeability in the lower part of the subsoil is moderately slow, and the water table is within 1/2 foot to 3 feet of the surface during periods of wetness. The moderately slow permeability and a seasoned high water table are limitations to most uses. Soil is classed Capability Unit IIw-2 — covered by shallow water during heavy rains.

**CmB Comly Silt Loam 3-8% slope**

This soil is on broad, flat upland areas and top slopes, in drainage ways and potholes and along small streams. If soil is cultivated, the hazard of erosion is moderate. Classed as Capability Unit IIe-1 — Erosion hazard is moderate, permeability is moderately slow to slow; soils are somewhat wet.

**Ho Holly Silt Loam**

Deep, nearly level, poorly drained to very poorly drained soils that are on flood plains along most of the perennial streams in the area. Surface layer is 9 inches thick with subsoil 31 inches thick. Subject to flooding. Classed as Capability Unit IVw-1 — Poorly drained soil, susceptible to flooding with high water table, unsuitable for non-farm uses.

**CIA Clarksburg silt loam 0-3% slope**

Deep soils composed of material weathered from limestone "cement rock" and some shale. Typically located along drainage-ways, large sinks and flat basins. Typically soil is 9 inches with subsoil depth of 9 to 29 inches. Subject to flooding during periods of heavy rainfall and spring thaws. Slow permeability and seasonal high water table are major limitation to most uses. Classed as Capability Unit IIw-2 — Poorly drained, natural drainage-ways need to be kept open to provide outlets for water lying in depression.

**CIB Clarksburg silt loam 3-8% slope**

Soil in drainage ways, on undulating to karst (sinkhole) uplands. Erosion hazard is moderate. Drainage-ways pond during heavy rainfalls and spring thaws. Slow permeability and a seasonal high water table are limitations to most uses of this soil. Classed as Capability Unit IIe-1. — Available moisture capacity is moderate to high. Soil is somewhat wet.

**Mn Muck**

Consists of organic material 2 1/2 to many feet thick, in bogs and swamps. Very recent forming soils. Water table is near the surface. Totally unsuited for any building, roads,

embankments or other structures. It is essentially peat. Classed as Capability Unit VIIw-1. — Occupies depressions in glaciated uplands. It has value as a natural reservoir for water.

**BaB Baile silt loam, neutral variant** **2-8% slope**

Deep, poorly drained soil. Soil is in depressions or uplands, in drainage-ways and along the base of ridges. Seepage from springs keeps them wet most of the year. Classed as Capability Unit VIIs-1, soils are too stony and too wet even for crops. They are fairly well suited to moisture-tolerant trees.

**Bm Barbour and Middlebury soils, highbottom** **0-5% slope**

Soils are on smooth highbottoms, benches and stream terraces. Soil is typically 10 inches thick at surface, subsoil 18 inches thick. Subject to flooding, mainly along streams. Classed as Capability Unit IIw-1 — Soils are on flood plains, and subject to flooding.

**Mb Middlebury soils**

Surface layer is brown sandy loam about 10 inches thick, subsoil is 20-27 inches deep. Soils are in areas along small streams that flow from the base of the Blue Mountain. Flooding is the main limitation to most uses. Classed as Capability Unit IIw-1 — Poorly drained soils, they are fairly well suited to moisture-tolerant trees.

**Phb Phelps gravelly silt loam** **2-8% slope**

Soil's surface layer is thin, with fine sandy loam subsurface layer. Combined thickness of layers is about 10 inches. Erosion hazard is moderate. Soil's moderately slow permeability and seasonal high water table are the major limitations to most non-farm uses. Classed as Capability Unit IIe-1 — Poorly drained soils.

**Rh Red Hook gravelly silt loam** **0-5% slope**

Deep, somewhat poorly drained soil. Surface layer is 5 inches thick with subsoil of 10 to 25 inches, and substratum of 35 inches. Permeability is moderately slow, with water table between depths of 6 to 8 inches during wet periods. Depressions are subject to ponding during heavy rains. Seasonal high water tables are limitations to most non-farm uses. Classed Capability Unit IIIw-1 — Most areas are suited to wildlife habitat and to watershed.

**UtB Urbana Silt loam** **2-10% slope**

Deep soil surface layer 9 inches thick, subsoil 9 to 19 inches depth; lower subsoil can be 19 to 38 inches deep, substratum can extend to 50 inches deep. Erosion hazard is moderate. Moderately slow permeability and a seasonal high water table are major limitations to most non-farm uses. Classed as Capability Unit IIe-1 — Somewhat poorly drained soil, occupies drainage-ways, depressions and lower foot slopes along the base of ridges and mountains.

**Variable Drainage / Urban Land / Flood Prone**

**Us Urban Land, occasionally flooded**

All Us soils in Urban land areas are long and narrow and parallel to nearby streams. Consists of water laid sediments, subject to frequent flooding.

*Note:* Within Urban Land Areas, typically the City of Easton, there are narrow, steeply sloped land areas; currently many of these areas have re-wooded and are often terraced. Not classified by the soil survey, these steep urban lands should be noted. As a condition, they should all be left wooded and undeveloped when over 15% slope, even though they are watered and sewerred by public works infrastructure.

### **Slow, Poorly Drained and Extremely Stony**

#### **AoB Andover extremely stony loam 0-8% slope**

Soil surface layer is 7-10 inches thick. Soil contains high water table and slow permeability. Unsuitable for most non-farm uses. During wet season the water table is at or near the surface. Classed as Capability Unit VIIIs-1 — Somewhat poorly to poorly drained soils. Fairly well suited to moisture-tolerant trees.

#### **BvB Buchanan extremely stone loam 0-8% slope**

Soil located typically at lower foot slopes of mountains. Surface layer is 8 inches thick, subsoil is 24 to 43 inches deep. Permeability is slow, water table rises within 1 to 3 feet of the surface, which causes the soil to be non-suited to most non-farm uses, Typically wooded. Classed as Capability Unit VII2-3 — stoniness severely limits them as unsuitable for farming and practically all uses.

#### **CkB Chippewa extremely stony silt loam 0-8% slope**

Nearly all of this soil is wooded, idle or sometimes in pasture. Stoniness and high water table impose limitation to most uses. Subject to frequent ponding in depressions during periods of heavy rain or spring thaw. Classed as Capability Unit VIIIIs-1 somewhat poorly to poorly drained soils. Fairly well suited to moisture-tolerant trees.

#### **CnB Comly extremely stony silt loam 0-8% slope**

Soil is on smooth or slightly concave uplands that have potholes or depressions in some places. Generally in swales and drainage-ways along small streams. Extremely stony, moderately slow permeability and seasonal high water table are limitations to many uses. Classed as Capability Unit VIIIs-3 stoniness severely limits them as unsuitable for farming and practically all uses.

#### **BeB Baile extremely stone silt loam, neutral variant 0-8% slope**

Most of soil is in native pasture or has a cover of trees and brush. Stones on the surface make this soil unsuitable for crops. Stoniness, slow permeability and a high water table are limitation to non-farm uses. Classed as Capability Unit VIIIs-1 — Soils are too stony and too wet. Fairly well suited to moisture-tolerant trees.

### **Well Drained and Extremely Stony**

#### **Bg Barbour soils**

Deep, well drained soils on flood plains and terraces along all the perennial stream in area. Subject to flooding. Classed as Capability Unit IIw-1 — Soils are on the flood plains preventing all non-farm uses; subject to erosion.

**LaB Ladig extremely stony 0-8% slope**

Mottled soils, extremely stony, typically located on the toe slopes of Blue Mountain. Soils contain small wet areas or potholes. Soil is better suited as woodland than to other uses. Classed as Capability Unit VIIs-3 — Slow to moderate permeability, soils unsuitable for cultivation and most other uses.

**LaD Ladig extremely stony silt loam 8-25% slope**

Soils are on the toe slopes of the Blue Mountain. Extremely stony soil, with some soils in potholes and depressions. Steepness of slope and the extremely stony surface are limitation to most uses. Classed as Capability Unit VIIs-3 — slow to moderate permeability soils unsuitable for cultivation and most other uses.

**Deep, Well Drained Soils**

**Stony and Rubble Lands (all extremely stony)**

**St Stony Land**

Soil feature are covered by stones and boulders. Stony land is on mountains, hills, and ridges. 90% of the surface is covered with stones and boulders. Stony land generally supports a thin, scrubby stand of oak and red maple. Steep slopes make harvesting of trees impossible in most areas. Best suited to watersheds or aesthetic uses. Classed as Capability Unit VIIs-1 — not suitable for growing trees commercially; most areas are suited for wildlife habitat and to watershed.

**Ru Rubble Land**

Areas covered with more than 90% stones and boulders, soil features obscured. Supports little or no vegetation. Best suited for watershed or aesthetic uses. Classed as Capability Unit VIIIs-1 — not suitable for growing trees commercially; most areas are suited for wildlife habitat and to watershed.

**CrD Conestoga and Hollinger extremely stony silt loams 8-35% slope**

Most areas of these soils are wooded. Stones and steepness makes soils poorly suited to cultivation and limit residential development. Classed as Capability Unit VIIs-3 — stoniness makes these soils unsuitable for cultivation and severely limits them for most other uses.

**Crf Conestoga and Hollinger extremely stony silt loams 25-65% slope**

Soils are on uneven hillsides and ridges. Stones cover 10 to 25 % of the surface. Most areas of these soils are wooded. Stones and steepness makes soils poorly suited to cultivation and to most non-farm uses. Classed as Capability Unit VIIs-2 — Permeability is moderate to moderately slow, and available moisture capacity is moderate to high. Better suited to woodland, wildlife habitat and for watersheds; logging difficult and hazardous.

**LaF Ladig extremely stony silt loam 25-65% slope**

Deep, well drained very steep soils, Surface layer is thin, only 2 inches thick. Subsurface is 2 inches thick, upper part of subsoil is 3 to 40 inches thick. Maximum depth of substratum is 70 inches. It is about 45 % gravel, cobblestones, and channery fragments. Extremely stony and poorly suited to most uses. Classed as Capability Unit VIIs-2 — Best suited as woodland, wildlife habitat and for watershed.

**WhF Washington very rocky silt loam 25-75% slope**

Soil is on smooth, abrupt hillsides and escarpments along many of the larger drainage-ways. Rock outcrops and ledges make up about 15% of the mass. Steepness of slope and rock outcrop are the major limitation to most uses. Classed as Capability Unit VIIs-2 — Best suited as woodland, wildlife habitat and for watershed; logging is difficult and hazardous.

**Sloping Gently**

**CrB Conestoga and Hollinger 0-8% slope**

Most areas of this soil are wooded. The extremely stony surface is poorly suited to cultivation; stoniness limits residential development. Classed as Capability Unit VIIs-3 — Stoniness makes these soils unsuitable for cultivation and severely limits them to most other uses. Slow to moderate permeability.

**Steep Lands (>15% slope gradient) - not extremely stony**

**BsF Berks and Weikert soils 25-65% slope**

Soils are on hillsides and ridges along deeply cut drainage-ways, Soil is about 9 inches thick, with subsoil of 28 inches. Shallowness to bedrock and the high content of coarse fragments are limitations to most uses. Soils too steep for crops and for most non-farm uses. Classed as Capability Unit VIIe-1 — Best used as woodland and as wildlife habitat.

**BrD Berks shaley silt loam 15-25% slope**

Soil is on smooth or convex hillsides and ridges along deeply cut drainage-ways. Soil is about 9 inches at surface. Poorly suited to crops; steepness of slope is a severe limitation to most non-farm uses. Classed as Capability Unit IVe-2 — Best suited as long-term hay or pasture for farm use; subject to erosion.

**WkD Weikert channery silt loam 15-25% slope**

Soil cover is thin, soil is moderately to severely eroded and the hazard of further erosion is high. Rills and gullies are common. Very high erosion hazard soil. Classed as Capability Unit VIe-1 — Best used as woodland and as wildlife habitat.

**WaD Washington silt loam 15-25% slope**

Soil is on rolling, convex uplands. Surface layer is 19 inches thick, subsoil is 20 inches thick; lower part of subsoil is about 42 inches thick. Substratum is below a depth of 72 inches. Hazard of erosion is severe. Steepness of slope is major limitation to most non-farm uses. Classed as Capability Unit IIIe-1 — Erosion hazard of soil is very high if these soils are cultivated; best suited for long-term hay and pasture.

**CoD Conestoga silt loam 15-25% slope**

Moderately deep soil is located on hillsides and ridges, typically adjacent to smaller streams. Erosion, if soil is cultivated, is moderate to high. Poorly suited to cultivated crops. Steepness of slope is a limitation to most non-farm uses. Classed as Capability Unit IVe-1. Erosion hazard very high. Best suited as pasture or woodland; extremely droughty.

**HnD Hollinger gravelly silt loam 15-25% slope**

Soil is 8 inches thick at surface layer, on irregularly shaped hills and ridges, mostly in the vicinity of small drainage-ways. Hazard of erosion is moderate to very high in cultivated areas. Poorly suited to cultivated crops. Steep slopes are limitation to most non-farm uses. Classed as Capability Unit IVe-1 — Erosion hazard very high. Best suited as pasture or woodland, extremely droughty.

**CtD Conotton gravelly silt loam 15-25% slope**

Soil is located on escarpments and karms. Rills and small gullies are common. Soil is poorly suited to cultivated crops. Erosion hazard is very high. Steepness of slope is major limitations for most non-farm uses. Classed as Capability Unit IVe-1 — Erosion hazard very high. Best suited as pasture or woodland, extremely droughty.

**CtF Conotton gravelly silt loam 25-65% slope**

Soil is located on smooth, abrupt escarpments and karms that are generally near major drainage-ways. Erosion hazard very high on cleared areas. Too steep for cultivated crops, hay or improved pasture. Steepness of slope is major limitation to most non-farm uses. Classed as Capability Unit VIIe-1 — Erosion hazard very high. Best suited as woodland; extremely droughty.

**Sloping Lands ( 8 to 15% Slope Gradient) not extremely stony**

**BrC Berks shaley silt loam 8-15% slope**

Soil is on convex hillsides and ridges. Surface layer is 9 inches thick, subsoil is to a depth of 28 inches. Soil has high erosion hazard and is somewhat droughty. Shallowness to bedrock steepness of slope and high content of shale are major limitations to most non-farm uses. Classed as Capability Unit IIIe-3 — Well drained soils subject to erosion and droughtiness.

**BoC Bedington Shaly silt loam 8-15% slope**

Deep, well drained soils. High erosion hazard and high content of shale are major limitation to most uses. Classed as Capability Unit IIIs-1. Erosion hazard is high.

**WkC Weikert channery silt loam 8-15% slope**

Soil is on convex hillsides and ridge tops. Cultivated areas are severely eroded. Low available moisture capacity, high erosion hazard. Shallowness to bedrock, steepness of slope, and the many channery fragments are a major limitation to most non-farm uses. Classed as Capability Unit IVE-3. —Erosion hazard is high, low available moisture capacity.

**RyC Ryder silt loam 8-15% slope**

Soil is on convex uplands and on the lower toe slopes of shale ridges. Erosion hazard is moderate to high in cultivated areas. Steepness of slope is major limitation to most non-farm uses. Classed as Capability Unit IIIe-3 — Well drained soils subject to erosion and droughtiness.

**WaC Washington silt loam 8-15% slope**

Soil is on convex uplands that have few closed depressions and rock outcrops. If cultivated, hazard for erosion is server. Steepness of slope is a major limitation to most non-farm uses. Classed as Capability Unit IIIe-1 — Erosion hazard is high.

**CoC Conestoga silt loam 8-15% Slope**

Soil is on rolling ridge tops and hillsides. Hazard of erosion is moderate to high in cultivated areas. Sheet and rill erosion are common. Steepness of slope is major limitation to most non-farm uses. Classed as Capability Unit IIIe-1 — Erosion hazard is high.

**HnC Hollinger gravelly silt loam 8-15% slope**

Deep, well drained, steep soils on uplands. Erosion is moderate to high in cultivated areas. The main limitation to most uses is slope and the many coarse fragments on the surface. Classed as Capability Unit IIIe-1 - Erosion hazard is high.

**CtC Conotton gravelly silt loam 8-15%**

Deep, well drained, steep soils on short convex escarpments and karms. If on-site sewage disposal systems are used, there is a hazard of ground-water contamination by unfiltered effluents. Classed as Capability Unit IIIe-2 — Low available moisture capacity. If cultivated, erosion hazard is high; slow to rapid permeability.

## Water Surface Features within the Two Rivers Area

Overlaying and moving across all of the area’s geologic, soil, surface and strata features are a set of at-surface natural moving waterways. These natural waterways are the most visible expression of the area’s complex natural water systems. The Two Rivers Area is blessed with generally a high water quality matrix of watersheds, expressed by a set of waterway/channel features. The following profile reports on the these at-surface visible waterways and their qualities.

### The Overall Significance and Value of Waterway and Watershed Resources within the Two Rivers Area of Pennsylvania

The Pennsylvania Department of Environmental Protection has officially designated the major waterway and watershed features within the Two Rivers Area as follows:

Watershed	Status	Square Miles
Bushkill Creek (Main stem)	High Quality (HQ); Cold Water Fish (CWF)	82.2
Unnamed tributaries to Bushkill Creek Basins (except for the Schoeneck Creek)	HQ; CWF	inclusive of above
Little Bushkill Creek Basin	HQ; CWF	inclusive of above
Frya Run Basin	HQ; CWF	6.3
Bull Run	unclassified	1.1
Raubsville Run	unclassified	0.9
Direct drainage into Lehigh River	unclassified	approximately 12.8
Direct drainage into Delaware River	unclassified	approximately 10.8
Unnamed stream (Williams Twp.)	unclassified	1.7

These official water quality designations are taken from Chapter 93 of the Water Quality Standards of the Pennsylvania Code. These official designations by the Commonwealth render the following general valuation:

#### High Quality (HQ)

“High quality waters are considered as a stream or watershed with excellent quality water and environmental features that require special protection.”

The State’s criteria further goes on to state generally of high quality water(s):

“High quality waters are to be protected and maintained at their existing quality or enhanced unless it can be shown that any increased discharge of any pollutant is justified as a result of economic or social development which is of significant public value. The best available treatment and land disposal technologies must be used where economically feasible and environmentally sound.”

#### **Cold Water Fishes (CWF)**

The State’s requirement for Cold Water Fishes (CWF) designation involves:

- the permission of the adjacent landowners for access to fishing is granted
- that the stream is able to reproduce trout naturally, and
- it must be controlled environmentally.

This water quality is intended “to help protect aquatic life in that it deals with the maintenance and/or propagation of fish species and flora and fauna which are native to cold water habitats.”

Within the land surface area of the Two Rivers Area River Conservation Planning Area those designated High Quality and Cold Water Fishes waterways and the watershed/basins encompass over 75% of the Two Rivers Area.

#### **Subsidence and Sub-Surface Features, Man-made and Natural**

Within the Two Rivers Area both man-made and natural processes have created a complex matrix of cuts, puts, tunnels, fissures and holes through the area’s soil and rock strata. Combined, these features play a significant role in the area’s hydrology and, at points, create geologic hazards, such as mines, quarries and pits. The following narrative presents an initial profile of these features.

For the period of time from the 1820’s to the post World War II era, there is no historically thorough, definitive public document which states all locales of industrial and mining operations within the Two Rivers Area. As well, there is no definitive study of the environmental hazards that such sites may contain, or the possible resultant threat to general health and water quality via polluting leakage and seepage. Such a study should be considered, which also could provide on-site soil chemical content(s) identification and analysis. A number of these sites may (tend to) be quarry and mine site locales identified through the Pennsylvania Geological Surveys Report #48, Northampton County, Pennsylvania, by B. Miller, D. McCoy Fraser, and R. Miller. This verified list is as follows:

**List of Active and/or Vacated Limestone Quarry Operations within the Two Rivers  
Area-River Conservation Plan Area — Bushkill Watershed**

**Post 1900 Limestone Quarries**

<b>Name</b>	<b>Date Established</b>	<b>Status</b>
Old Nazareth Cement Company Nazareth	1907	Still Active
Hercules Cement Corporation, Nazareth	1907	Still Active
Northampton Portland Cement Company Stockertown	By 1909	Closed in 1912

**Unnamed pre-1900 Limestone Quarries**

	<b>Name</b>	<b>Date Established</b>	<b>Status</b>
5	Five abandoned Road Material and Limestone Quarries Easton, PA	18th to early 20th centuries	All abandoned hill side cuts along Bushkill Creek
6	Six abandoned limestone quarries along Bushkill Creek from 25th St. to former Binney and Smith Plant, Forks Township	19th and early 20th century	All abandoned hillside cuts along Bushkill Creek
5	Five abandoned limestone Quarries along Bushkill Creek in area of Newlins Mill Road and Bushkill Drive Forks and Palmer Township	19th through to early 20th century	All abandoned hillside cuts along Bushkill Creek and nearby pits on farmland (Palmer Twp.)
5	Five abandoned limestone quarries Tatamy area.	19th-early 20th century	All abandoned along Bushkill Creek and in the Borough of Tatamy and farmland in Palmer Twp.
3	Three abandoned Limestone Quarries northern Forks Twp.	19th and early 20th century	All abandoned; one due east of Uhler Station is over 100' deep
3	Three abandoned Limestone Quarries along Schoeneck Creek	19th century	All abandoned along or near Schoeneck Creek
5	Five abandoned Limestone Quarries in mid Palmer Twp.	19th century	Abandoned, filled in, shallow
3	Three abandoned Limestone and Road Material Quarries in southeast Palmer Twp.	19th-early 20th century	Abandoned, filled in
21	Twenty-One Limestone and/or Cement Quarries southeast of Nazareth headwaters of Schoeneck Creek	19th and early 20th century	Many now swallowed up into larger active quarry operations; several abandoned, filled in (shallow).
2	Two Cement Quarries near Stockertown	early 20th century	Still active, very deep quarry cuts.
7	Seven abandoned Limestone Quarries, northwest Williams Twp.	19th century	Abandoned, some filled in.
4	Four abandoned Limestone and Road Material Quarries along Delaware River in the City of Easton	Mid-19th century	Abandoned hill slope cuts some rubbish filled (known environmental hazard).
7	Seven abandoned Limestone Quarries, Browns Run Watershed, Williams Twp.	18th and 19th century	Abandoned, some filled in with agricultural process debris.
3	Three abandoned Limestone Quarries (Raubsville) Run Watershed, Williams Twp.	18th and 19th century	Abandoned, some filled in with agricultural debris.
	Six abandoned Limestone Quarries, Frya Run Watershed, Williams Twp.	19th century	All abandoned along or near Schoeneck Creek

**List of Abandoned Iron Ore Mines-Belt, Williams Township, within the Two Rivers Area-River Conservation Plan Area**

<b>Name</b>	<b>Date Established</b>	<b>Status</b>
Thomas Richard Mine, northern Williams Twp.	post Civil War (?)	Shaft 107', abandoned
Richard's Mine, northern Williams Twp.	post Civil War (?)	Open cut 6-8' deep, abandoned
Mary Brotzman's Mine #1, northern Williams Twp.	pre Civil War (?)	Open cut, 8' deep, abandoned
Mary Brotzman's Mine #2, northern Williams Twp.	pre Civil War (?)	Open cut, abandoned
Mary Brotzman's Mine #3, northern Williams Twp.	pre Civil War (?)	Open cut, abandoned
Mary Brotzman's Mine #4, northern Williams Twp.	pre Civil War (?)	Open cut, abandoned
Joseph L. Brotzman's Heir's Mine, northern Williams Twp.	pre Civil War (?)	Open cut, abandoned
Jacob Crawford's Maine, northern Williams Twp.	pre Civil War (?)	Shaft 70" deep, abandoned
Daniel Boyers Mine, northern Williams Twp. (clay pit nearby)	pre Civil War (?)	Shaft 45' deep, abandoned 1877 (clay pit abandoned).
William Hahn's Mine, northern Williams Twp.	pre Civil War (?)	Shaft depth unknown, abandoned
Enoch Woodring's Mine, northern Williams Twp.	Pre Civil War (?)	Shaft depth unknown, abandoned
<b>note:</b> the following 6 Mines are known located within and underneath the massive lineal <u>Chrin Landfill</u> facility of northern Williams Twp.		
Glendon Iron Company's Mines #1 and #2	pre Civil War (?)	Shaft depth unknown abandoned filled over
Adam Hahn's Mines #1 and #2	pre Civil War (?)	Shaft depth unknown, filled over, abandoned
Heckman Estate Mine	pre Civil War (?)	Shaft depth unknown, abandoned filled over
Sampson and Sitgreaves Mine	pre Civil War (?)	Shaft depth unknown, abandoned, filled over
Miss Miller's Mines, northern Williams Twp.	pre Civil War (?)	Shaft depth unknown, abandoned, filled over
John Woodring's Mine, northern Williams Twp.	pre Civil War (?)	Shaft depth unknown, abandoned, filled over
Glendon Iron Co.'s Mine, northern Williams Twp.	pre Civil War (?)	Shaft depth unknown, abandoned, filled over
George Seibert's Mine, northern Williams Twp.	pre Civil War (?)	Shaft depth unknown, abandoned, filled over
Mrs. Lewis' Mine, northern Williams Twp.	pre Civil War (?)	Shaft depth unknown, abandoned, filled over
James Hess' Mine, northern Williams Twp.	pre Civil War (?)	Shaft depth unknown, abandoned, filled over

**continued: List of Abandoned Iron Ore Mines-Belt, Williams Township,  
within the Two Rivers Area-River Conservation Plan Area**

<b>Name</b>	<b>Date Established</b>	<b>Status</b>
Charlie Walters' Mine, Brown's Run headwater area, Williams Twp.	pre Civil War (?)	Shaft 60' deep, abandoned
Joy's Mine, along Coffeetown Rd., southern Williams Twp.	Early 19th century	Shaft depth unknown, abandoned
Raub's and Lerch's Mine, along Coffeetown Rd., southern Williams Twp.	Early 19th century	Shaft depth over 100' deep, abandoned
Joy's Ivy Mine, along Coffeetown Rd., southern Williams Twp.	Early 19th century	Shaft depth over 75' deep, abandoned
Stout & Riegel's Mine, south of Christine's Hill, southern Williams Twp.	Early 19th century	Shaft depth unknown, abandoned

**List of Abandoned "Valley" Iron Ore Mines, Palmer, Lower Nazareth and Forks Townships, within the Two Rivers Area River Conservation Plan Area**

<b>Name</b>	<b>Date Established</b>	<b>Status</b>
Thomas Richard, Jr. Mine, current Laneco Shopping Center, south of William Penn Hwy., southwestern Palmer Twp.	Pre Civil War (?)	Open pit, abandoned, filled in, developed over
Unnamed Mine (#1) along Country Club Rd., southeast Lower Nazareth Twp.	Pre Civil War (?)	Open pit, abandoned, filled in
Unnamed Mine (#2) along Country Club Rd., southeast Lower Nazareth Twp.	Pre Civil War (?)	Open pit, abandoned, filled in
William G. Beck's Mine, along Newburg Rd., mid-eastern Lower Nazareth Twp.	Pre Civil War (?)	Open pit, abandoned, filled in
J. Beck's Mine	pre Civil War (?)	Open pit, abandoned, filled in
Samuel Schorts" Mine, due west of Country Club Rd., eastern Lower Nazareth Twp.	pre Civil War (?)	Open pit, abandoned, filled in
Samuel Hummel's Mine, due west of Country Club Rd, eastern Lower Nazareth Twp,	pre Civil War (?)	Open pit, abandoned, filled in
Unnamed Mine, near Samuel Hummel's Mine	pre Civil War (?)	Open pit, abandoned, filled in
Unnamed Mine due northeast of Samuel Hummel's Mine	pre Civil War (?)	Open pit, abandoned, filled in
Messinger & Woodring's Farm Mine, due west of Richmond Rd., Lower Forks Twp.	pre Civil War (?)	Several shafts, depth unknown, abandoned.
Thomas Richard Jr. Mine, due east of Richmond Rd., Lower Forks Twp.	pre Civil War (?)	Shallow open pits, abandoned.

**Karst-Sinkhole Factors**

Geologically defined,

“ A sinkhole is a hole formed in a karst area by localized, gradual or rapid sinking of the land surface to a variable depth; it is characterized by a roughly circular outline and a distinct break in the land surface. The collapse feature is a result of soil or related materials being transported by water into voids within the carbonate bedrock or in the overlying regolith.” *(loose surface rock) (Source: Kochanov).*

Essentially, each sinkhole is a clogged drain into this underground water piping network. Each sinkhole has its own unique design and structure which will determine when it opens up at its surface. But, all are effected by a subtle subsidence process which can cause the clay and soil plug to moisten, lose its cohesive properties and begin to break apart and descend into the drain or sinkhole opening in the limestone rock. A silent process, some holes can open up with rapid failure causing massive sinkholes up to 100’ across and 40’ deep in a single movement failure. Typically, though —

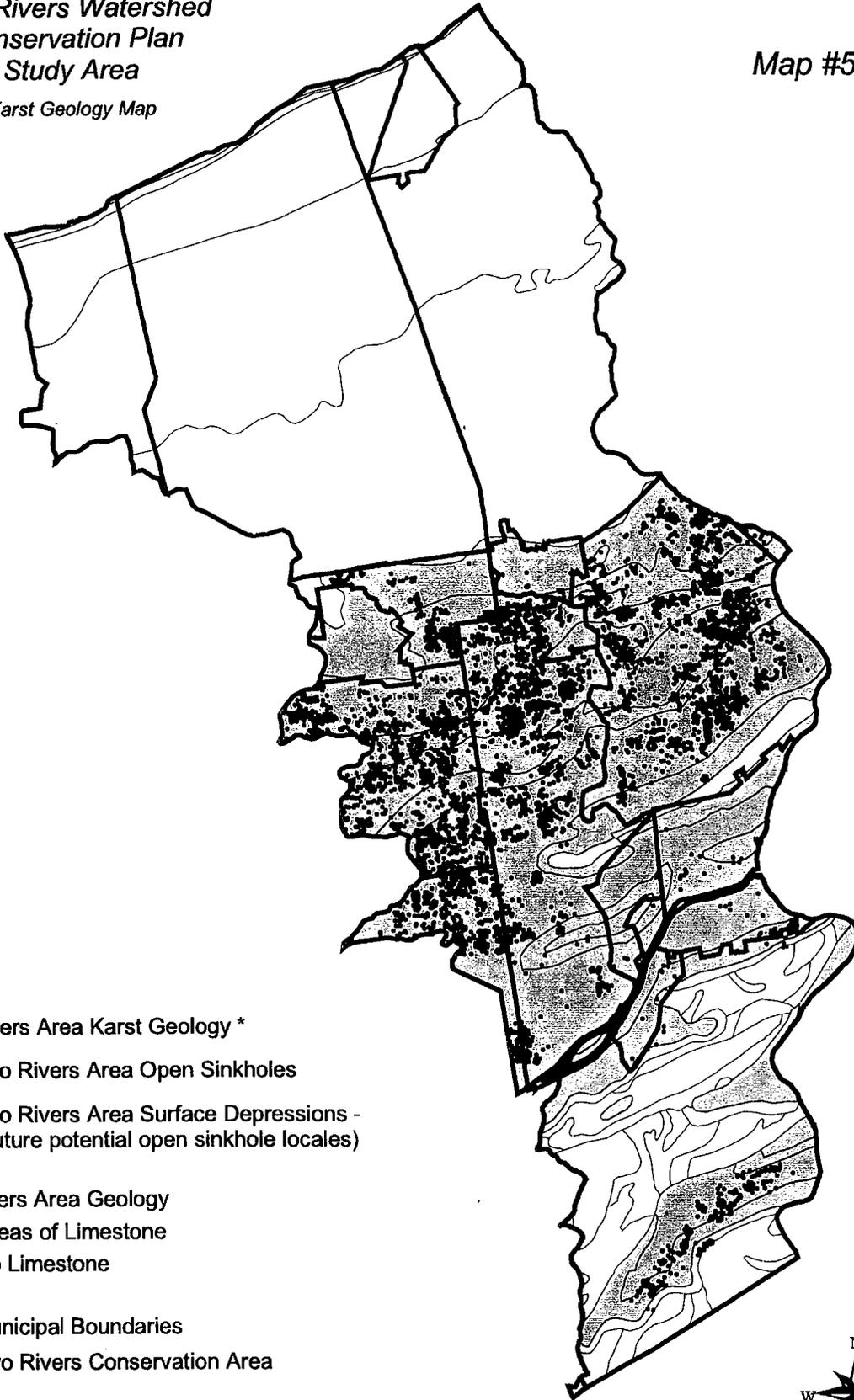
“on average, sinkholes in Pennsylvania range from 4 to 20 feet in diameter and have approximately the same range in depth. Surface water can induce erosion along the rim of a sinkhole and cause enlargement of the sinkhole to a much as several hundred feet long. Due to the interconnected nature of the karst plumbing system a group of small sinkholes can also coalesce to form a larger sinkhole.”

Probably the most challenging section of the Two Rivers Area- River Conservation Plan is this section which addresses the factors and concerns towards the area’s Karst , more popularly known as “sinkhole”, activity. Within the Two Rivers Area all sinkhole activity generally occurs within the Limestone-based rock strata situated within the following municipalities.

• <b>Borough of Glendon</b>	in full land area
• <b>Borough of Nazareth</b>	almost in full four-fifths land area
• <b>Borough of Stockertown</b>	almost in full land area
• <b>Borough of Tatamy</b>	in full land area
• <b>Borough of West Easton</b>	in full land area
• <b>Borough of Wilson</b>	almost in full land area
• <b>Bushkill Township</b>	small land area in southeastern border with Lower Nazareth Township
• <b>City of Easton</b>	almost in full land area, excepting Chestnut Ridge
• <b>Forks Township</b>	almost in full land area
• <b>Lower Nazareth Township</b>	in full land area
• <b>Palmer Township</b>	almost in full land area
• <b>Plainfield Township</b>	small land area adjacent to Stockertown
• <b>Upper Nazareth Township</b>	almost in full three-quarters land area
• <b>Williams Township</b>	in varied bands, accruing to approximately three-eighths land area

*Two Rivers Watershed  
Conservation Plan  
Study Area  
Karst Geology Map*

Map #5



Two Rivers Area Karst Geology \*

- Two Rivers Area Open Sinkholes
- Two Rivers Area Surface Depressions -  
(future potential open sinkhole locales)

Two Rivers Area Geology

- ▨ Areas of Limestone
- No Limestone

- ▭ Municipal Boundaries
- ▭ Two Rivers Conservation Area

*\*Source: Commonwealth of Pennsylvania  
Dept. of Conservation & Natural Resources  
Bureau of Topographic & Geologic Survey*

*County of Northampton GIS Div. September 24, 2001*



As stated above, the Karst-Sinkhole factor within limestone based rocks is a major factor in the Two Rivers Area which has received little or no formal municipal planning consideration to date. Long regarded as an "Act of God", sinkholes are in fact quantifiable features and need to be taken into future land use planning regulation in order to ensure well planned and safe land development which provides and ensures

- built structures not susceptible to subsidence
- safe and unpolluted surface water to underground limestone-based /aquifer /water reserves

This consideration is important in view of the following quote from Percy H. Dougherty's work, "Land Use Regulation in the Lehigh Valley: zoning and subdivision ordinances in an environmentally sensitive karst region, 3rd Multidisciplinary Conference on Sinkholes / Oct. 1989".

"Karst subsidence is a big problem in the Lehigh Valley. More than \$1,000,000 damage occurs each year with several single episodes exceeding \$500,000. In addition, groundwater pollution has endangered the productive aquifers of the area.

"Structural damage to buildings, highway subsidence, and disruption of utility lines results in over \$1,000,000 damage a year in the Lehigh Valley of Eastern Pennsylvania (figure from 1989). There is a long history of karst related problems in the Lehigh Valley with several deaths related to karst collapse at the turn of the century (Wittman 1988). The Allentown-Reading metropolitan area contains over one million people in a confined carbonate valley; therefore, there is a large population at risk. In the United States, the Lehigh Valley ranks only second to the Florida karst in terms of total damage (Dougherty and Perlow, 1988). If this were a rural area the problem would undoubtedly be overlooked. With a dense population, even the very smallest sinkholes are reported. The area has a long history of karst subsidence and it is assumed that the same processes will continue to work in the future.

"If it were known that a problem is going to occur, it makes sense to do something about it today. None of us would build a home on top of a known sinkhole, for an area experiencing subsidence in the past will probably do so again. Why should we allow someone else to build on the same sinkhole? This is especially relevant if it is going to be our tax money which pays the expensive repair bill. Locally, the Vera Cruz Sink cost in excess of \$700,000 to repair and the Macungie Sinkhole cost over \$600,000; both using tax money (Dougherty and Perlow, 1988)."

In recent years, the City of Easton has experienced the expensive repair of a sinkhole opened up by a broken water line along West St. Joseph Street. The cost of this repair to a single incident was \$160,000 (along with additional cost of city staff and equipment) of the City's funds. Although often unseen, the karst (sinkhole) features of the Two Rivers Area are a prominent geological and hydrologic factor of this area. The following is a brief description of sinkhole distribution in the area.

### **Where are the Sinkholes?**

At present, no municipality within the Two Rivers Area officially recognizes and/or takes into consideration the location of sinkholes in their municipal land area(s) land use

planning. It is scientifically known and recorded where these sinkholes are, as identified by the Pennsylvania Geological Survey.

“In 1985 a program was initiated by the Pennsylvania Geological Survey to inventory existing sinkholes and to map areas of potential sinkhole development (Kochanov, 1988). The program was developed to provide general background information for the initial stages of site investigations and as a tool for developing regional land-use planning strategies in the carbonate (limestone) regions of Pennsylvania. . .

The Pennsylvania State Code addresses potential problems such as land subsidence and groundwater contamination within the permitting process. If an area is underlain by carbonate bedrock, then specific guidelines must be followed (e.g. PA State Code, Chapter 75, Section 425). Permit applications require that the applicant provide adequate evidence to support an interpretation that a facility is not located within an area susceptible to landslides, *sinkholes*, or deep-mine subsidence.

The following karst feature maps were developed in response to State code. All work on Northampton County was completed by William E. Kochanov of the Pennsylvania Geological Survey, ( issued 1987, revised 1990) and serves as an official piece of environmental geological data to benefit the public, and enable meeting the Pennsylvania State Code. Chapter 75 Section 425, by Federal, state and local governments and agencies. *Note: an update on this map sequence should be undertaken every 10 years, with Northampton County comprehensive aerial survey in year 2000. Such an update should be conducted by year 2001.*

As these maps show, sinkholes are not highly isolated features. They are present in high numbers throughout the Two Rivers Area. As such, sinkhole locations deserve formal public attention in municipal planning and development review.

## **Section # 3 — Biological Resources**

### **A Brief Description of the Two Rivers Area Environment and its Flora and Fauna,**

#### **8,000 BC into the Present**

There is some quantifiable knowledge, based upon archaeological remains excavated within the region, as to the appearance of the environmental character of this area between the years 8,000 BC and AD 1000. The transition of these environments spans four Climatic Episodes:

- Pre-Boreal/Boreal Episode (8,000 BC - 6,500 BC)
- Atlantic Climatic Episode (6,500 BC - 3,100 BC)
- Sub-Boreal Climatic Episode (3,100 - 800 BC)
- Sub-Atlantic Episode (800 BC - 1000 AD)

During these geologically recent climatic episodes, the area's soils and vegetative cover renewed and expanded after the harsh erosive impact of the last ice sheet. A brief description of the general characteristic of each of these episodes follows.

Source: Dr. Christopher Bergman, Archaeological Data Recovery for Transcontinental Gas Pipeline Corporation's 6.79 mile Leidy Natural Gas Pipeline Expansion. Sandts Eddy Site (36-NM-12), Northampton County, Pennsylvania. Private Client - FERC File Report, July 1994.

#### **Pre-Boreal-Boreal Episode**

"There was a reduction of open grassland and a spread of boreal forest with spruce and pine the dominant species' some oak forest also existed at this time, The spread of closed coniferous forest would have drastically lowered faunal carrying capacity. Poorly drained swampy areas and stream margins would have been the focal points of game animals such as deer, moose and elk".

#### **Atlantic Climatic Episode**

This Episode "was characterized by a warming trend. There was an increase in precipitation and an expansion of mesic forests, first of hemlock and later of oak. Oak became the dominant species by about 5000 BC. The faunal (animal) assemblage became essentially modern, with deer and turkey as major components."

#### **Sub Boreal Climatic Episode**

This climatic period "was a warm and dry period...which peaked around 2350 BC. This was followed by a period of increasing moisture and slowly decreasing temperature.

Primary among these changes was an increase in hickory and expansion of grasslands. Increases in nut bearing trees such as hickory would have favored wild turkey and deer populations. Hydrological (water flow) fluctuations due to changes in moisture would have affected riverine and estuarine resources, especially species with limited tolerance to temperature and salinity, such as oysters and anadromous fish. Upstream migration of American shad and Alewife would have been at a

maximum during the period. Shad continue to migrate up the Delaware River (and now Lehigh River) to this day."

### **Sub-Atlantic Episode**

The episode which lasted up until 1,000 years ago "saw an increase in moisture and cooler temperatures that led to a close approximation of modern conditions. ..the region's most recent vegetation sequence, the maple-beech-hemlock climax forest, is more completely called the maple-wapiti (elk) - deer-beech faciation. On the plateaus of Pennsylvania ... this forest also contain(ed) large numbers of white pine and smaller amounts of basswood and yellow birch."

By AD 1000 the Two Rivers Area was a location within the southern portion of the Canadian Biotic Province. Generally within this environmental setting

"roots, tubers, berries and nuts were plentiful, and would have supported white-tailed deer, black bear, wild turkey, eastern and New England cottontail (rabbit), beaver, raccoon, wapiti(elk) southern woodchuck, grey squirrel, ruffed grouse, and migratory water fowl."

The food value provided by these populations of game animals was of the greatest importance to the prehistoric populations of the Two Rivers Area. Deer populations were probably at —

"densities of 10 to 15 individuals per square mile. In the fall months deer congregated in areas of heavy mast production, enabling hunters and gatherers to harvest both vegetable and animal foods. When winter temperatures and snowfall were moderate, deer were fairly evenly distributed across the countryside, but during severe winter weather, they tended to shelter in narrow valleys, providing the impetus for hunter-gatherers to move to those locales."

### **Environmental History — AD 1000 to 1600's**

From AD 1000 to the 1600's, the Native American populations within large parts of present day Pennsylvania and New Jersey are known to have developed and practiced the art of "firing the forest" on vast areas. "Firing the forest" was a deliberate practice of setting controlled fires to forest and vegetative cover every 25 years. This deliberate clearing radically altered the physical composition and character of large sections of Pennsylvania's and New Jersey's floral and faunal communities.. Accumulating evidence indicates that prehistoric people effected a wide-scale form of silviculture gamelands promotion through deliberate controlled forest fires. This burning encouraged the growth of oak and more fire resistant tree species which bear nuts. The presence of these nut-bearing trees tends to attract and support larger populations of game for hunting in the area.

The reason this was done locally was, most probably, to constantly recreate a young, regenerating forest cover. Current Pennsylvania Fish and Game Commission studies consistently document that such regenerating forest environs attract and support larger populations of wild game than a mature, deep cover forest.

Accounts from the earliest historic settlers of the Two Rivers Area describe a variety of locales of burned-over forest, producing what they termed as "Grub Lands". These "grub lands" existed north and west of today's City of Easton. All of the "grub lands" extended totally over the area's limestone based soils north of the Lehigh River. This burning effect extended up into the Slate Belt. In fact, the term Plainfield is descended directly from Holland Dutch terminology "plain-veldt", describing a large (fire-cleared ) area in the forest.

## Recent Historic Environmental History — 1600 into the 18th century

At the time of actual historic development, beginning by the 1730's in the Two Rivers Area, the earliest settlers did not find a vast virgin forest covering the land. What they found was a highly altered ecological system caused by deliberate, repeated burning of the forest and vegetative cover. Generally, most of the area north of the Lehigh River was affected by this firing of the forest. The earliest accounts infer that the areas south of the Lehigh River, now Williams Township, were primarily forest covered, and not previously deliberately burned.

A detailed review of extant 18th century Northampton County Surveyor notes from the 1760's to the 1780's (located in the Moravian Archives at Bethlehem, Pennsylvania) does give a clear image of the area's land surface character. Based on these field notes, all non-streamside lands were generally burned over "Grub Lands" of thick brush, and young, maturing trees. The immediate stream side valleys and lands contained stands of mature trees and vegetation consisting of oak, pine and hickory trees. These field notes are detailed only for the area south of the Slate Belt, on limestone based soils. No observations survive as to the known large conifer stands along the Bushkill Creek in the Jacobsburg Park area. The implications from this evidence are that Native American populations could control and direct these fires in a very sophisticated manner. They kept these fires out of the stream valley areas where they typically located their agricultural fields, camps and villages up until the 18th century.

## Ecologic Studies of the Two Rivers Area

The first full attempt at an in-area biota profile occurred with the works of Lewis De Schweinitz, a Moravian from Bethlehem who in 1824 published "A List of the Raer (sic) Plants Found near Easton", American Journal Science and Arts, 8 pp. 267-269.

De Schweinitz's Herbarium is now curated at the Academy of Natural Sciences, Philadelphia. Noted field studies after De Schweinitz's publication follow in quick succession, including:

J.G. Kumm, "A Catalogue of Botanical Specimens Collected by J. Wolle and A.L. Huebner during the Year 1837 in the Vicinity of Bethlehem and other Parts of Northampton County", American Journal of Science and Arts 37, pp. 310-320 (1839). (Jacob Wolle's Herbarium is currently located at the Academy of Natural Sciences, Philadelphia.)

This activity was followed by collections assembled in the mid to late 19th century; Dr. Henry Detwiler's Herbarium and the A.P. Garber Collection, marked "Easton".

Through the post Civil War year era into the earliest years of the 20th century, a set of professional and skilled lay botanists greatly expanded the identification and description of the available full biota inventory in the Two Rivers Area. Relative to the study, these efforts are hallmarked by Thomas Conrad Porter's (Professor of Botany, Lafayette College) years of work in the Easton vicinity, as evidenced in the Porter Herbarium and several publications led by his masterwork "*Flora of Pennsylvania*", pub. 1903.

Porter's work and presence encouraged others to work at collecting in the Two Rivers Area which includes the following persons of note: Thomas Seal, Dr. Trail Green, J. C. Shimer [of Martins Creek], Eugene Rau [of Bethlehem], Wilbur King [of Bethlehem], Charles Bachman, Bayard Long, Edwin B. Bartram, Samuel S. Pelt.

By 1912 over 1,304 species of plants had been identified in areas in and about the Two Rivers Area. All of the works of the above individuals provided the foundation for an over 11 year period of field study by Robert L. Schaeffer, Jr., of the University of Pennsylvania, whose thesis produced the contemporary foundation work, "*The Vascular Flora of Northampton County Pennsylvania*" published in 1949.

Schaeffer's work is a synthesis of over 162 years of varied persons' field work trying to understand the breadth and functioning of the natural vegetation of the area. Schaeffer's writings were comprehensive and went further in understanding how the geology, soils and functioning of water influenced and supported the function and distribution of the natural habitat area within the area's watersheds. Respecting and honoring his work we provide the following citations which still today clearly portray how the natural habitats and their features are arranged in the Two Rivers Area.

Within the county, there are several distinct areas which need brief description. The Blue Mountain or Kittatiny Mountain is the southern limit of the Ridge and Valley section which forms a wide belt across the state in a southwestern direction. The underlying rocks are hard sandstones and conglomerates. This ridge undoubtedly represents a former peneplane which has been dated to Cretaceous or middle Tertiary time. The height of the ridge is rather constant and varies between 1,500 and 1,600 feet above sea level. The ridge is relatively narrow and is dissected at the two water gaps where the Lehigh and Delaware Rivers have cut their way through the hard rocks. Several smaller gaps which at one time carried drainage from more northern regions are found along the ridge. Wind Gap is the only conspicuous member of these former stream beds. The mountain is covered with open mostly scrubby vegetation. The narrow summit often has wide areas of thickets formed by scrub oaks, pitch pines and wild cherry. In several of the low depressions of the "wind gaps" there are swampy areas which often contain "Canadian" species. "Canadian" species can also be found along the ridge, but specimens are usually isolated small groups or single plants rather than large colonies.

The south side of the mountain is rather steep. Near the crest there are usually exposed cliffs. Below the cliffs are areas of talus which completely conceal the contacts of the shales and sandstone. These talus areas have very little vegetation. Below the talus are open oak woods which are always of secondary growth. The slopes of the mountain are lumbered periodically and occasional fires have also helped to check the growth of the vegetation. There are many small swamps and meadows which harbor many of the floristic novelties. Most of the plants which have coastal plain relationships are found along the base of the Blue Mountain.

The formations below the mountain have been less resistant to erosional factors, and as a consequence the shale and limestone belts are today much lower than the more resistant sandstones.

The shales form a distinct area across the county. This band is about 7 miles wide. It is characterized by many round-topped hills with steep slopes. Numerous small streams have cut rather steep valleys through this formation. Elevations vary from 600 to 800 feet above sea level. Farming has been rather profitable for grazing purposes and the raising of fruit trees and potatoes. However there are still many areas of second growth. Woods, numerous meadows and swamps occur here.

South of the shale belt is a flat limestone plain which has been formed by non-resistant Cambrian and Ordovician limestones. The elevation of this belt is about 400 feet throughout the plain. Most of the drainage is underground, and even the larger streams are often dry during the summer months. The entire belt is under intensive agriculture. It is difficult to find several acres of woodland in this belt. At one time this belt must have supported a luxuriant forest. Limestone

specialties can still be found along the river bluffs and the cliffs of the larger streams which pass through this plain. Three hills, Camel's Hump, Pine Top, and Chestnut Hill, rise conspicuously above the plain. All three are formed of resistant pre-Cambrian rocks.

Toward the southern part of the county, the Lehigh bends abruptly to the East, and at Easton enters the Delaware. On the south side of the Lehigh River, the South Mountain section is located. This belt extends to the southern border of the county. It is characterized by alternating hills and valleys. The hills are formed of resistant pre-Cambrian crystalline rocks. The alternating valleys are formed mostly of Paleozoic limestones. Some of the hills are often quite broad and are usually covered with woodland. Sometimes "Canadian" species will be found in some of the cool swamps and meadows of this belt. However, the novelties here are generally species which are confined to the piedmont, or species which are near the northern limits of their distribution. Farming is mostly restricted to the valleys.

Several ice sheets covered the county or parts of the county at various times during the Pleistocene period. Only the Wisconsin moraine is important in this discussion. The Jerseyan sheet probably covered the county, but did not leave any important deposits. The Illinoian sheet left extensive deposits in several parts of the county. These deposits offer no swamps or pot holes. As a consequence we have found no species for the county whose distributions can be correlated with these earlier deposits. In adjacent Lehigh County, however, there are interesting swamps and pot holes along part of the Illinoian moraine.

A small outcrop of serpentine formation is found at Chestnut Hill, near Easton. This hill was worked thoroughly by Porter and has been visited in recent years. None of the serpentine plants which are characteristic of the barrens of southeastern Pennsylvania is found on this small outcrop.

There are two large rivers in the county into which all of the streams drain. The Delaware River yields many more interesting species than the Lehigh. The banks of the Lehigh have been ruined by the canal and railroads. Along the borders of the Lehigh are many raised swamps which are in contact with the river only in times of severe floods. Similar swamps are mostly absent from the Delaware. The Delaware has numerous and extensive sand bars which harbor many northern plants. The Lehigh has few sand bars, and these are small and usually covered with dense thickets. Cliffs and bluffs are more numerous and more extensive along the Delaware River.

During Schaeffer's eleven year study, he sought to clarify and specify what indigenous, native flora existed within the county as per each of its physiographic areas. Schaeffer identified "a great many wide ranging species" located relative to the Two Rivers Area following physiographic areas.

1. Wide ranging northern species near their southern limits
2. Canadian species
3. Species of the river valleys
4. Species restricted to limestone formations
5. Widespread aquatics
6. Southern species near their northern limits
7. Species of eastern Pennsylvania and the Coastal Plain
8. Wide ranging species confined to the acid slopes of the Blue and South Mountains

### **Overlaying Vegetation and Natural Habitats /Forest Vegetation Cover Evolution**

Growing upon the mantle of varied rock strata and serrated layers of soils within the Two Rivers Area is a highly varied and complex vegetation cover. Before the time of probable manipulation by "firing the forest" by earlier humans (5,000 BC), current research indicates that the Two Rivers Area was situated in a region where the following three major vegetation cover - forest systems met and mixed. These forest systems were:

- Mixed Conifer - Northern Hardwood
  - Deciduous Forest of Oak-Hickory
- and
- Southeastern Evergreen Forest of Oak - Hickory - Southern Pine

All of these vegetation cover systems were physically dominated by an overstory of tall trees which covered an understory complex of shrubs and perennial plants. The possible effects on this prior arrangement of plants by the "firing of the forest" is only recently being studied. As to how it may specifically have affected the Two Rivers Area, it is only known that it would have reduced the presence of less fire-resistant trees, "such as northern red oak, yellow birch, red maple and black cherry, while benefiting oak and other fire tolerant species."

However, none of this activity has changed the fact that the Two Rivers Area lies within a vegetation management region of the United States regarded today as the Eastern Hardwood Forest System which has been affected by the manipulated vegetation activity of Mixed Agriculture, significantly since the 1820's, with increasing Urbanized Land Development since the 1960's.

How the Eastern Hardwood Forest System is composed and functions has a significant effect on the area's —

- water quality and its healthful functioning
- current composition and healthful functioning of flora and fauna and the human community's varied social and economic activities and health

The general value and effect the Eastern Hardwood Forest System has relative to the area's watershed systems is portrayed as follows.

**General Hydrologic Functioning of the Area's Eastern Hardwood Forest System.**

It is fair to characterize the Two Rivers Area portion of the Eastern Hardwood Forest as an area of "once extensive forests now confined to the roughest areas". Throughout this area, woodlots were once "an important adjunct to family [farm] operations, many of them being held for shelter of pasturing of livestock and some for wood supplies. Today this region is formed as a patchwork pattern in which forested and cultivated lands alternate..." and surround roadway reliant cores of dense towns and adjacent masses of expanding suburban sprawl land development.

As in its' past, the Two Rivers Area's current natural forest vegetation is evolving into a "prevaillingly dense" natural vegetation "where (there) is a great variety in the arboreal and lower plant forms", which, however, is increasingly encroached upon by the presence of introduced invasive, non-native species of plants. In this area in fact, a greater number of tree species is found than in any other part of the United States." The prominent tree species "can be. . . yellow poplar, chestnut oak and other oaks... on the exposed ridges and drier slopes several species of pine are occasionally important constituents of forest stands." Other important types of trees in the area can be of the following.

Central Broadleaf Forest and Southern Oak Pine Forest

Green Ash	Black Locust	Willow Oak
White Ash	Cucumber Magnolia	Pecan
American Basswood	Red Maple	Eastern White Pine
White Basswood	Sugar Maple	Loblolly Pine
American Beech	Black Oak	Longleaf Pine
Yellow Birch	Blackjack Oak	Sand Pine
Yellow Buckeye	Bur Oak	Shortleaf Pine
Eastern Red Cedar	Chestnut Oak	Slash Pine
Flowering Dogwood	Red Northern Oak	Virginia Pine
American Elm	Post Oak	Tulip Poplar
Eastern Hemlock	Scarlet Oak	Sweetgum
Bitternut Hickory	Southern Red Oak	Black Tupelo
Mockernut Hickory	Water Oak	Black Walnut
Shagbark Hickory	White Oak	

When left to grow and mature, all forest land in this area is "characterized by the dominance of tall trees". The Two Rivers Area is predominated by deciduous hardwood trees which carry "leaves during the warmer part of the year. This creates a distinct hydrologic arrangement from conifer" (year round needle cover) predominated forest areas.

"Numerous studies have shown that virgin forests (none appear to exist in the Two Rivers Area) or those long undisturbed (over 50 years) provide the most complete natural control over surface run-off, stream flow peaks, and erosion... and water quality." In studies of these kinds, direct measurements of water and eroded material have shown the superiority of undisturbed forest conditions "wherever rain intensities are high or soil easily eroded." The Two Rivers Area lies within a section of the United States where the annual average rainfall ranges between 30-40 inches. This can produce a water run-off rate of 10 - 20 inches on an annual average. "During winter hardwood crowns (the forest's overstory) that are leafless provide little intercepting and transpiring surface, and little shade for snow and soil."

Throughout the Two Rivers Area and the forested regions of the Commonwealth, the

movement of water by rain and snow is organized by the Hydrologic Cycle as illustrated in the attached graphic and specific to the vegetative cover figure.

[ Source: Little Waters: A Study of Headwaters, Streams & other Little Waters, their Use and Relations to the Land, by H. S. Person. Water Resources Section, Public Works Administration US Government, 1936.]

The forest cover lands in the Two Rivers Area enhance the area's soils' water permeability by their trees' and shrubs' water cover —

“root movement and root decay [cavities that] provide essential channels for downward water flow to recharge the soil and aquifer. . . the leaves of hardwoods generally have a higher mineral content...the litter under hardwoods is therefore usually richer in nutrient for micro-organisms and burrowing insects that keep the soil porous and friable. Such a difference would be expected to lead to differences in permeability and hence to different hydrologic characteristics” —

of noted value to water retention, stream flow and water quality.

Where existing today or regenerating in the future, the expanding areas of the Two Rivers Area portion of the Eastern Hardwood Forest are enhancing and assisting the natural maintenance and improvement of its varied watersheds and natural habitats.

### **The Contemporary General Physical Distribution and Expansion of the Two Rivers Area Forest Cover.**

Today there is an evolving new pattern of forested tract lands within the Two Rivers - River Conservation Plan Area. The best analysis to date of this pattern of distribution is the County of Northampton's GIS mapping sequence which portrays all forest areas over one (1) acre in size, based on detailed analysis of aerial photographic information. (This data is now five years old and will be updated and upgraded by a pending full county photographic aerial survey of all land features, beginning in the year 2000.) The following highlighted map portrays the growing forest land cover within the study area. When one compares this forest cover map with other available soil and habitat data the following correlations become apparent.

1. That soils which are classified as:
    - Slow Poorly Drained Soils
    - Variable Drainage / Urban Land/Flood Plain
    - Slow, Poorly Drained and Extremely Stony
    - Sloping Lands (8% to 15% slope)
    - Well Drained and Extremely Stony
    - Stony and Rubble Lands
    - Steep Lands >15% slope
- and to an initial extent*

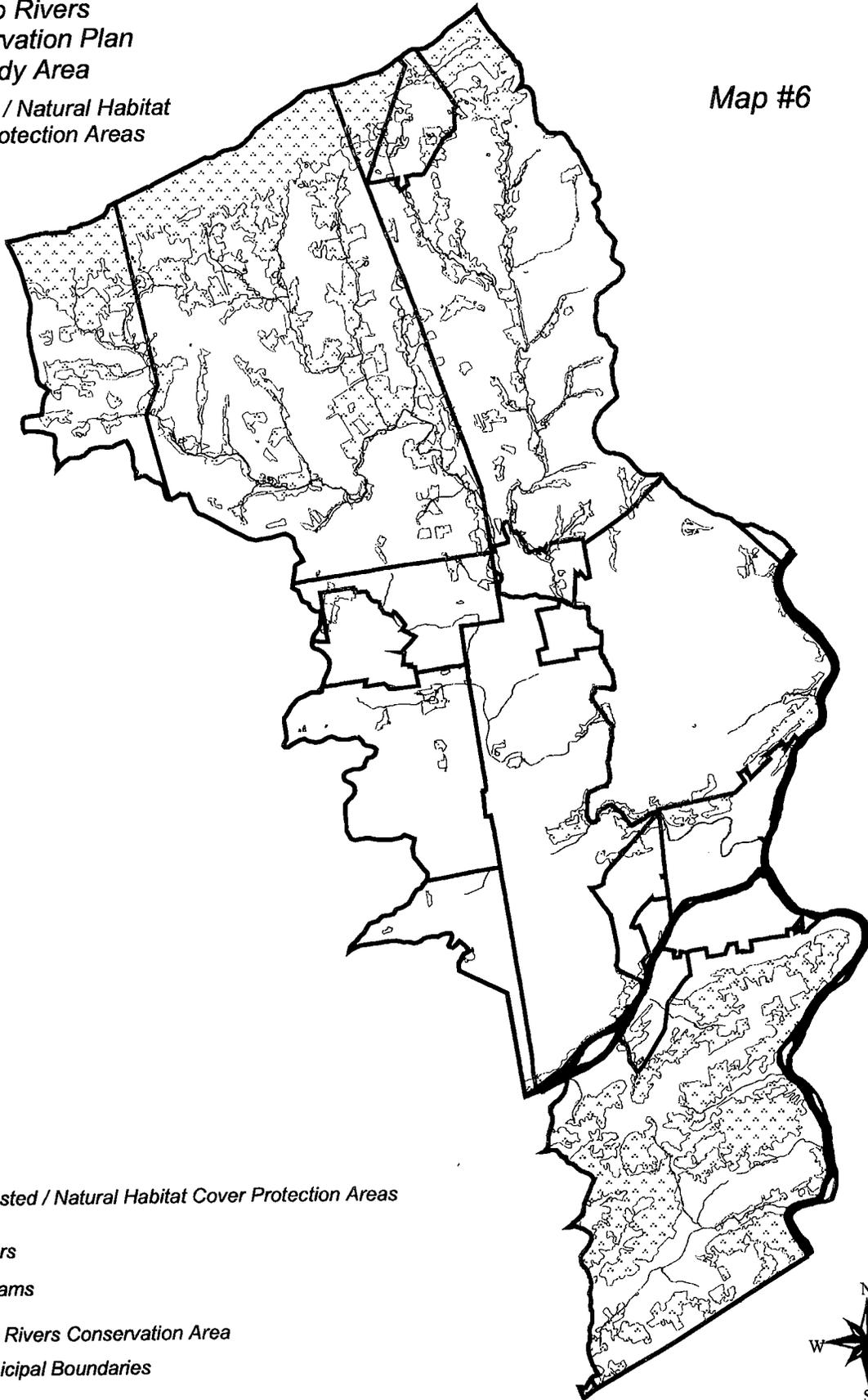
are being abandoned and are reverting into forest cover over 1 acre in size very substantially in the following areas.

- All Martinsburg Shale Based Soils (the Slate Belt)
- and all
- Williams Township

*Two Rivers  
Conservation Plan  
Study Area*

*Forested / Natural Habitat  
Cover Protection Areas*

**Map #6**



 *Forested / Natural Habitat Cover Protection Areas*

 *Rivers*

 *Streams*

 *Two Rivers Conservation Area*

 *Municipal Boundaries*



2. A very initial corridor of forested land over 1 acre in size is just beginning to evolve along side the main stem of the Bushkill Creek where it traverses the limestone based soils in Forks and Palmer Townships, and the City of Easton, and in limited locales along its branch Schoeneck Creek.
3. An east to west band of forest cover of 1 acre in size is evolving along Chestnut Ridge on the Pre-Cambrian rock based soils along the borders of Forks and Palmer Township and the City of Easton and the Borough of Wilson.
4. Lineal bands of Forest Cover over 1 acre in size significantly expand on alluvial soils of in-waterway islands, adjacent alluvial river banks, and adjacent by river steep slopes on the Delaware and Lehigh Rivers. In part, large sections of these lands are under the jurisdiction of the City of Easton's Hugh Moore Park along the Lehigh River, and the Roosevelt State Park along the Delaware River.
5. In all instances, the expanding patterns of Forest Cover are within and/or are forming within and around the sites of Statewide Significance, and Areas of Local Significance - Natural Habitat Areas recently noted in the *Lehigh and Northampton County Natural Areas Inventory*, conducted by the Pennsylvania Science Office of the Nature Conservancy (pub. 1999). This makes the forest cover areas within the Two Rivers Area the primary locale of the areas of native and rare plants and animal life, as documented by scientific survey (1997-1999).

*(Note: further presentation of this study's findings relative to the study area follows.)*

#### **Natural Areas Inventory: Sensitive Areas**

The most recent qualified study of the sensitive natural areas within the Two Rivers Area is the "A Natural Areas Inventory of Lehigh and Northampton Counties", conducted by the Pennsylvania Science Office of the Nature Conservancy, for the Lehigh Valley Planning Commission, issued April 1999. Conducted as part of the Pennsylvania Natural Diversity Inventory Data System, this study focused on "known outstanding natural features - floral, faunal and geologic." This inventory, relative to the Two Rivers Area, has identified outstanding natural features which in total are located in and around the *existing* forest cover *extant* today. It is the purpose of this section of the Two Rivers Area - River Conservation Plan to present and embrace the natural areas identified in this inventory as publicly valuable and of benefit to the public's health and welfare. Public recognition of these natural areas, by and through the area's varied municipalities' public development process and efforts regarding watershed conservation, is a basic intent of this River Conservation Plan.

#### **Core Habitat Areas for Native Bio-Diversity**

The anticipated official recognition of the value and role of these core Natural Habitat Areas is crucial towards the conservation and future restoration of the Two Rivers Area Watershed as defined under this River Conservation Plan. These Core Natural Habitat Areas for Native Bio-Diversity for the Two Rivers Area are as follows, per this study:

As per each of these identified resources the following mapping and descriptions provides more information on the significance of the Two Rivers Area - Core Natural Area Habitat Areas for Bio-Diversity.

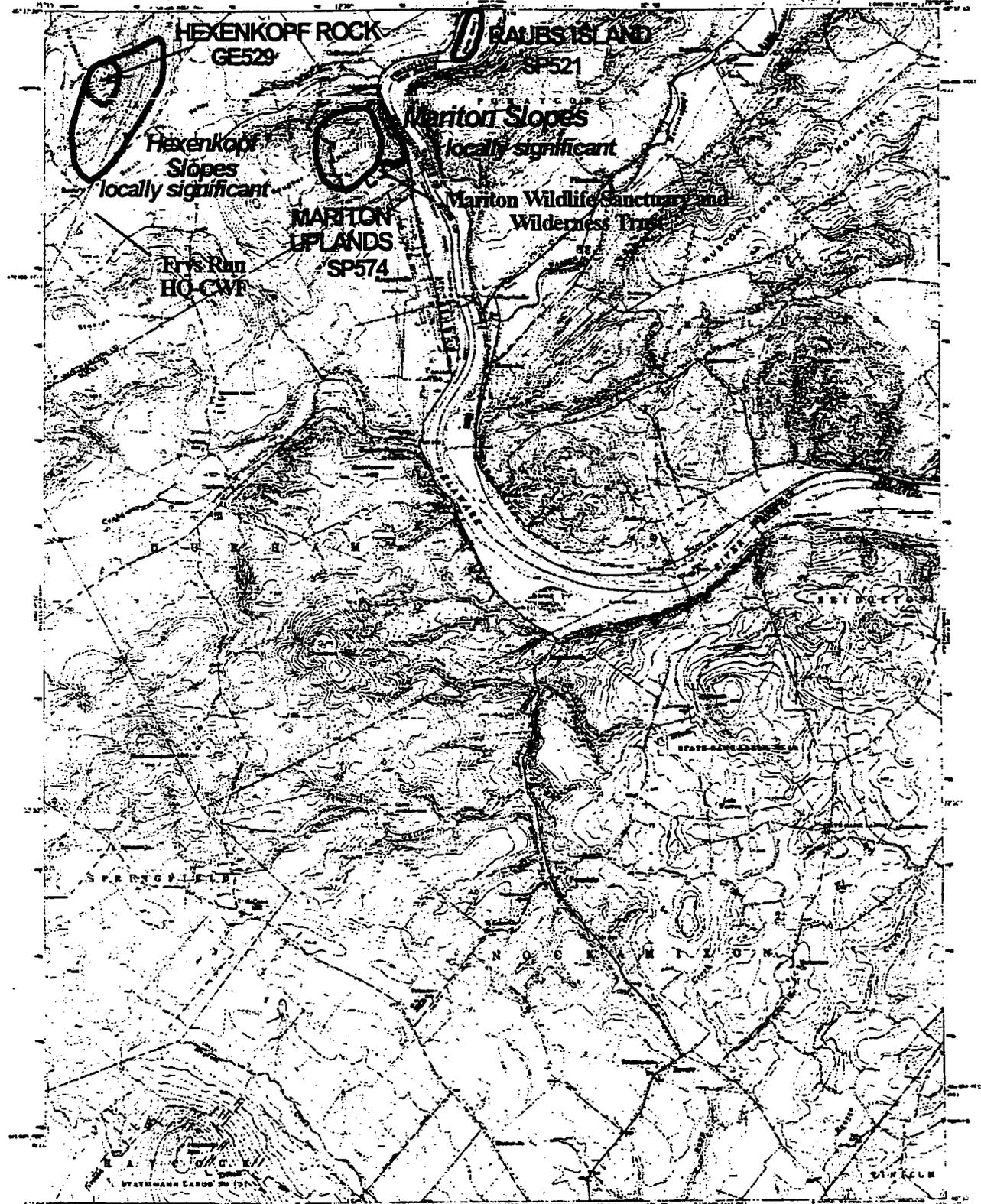
**Exceptional Natural Features: Delaware River and Blue Mountain**

In considering the value of specific sites for the preservation of biological diversity it is important to note that these sites are dependent on the integrity of larger scale systems such as rivers and mountain ridges.

The DELAWARE RIVER and its adjacent forested watersheds comprise one of the major corridors for the movement of biota in eastern Pennsylvania. This includes habitat for resident species, habitat required for migrating birds on a biannual basis, habitat for resident and migratory aquatic animals, habitat needed for the long term survival of plant species, and more. Conserving the best sites as highlighted in this report must be considered as part of the effort to conserve the greater natural functional value of the river corridor.

BLUE MOUNTAIN is the most extensive relatively contiguous area of natural habitat in the two counties. It is also one of the major corridors for the movement of biota in eastern Pennsylvania. With its extensive forests, streams, seeps, vernal pools, rock outcrops, and boulder fields, Blue Mountain is probably the wildest area remaining in southeastern Pennsylvania. It has long been recognized as one of the major east coast fall flyways for migrating raptors.

The extensive relatively unfragmented forests include habitat for resident animal species including larger mammals such as bear and bobcat, as well as for numerous smaller mammals including the PA-Threatened Allegheny woodrat (*Neotoma magister*). Although the mountain is primarily upland forest it includes streams, seeps, springs, and vernal pools. These features are more common on lower slopes as well as in areas at the base of the mountain where drainage is poor, such as in the glaciated portion of Northampton County. These riparian and wetland areas are important habitat for a wide diversity of plant species as well as for many groups of animals, including birds, reptiles, amphibians, odonates (dragonflies and damselflies) and other aquatic insects.



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Edited and published by the Geological Survey  
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SCALE 1:24,000

CONTOUR INTERVAL 20 FEET  
ELEVATION HEIGHTS IN FEET

THIS MAP SHOWS THE ORIGINAL, UNALTERED, UNCORRECTED  
AND BASED ON U.S. GEOLOGICAL SURVEY  
ORIGINAL, UNCORRECTED, UNALTERED, UNCORRECTED  
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WITHOUT THE WRITTEN PERMISSION OF THE GEOLOGICAL SURVEY

ROAD CLASSIFICATION

UNIMPROVED ROAD

PAVED ROAD

RAILROAD

U.S. ROAD

STATE ROAD

NEEDSVILLE, PA.-W.V.

ADDITIONAL INFORMATION: This map is a reproduction of the original map published in 1954. It is not to be used for any other purpose without the written permission of the Geological Survey.

"  
**MARITON UPLANDS** (Williams Twp.) SP574 - This site includes forest of varying ages and several large meadows. It supports a fair quality population of a PA-Threatened plant species. Associated plants include various species of goldenrod (Solidago spp.) and aster (Aster spp.). This site occurs on the grounds of the Mariton Wildlife Sanctuary and Wilderness Trust and is contiguous with the Locally Significant Area - MARITON SLOPES (see below).

**RAUBS ISLAND** (Williams Twp.) SP521 - This site is located on an island in the Delaware River. The island includes two primary habitat types. One is the higher elevation forested portion which is infrequently flooded, has deep alluvial soil, and occurs on the downstream half of the island. The other, which consists of shrub thicket, is located on the upstream portion of the island and is at a slightly lower elevation with a substrate of sand, gravel and cobbles. This habitat is characterized by seasonal scouring from ice and flood waters. Vegetation consists of linear patches of shrubs and stunted trees such as sycamore (Platanus occidentalis) and ash (Fraxinus spp.) interspersed with open areas dominated by herbs, vines, and grasses. This scour impacted habitat supports a good quality population of a PA-Rare plant species. The rare plant grows in association with poison ivy (Toxicodendron radicans), frost grape (Vitis riparia), and many exotics including soapwort (Saponaria officinalis), Cypress-spurge (Euphorbia cyparissias), and multiflora rose (Rosa multiflora). The margin of the upstream portion of the island (particularly in the late season) is mostly unvegetated gravel and cobbles with a few scattered weedy plant species. The island is also good habitat for bird species such as osprey (Pandion haliaetus) and herons. This island has been disturbed in the past by the construction of a bridge of which only an abandoned stone pier remains. Leaving this site in its current condition will help the rare plant persist here.

DELAWARE RIVER is an excellent recreational and scenic resource; it includes many current and historical records for species of special concern. The river and adjacent forested watersheds comprise one of the major corridors for the movement of biota in eastern Pennsylvania.

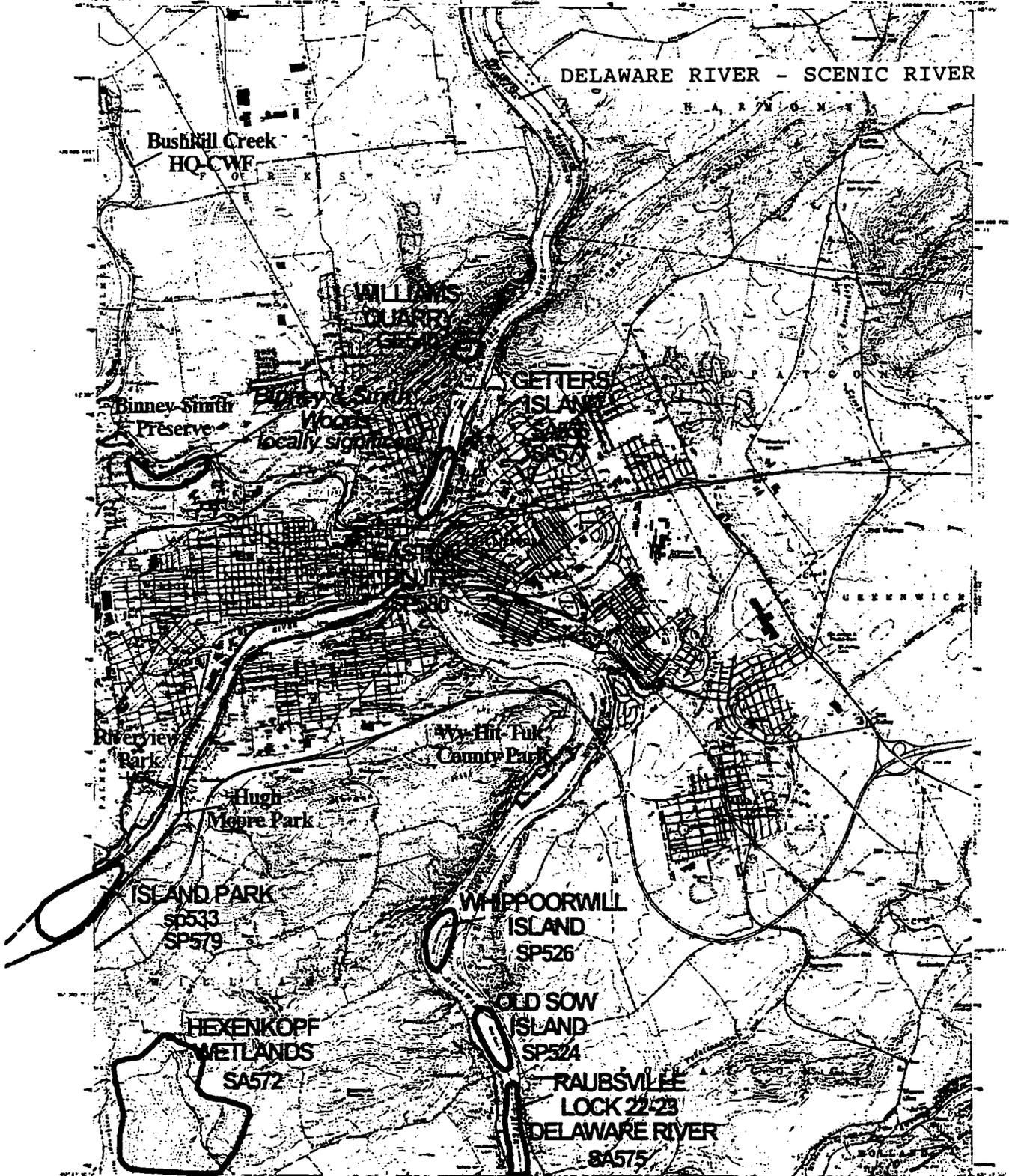
**HEXENKOPF SLOPES** (Williams Twp.) - This locally significant area is a broad southeast facing forested slope. The summit of the ridge includes a large linear rock outcrop formation (see GE529). Areas adjacent to the summit have large and small boulders making up the substrate. Common tree species include tulip poplar (Liriodendron tulipifera), sweet birch (Betula lenta), oaks (Quercus spp.), and hickories (Carya spp.). Witch-hazel (Hamamelis virginiana) and spicebush (Lindera benzoin) are common shrubs. Herb diversity is moderate with greater numbers of species being found further down slope. The site also includes several seeps and at least one vernal pool. These wetland areas support numerous plant species and are home to many animals as well. Upland areas on the slope have long been known as nesting areas for both black vultures (Coragyps atratus) and turkey vultures (Cathartes aura). Although portions of the site have been selectively logged and it is currently bisected by a large powerline right-of-way, there are a variety of habitat types here and there is potential for several species of special concern. Retaining the forest in an unfragmented

condition will benefit the numerous species that make their homes here as well as those that use this area for migration.

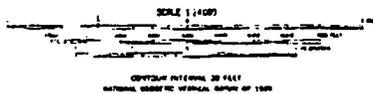
**MARITON SLOPES (Williams Twp.)** - This locally significant area is a series of forested slopes and shaded escarpments above the Delaware River. The steepest portion of the slopes are dominated by red oak (Quercus rubra), chestnut oak (Quercus prinus), sweet birch (Betula lenta), and red maple (Acer rubrum) with scattered stands of hemlock (Tsuga canadensis). These areas consist of many vertical rock faces interspersed with narrow ravines. These cool heavily shaded outcrops are good habitat for numerous fern species as well as spring wildflowers. Rhododendron (Rhododendron maximum) is very common on these slopes and extends in dense thickets far upslope. The forest on the crest of the slope is less diverse with large tulip poplar (Liriodendron tulipifera) dominating the canopy. A predominance of tulip poplar indicates that the site has a history of logging because tulip poplar requires forest openings to germinate. It grows faster than other trees and eventually dominates a site. As the forest matures, however, shade-tolerant species (such as red oak) replace tulip poplar because it does not regenerate under a closed canopy (Tryon 1980). Wildflowers are abundant on the upper slope, but exotic species such as garlic mustard (Alliaria officinalis), wineberry (Rubus phoenicolasius), and Japanese honeysuckle (Lonicera japonica) are also common. Overall this site includes numerous habitat types and is an asset to the biological diversity of the greater Delaware River corridor.

**HEXENKOPF ROCK (Williams Twp.) GE529** - This is a hilltop outcrop of Pochuck gneiss, one of the oldest rocks in North America. The rock also contains the mineral magnetite (Geyer and Bolles 1979).

DELAWARE RIVER - SCENIC RIVER



Revised by the Army Map Service  
Revised by the United States Geological Survey  
Control by U.S.G.S. NATIONAL and the Army Map Service  
Photographs by aerial photography and other methods  
Control by U.S.G.S. National and the Army Map Service  
Projection: U.S. Army Geodetic System  
of 1960 (NAD 60)  
1:50,000 scale and other data available upon request  
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1327 North Washington Street, Suite 110, Silver Spring, MD 20910  
The U.S. Army Map Service of 1960 (NAD 60) is shown by dashed lines  
The U.S. Army Map Service of 1983 (NAD 83) is shown by solid lines  
The U.S. Army Map Service of 1983 (NAD 83) is shown by solid lines  
The U.S. Army Map Service of 1983 (NAD 83) is shown by solid lines



HYDROGRAPHIC	
Shaded	Light Blue
Blue	Medium Blue
Dark Blue	Dark Blue
White	White
Black	Black

EASTON, PA.-NJ.  
475713 020  
1983  
U.S. GEOLOGICAL SURVEY

**EASTON BLUFF (Easton) SP580** - This site is a northwest facing sparsely vegetated limestone cliff. It is found in a highly developed section of the City of Easton. It supports a relatively large population of a PA-Endangered sedge species. This species was first identified in this area in the 1800's and has not been relocated since 1921. It was successfully relocated in July of 1998. The area immediately surrounding the site has received significant disturbances over the years and much of the vegetation currently found at the site is non-native. Common non-native species include Norway maple (Acer platanoides), tree of heaven (Ailanthus altissima), and privet (Ligustrum spp.). Despite the dominance of the non-natives, natives including woody species such as slippery elm (Ulmus rubra), hop-hornbeam (Ostrya virginiana), basswood (Tilia americana), and ninebark (Physocarpus opulifolius) and herbaceous species such as zigzag goldenrod (Solidago flexicaulis), wild columbine (Aquilegia canadensis), harebell (Campanula rotundifolia), and purple cliff-brake (Pellaea atropurpurea) all still persist at the site. Leaving this site in its current condition will probably allow the rare species to continue to survive here.

**GETTERS ISLAND (Easton) SA556, SA577** - This site is a narrow much scoured island occurring in the Delaware River just north of the confluence of the Delaware River and Bushkill Creek. The river on both sides of the island is characterized by riffles flowing over cobbles and gravel. This stretch of the river supports two animal species of concern. Evidence of both animals was observed during 1997 field surveys though no living individuals were found. Further surveys are encouraged to determine the size and extent of these animal populations. This stretch of the river also has potential for several other animal species of concern which may also be targeted in future surveys.

**HEXENKOPF WETLANDS (Williams Twp.) SA572** - This site includes a series of wetlands and seepy forest that occur along an unnamed tributary to Frys Run. They are variously dominated by shrubs, sedges (Carex spp.), and sweetflag (Acorus calamus). A PA-Endangered animal has been observed at this site as recently as 1995. Surveys in 1998 were unsuccessful but only a small portion of the area was surveyed. During the 1998 surveys it was determined that suitable habitat still exists, but it is marginal. Better habitat may occur elsewhere in the vicinity. Further surveys are recommended to determine if this species still occurs here. Avoiding disturbance to these wetlands and the adjacent forest should help keep this habitat in reasonable condition.

**ISLAND PARK (Easton) SP579** - This site is one of several forested islands located in the stretch of the Lehigh River between Bethlehem and Easton. The forest on this island is a young to moderately aged second growth mix of sycamore (Platanus occidentalis), black walnut (Juglans nigra), river birch (Betula nigra), box elder (Acer negundo), hickory (Carya spp.), and red oak (Quercus rubra). Spicebush (Lindera benzoin), black-haw (Viburnum prunifolium), and silky dogwood (Cornus amomum) are common shrubs. The island appears to have been disturbed in the past including some excavation. The island interior includes a 5 to 10-acre slough known as "The

Gut." This isolated emergent marsh wetland supports a wide diversity of plant and animal species including a large good quality population of a PA-Endangered plant species. The site has potential for other species of concern and further surveys are recommended. All of the forested islands and adjacent forested floodplains and upland slopes along this stretch of the Lehigh River, roughly from just east of Steel City to just west of West Easton, remain in a relatively isolated condition in an otherwise well-developed landscape. The size of this unbroken river corridor habitat makes it an important natural resource. Allowing these historically disturbed forests and wetlands to mature without further disturbance would benefit the preservation of diversity in the county. The area has the potential for recolonization by both osprey (Pandion haliaetus) and bald eagles (Haliaetus leucocephalus), as well as a variety of neotropical migrant bird species.

**OLD SOW ISLAND (Williams Twp.) SP524** - This site is located on an island in the Delaware River adjacent to Raubsville. The island includes two primary habitat types. One is the higher elevation forested portion which is infrequently flooded and occurs on the downstream portion of the island. The other habitat type, located on the upstream half of the island, has a substrate of sand, gravel and cobble. This habitat is characterized by seasonal scouring from ice and flood waters. Vegetation consists of dense patches of shrubs and stunted trees such as sycamore (Platanus occidentalis), ash (Fraxinus spp.), and sandbar willow (Salix spp.) interspersed with small open areas dominated by robust herbs and vines such as sneezeweed (Helenium autumnale) and frost grape (Vitis riparia), as well as many exotics including purple loosestrife (Lythrum salicaria), soapwort (Saponaria officinalis), and crown-vetch (Coronilla varia). The scoured upper end of this island supports a good quality population of a PA-Rare plant species. This species was last observed at this site in 1986. A survey during the 1997 field season failed to relocate the population. It is possible that the species still occurs here but was missed during the 1997 survey due to the island's dense vegetation. The island is also good habitat for bird species such as osprey and herons. Leaving this site in its current condition will best benefit the species that depend on it.

**RAUBSVILLE LOCK 22-23 - DELAWARE RIVER (Williams Twp.) SA575** - This stretch of the Delaware supports an animal species of special concern. Evidence of this species was observed during 1994 field surveys, though no living individuals were seen. Further surveys are encouraged to determine the extent and quality of this occurrence. Pollutants and excessive sedimentation are threats to this species.

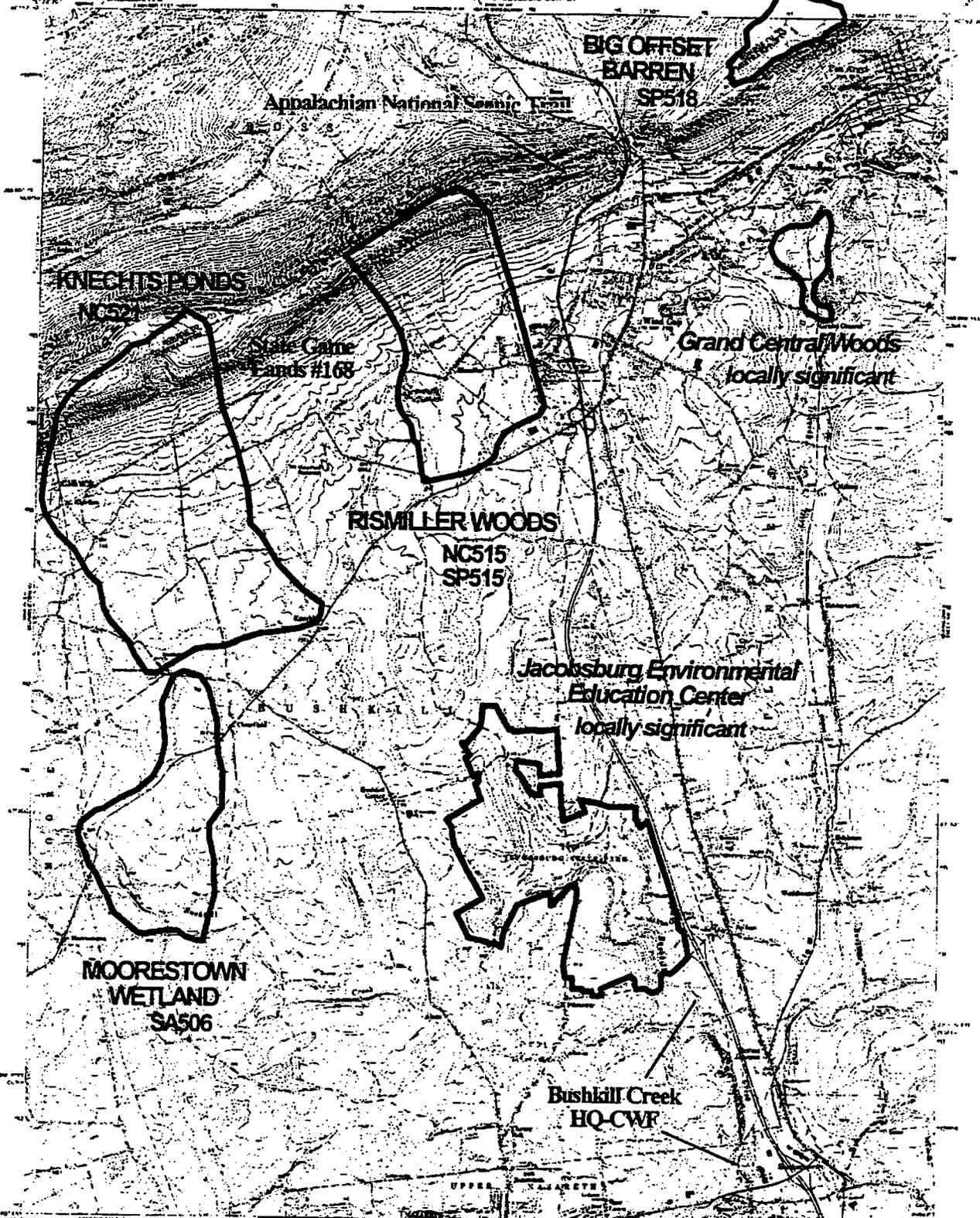
**WHIPPOORWILL ISLAND (Williams Twp.) SP526** - This site is located on an island in the Delaware River. The island includes two primary habitat types. One is the higher elevation forested

portion which is infrequently flooded, has deep alluvial soil, and occurs on the downstream half of the island. The other habitat type, located primarily on the upstream half of the island, is at a slightly lower elevation with a substrate of sand, gravel and cobble. This habitat is characterized by seasonal scouring from ice and flood waters. Vegetation consists of linear patches of shrubs and stunted trees such as sycamore (Platanus occidentalis), ash (Fraxinus spp.), and sandbar willow (Salix exigua) interspersed with open areas dominated by herbs, vines, and grasses such as big bluestem (Andropogon gerardii), poison ivy (Toxicodendron radicans), frost grape (Vitis riparia), common sneezeweed (Helenium autumnale), and many exotics including purple loosestrife (Lythrum salicaria), soapwort (Saponaria officinalis), and crown-vetch (Coronilla varia). The margin of the upstream portion of the island (particularly in the late season) is mostly unvegetated gravel and cobbles with a few scattered weedy species. The scoured upper end of this island supports a fair to good quality population of a PA-Rare plant species. The island is also good habitat for bird species such as osprey (Pandion haliaetus) and herons. Leaving this site in its current condition will help the rare plant persist here.

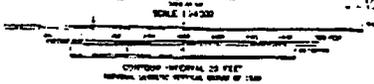
**BINNEY AND SMITH WOODS (Palmer Twp.)** - This locally significant area supports a relatively mature undisturbed forest. This 100 to 150-year-old stand of trees is located on a northeast facing slope above Bushkill Creek. It has a good diversity of trees and shrubs with red oak (Quercus rubra), sweet birch (Betula lenta), American beech (Fagus grandifolia), and tulip poplar (Liriodendron tulipifera) being most common in the overstory and witch-hazel (Hamamelis virginiana), spicebush (Lindera benzoin), maple-leaved viburnum (Viburnum acerifolium), bladdernut (Staphylea trifolia), and gooseberry (Ribes spp.) all common in the understory. The site also supports a wide diversity of herbs and ferns such as wild ginger (Asarum canadense), black cohosh (Cimicifuga racemosa), and rattlesnake fern (Botrychium virginianum). The site is excellent habitat for a variety of bird species which prefer riparian corridors. It also has boulders and rock outcrops on the upper part of the slope that are good habitat for reptiles and amphibians. This woodland, which is one of few remaining woodlands along the lower reaches of Bushkill Creek, is probably the best quality woodland remaining in Palmer Township. It would benefit local species diversity greatly to retain this woodland in an undisturbed condition. Maintaining this site as forest would be a good step toward restoring the lower Bushkill to a more ecologically viable system.

**DELAWARE RIVER** is an excellent recreational and scenic resource; it includes many current and historical records for species of special concern. The river and adjacent forested watersheds comprise one of the major corridors for the movement of biota in eastern Pennsylvania.

**WILLIAMS QUARRY (Easton) GE540** - This site is a well-known mineral collecting area. The major mineralization took place in the Precambrian period. Much of the limestone has been recrystallized into marble (Geyer and Bolles 1979).



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WIND GAP PA  
1995/06/17/429

**BIG OFFSET BARREN** (Plainfield Twp.; Hamilton Twp., Monroe County) SP518 - This site is a broad forested plateau which straddles the Northampton and Monroe County line on the Blue Mountain. It supports a fair to good quality population of a G2G3 PE-Endangered plant species. The relatively young forest at this site is dominated by red maple (*Acer rubrum*) and sassafras (*Sassafras albidum*) with scrub-oak (*Quercus ilicifolia*), lowbush blueberry (*Vaccinium* spp.), and huckleberry (*Gaylussacia baccata*) occurring in the understory and in forest gaps. The forest at this site has a history of logging or fire. Long term survival of this species at this site may depend on the availability of forest gaps. The 1997 survey of the barren found the population continuing to do well. The site is located partly on Appalachian National Scenic Trail lands.

**KNECHTS POOLS** (Bushkill Twp.; Ross Twp., Monroe Twp.) NC521 - This site is a gently sloping forested area that includes an Ephemeral Fluctuating Pools Natural Community. There are at least twelve vernal pools here. The woods are variably wet with some elevated areas being drier. Dominant tree species include white oak (*Quercus alba*) and red maple (*Acer rubrum*) which occur with scattered tulip poplar (*Liriodendron tulipifera*), red oak (*Quercus rubra*), and hemlock (*Tsuga canadensis*). Spicebush (*Lindera benzoin*) is the common understory species with white pine (*Pinus strobus*) saplings and arrow-wood (*Viburnum* spp.) also occurring. The pools may have varying covertypes as is typical of this community type. Cinnamon fern (*Osmunda cinnamomea*), sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), and fowl manna grass (*Glyceria striata*) are common in these situations with numerous other species being possible. Vernal pools are valuable habitat for the reproduction of amphibian species and can be important in the life cycles of many other animal species. The character of this site was determined through the examination of aerial photographs and through observations made from the adjacent road. This site has the potential for several plant species of special concern and further surveys are encouraged. Disturbances at the site include a paved road that bisects the site, as well as some unpaved lanes that cross through the woods. The woods have been cut over in the past but are nearing maturity again. Maintaining the forest cover at this site and letting the pools continue in their annual cycle of water retention and loss will benefit this natural community and all the species that depend on it.

**MOORESTOWN WETLAND** (Bushkill Twp.) SA506 - This site includes areas of marsh and shrub swamp, which are fed by ground water seepage. Red maple (*Acer rubrum*), cattail (*Typha latifolia*), skunk cabbage (*Symplocarpus foetidus*), and sedges (*Carex* spp.) are common species. It has been impacted by silt runoff from the adjacent farm fields as well as by the roads that may be influencing the hydrology. It supports an animal species of special concern. Maintaining the hydrology of the site is critical to the survival of this species at this site.

**RISMILLER WOODS (Bushkill Twp.) NC515, SP515** - This site supports a good to fair quality example of an Ephemeral/Fluctuating Natural Pools Natural Community. The forest is dominated by a mix of tulip poplar (Liriodendron tulipifera), red maple (Acer rubrum), sweet birch (Betula lenta), red oak (Quercus rubra), white oak (Q. alba), and shagbark hickory (Carya ovata). Several streams and springs are also present at the site. The ponds, streams, and springs create a diversity of microhabitats which support a large diversity of herbs, ferns, and graminoid species. The great variety of wetland microhabitats makes this area excellent breeding habitat for amphibians. The area has seen disturbance in the past from logging though much of the forest is currently recovering. A good quality population of SP515, a PA-Rare shrub, occurs in many of the pools at this site as well as along some of the small seepy streams. Associated species include highbush blueberry (Vaccinium corymbosum), arrow-wood (Viburnum spp.), and rhododendron (Rhododendron maximum). The north end of the stream corridor is threatened by new housing developments and gravel storage. This forested riparian corridor connects the sizable forest at Jacobsburg Environmental Education Center with Blue Mountain. Preserving these woods will provide a corridor for wildlife movement as well as habitat for SP515. This site will be best protected by maintaining the integrity of the matrix forest and by limiting or decreasing the fragmentation of the forest on the surrounding landscape.

BLUE MOUNTAIN is the most extensive relatively contiguous area of natural habitat in the two counties. It is one of the major corridors for the movement of biota in eastern Pennsylvania. It includes extensive forests with streams, seeps, springs, vernal pools, rock outcrops, and boulder fields. It has long been recognized as one of the major east coast fall flyways for migrating raptors. The extensive relatively unfragmented forests include habitat for resident animal species including larger mammals such as bear and bobcat, as well as for numerous smaller mammals including the PA-Threatened Allegheny woodrat (Neotoma magister). Wetland areas associated with streams, seeps and vernal pools are important habitat for a wide diversity of plant species as well as for many groups of animals including birds, reptiles, amphibians, odonates (dragonflies and damselflies) and others. Conserving sites on the mountain as highlighted in this report must be considered as part of the effort to conserve the greater natural functional value of the mountain ridge. Preserving the ecological integrity of Blue Mountain should be considered an important component in preserving the biodiversity of the two counties.

**GRAND CENTRAL WOODS (Plainfield Twp.)** - This locally significant area is a mesic hardwood forest dissected by the headwaters of Little Bushkill Creek. The area has a good diversity of tree species and is fairly mature (80-100 yrs). White oak (Quercus alba), black oak (Quercus velutina), red oak (Quercus rubra), and white ash (Fraxinus americana) are the dominant tree species. Red maple (Acer rubrum), tulip poplar (Liriodendron tulipifera), bitternut hickory (Carya cordiformis), sassafras (Sassafras albidum), and alternate-leaved dogwood (Cornus alternifolia) are also present. Understory shrubs and trees include rhododendron (Rhododendron maximum), spicebush (Lindera benzoin), maple-leaved viburnum (Viburnum acerifolium), winterberry (Ilex verticillata), and black cherry (Prunus

serotina). Although this site was visited too late in the season for many forest herbs, wild sarsaparilla (Aralia nudicaulis), asters (Aster spp.), skunk cabbage (Symplocarpus foetidus), sensitive fern (Onoclea sensibilis), jack-in-the-pulpit (Arisaema triphyllum), and solomon's seal (Polygonatum spp.) were all observed. The forest shows no signs of recent disturbance, and has an uneven age structure. Several standing dead trees were observed -- these are important for cavity nesting bird and bat species. A box turtle (Terrapene carolina) was also seen on our field survey. Some exotic species such as Japanese stilt grass (Microstegium vimineum) and Japanese barberry (Berberis thunbergii), are present at the site but are not dominant. A section of the Erie-Lackawanna Railroad has been converted to a walking trail through the woods. Preserving the site will be of value for human recreation and for wildlife.

JACOBSBURG ENVIRONMENTAL EDUCATION CENTER (Bushkill Twp.) - This locally significant area consists of over 1,168 acres of mostly forested land bisected by Bushkill Creek and Sober's Run. The park has a wide diversity of habitats, from shaly rock outcrops and hemlock forests along the Bushkill to mesic forests of red oak (Quercus rubra), white oak (Quercus alba), white ash (Fraxinus americana), shagbark hickory (Carya ovata), bitternut hickory (Carya cordiformis), and red maple (Acer rubrum). Some common herbs include maidenhair fern (Adiantum pedatum), rue anemone (Anemonella thalictroides), bird's-foot violet (Viola pedata), and black snakeroot (Cimicifuga racemosa). Much of the forest is fairly mature with good structure and a diverse groundcover persists despite invasion of exotic species such as Japanese barberry (Berberis thunbergii), honeysuckle (Lonicera japonica), and garlic mustard (Alliaria officinalis) in some areas. Several small tributary streams have headwater seeps with swamp white oak (Quercus bicolor), skunk cabbage (Symplocarpus foetidus), and jack-in-the-pulpit (Arisaema triphyllum). The park's wide variety of habitats and ecosystems provide a good potential for rare plant species, although none were identified in our surveys. The park is also home to an environmental education center, and has an extensive trail system used for biking, hiking and cross-country skiing. The park represents one of the largest remaining tracts of largely intact forest south of the Blue Mountain in Northampton County, and is connected to the Mountain by a riparian forest corridor. As such it is also important habitat for animals requiring large patches of forest, such as forest interior-breeding birds.

Although the Nature Conservancy's 1999 *Natural Areas Inventory* is not an exhaustive study, it is the most complete to date of the full biota in the Two Rivers Area since Schaeffer's 1949 Flora study. As a Natural Areas Inventory it stands today as the most comprehensive; however this inventory was limited by funding and time constraints. Robert Schaeffer's 1949 study took eleven years of field and record research to produce his confirmed flora list. Further studies will have to occur based upon the published report. Of special interest are potential locales for Ephemeral/Fluctuating Limestone Sinkholes. If located in the Two Rivers Area, these natural sites have a State Rank #1. Most likely due to farming practices and suburban development, such sites may have been eradicated in this area.

Specific areas of Intensive Natural Resource Study should be considered for:

- Comprehensive studies of the steep wooded slopes adjacent to the Lehigh and Delaware Rivers and specific sections of the Bushkill Stream.
- Comprehensive studies of the Limestone Based Soils and their evolving habitats on reverting to natural vegetation. Special attention should be made to seek out possible locales of —
  - Ephemeral/Fluctuating Limestone Sinkhole(s)
  - All existing tree lined fence rows on limestone based soils should be surveyed to seek out potential remnant native plant communities.

## **Section #4 —Recreational, Open Space Resources**

### **Current Status of Publicly Owned and Accessible, Private, and Land/Conservation Easement Land Areas**

The Joint Planning Commission of Lehigh and Northampton Counties actively maintains an updated inventory of Outdoor Recreational Sites for the Lehigh Valley. This inventory is the most thorough and encompassing inventory of park/recreational public, private and/or land areas covered by conservation easement which serve a role as open space lands within the Two Rivers Area - River Conservation Planning Area. The following inventory outlines a complex of mostly scattered park and/or open space lands, which are physically non-integrated for broader open space and recreational planning purposes. The exception to this general characteristic are the integrated, larger open space land areas of the following:

#### **Owned by the Commonwealth of Pennsylvania**

- Pennsylvania State Game Lands No. 168 along the Blue Mountain Ridge formation
- over 3,036.7 acres
- Jacobsburg State Park
- 1,168 acres
- Delaware Canal State Park ( a lineal riverside park)
- 111.5 acres

#### **Owned by the City of Easton**

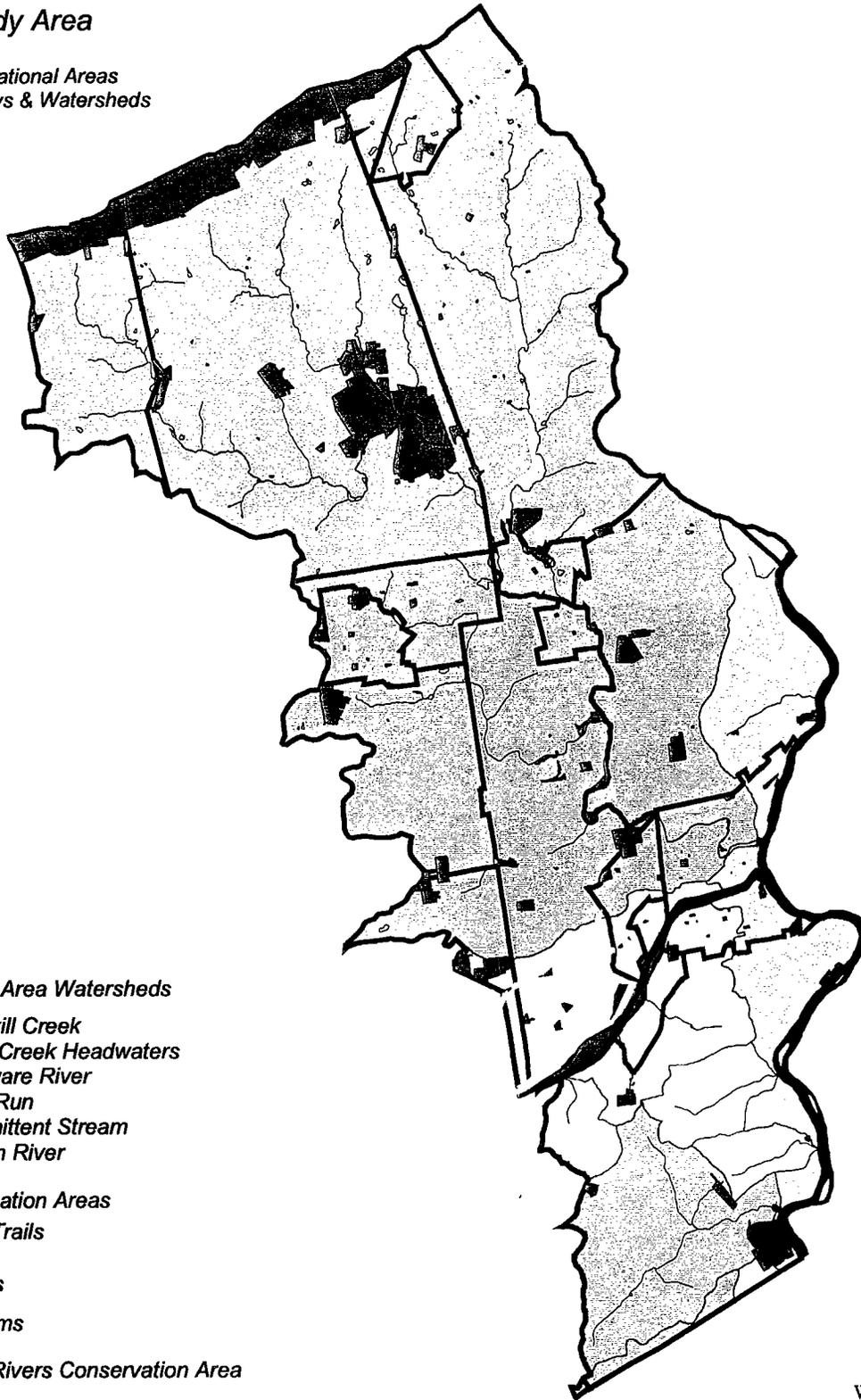
- Hugh Moore Historical Park ( a lineal riverside park)
- 258.8 acres

As per the Joint Planning Commission's updated inventory issued June 16, 1999 the following open space-recreational and/or land easement land areas exist within each municipality within the Two Rivers Area Planning Area.

**Two Rivers  
Conservation Plan  
Study Area**

**Map #7**

*Recreational Areas  
Waterways & Watersheds*



**Two Rivers Area Watersheds**

-  Bushkill Creek
-  Cook Creek Headwaters
-  Delaware River
-  Fry's Run
-  Intermittent Stream
-  Lehigh River

-  Recreation Areas
-  Bike Trails

-  Rivers

-  Streams

-  Two Rivers Conservation Area

-  Municipal Boundaries



REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: BUSHKILL TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 30

LAST UPDATED: 06/16/99

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
S	Bady's Grove	9.7	2.0		38	13	YES	NO
S	Belfast Edelman Sportsman Assoc.			(see Plainfield Township)				
N	Bushkill Township Recreation Center	44.4	20.0		03	03	YES	NO
S	Graver Arboretum	48.0	0.0		36	12	YES	NO
S	4-H Center of Northampton	4.8	1.5		42	14	YES	NO
R	Jacobsburg Environmental Education Center	1,168.0	0.0		05	05	YES	NO
S	Mountainview Drive Inn & Miniature Golf	2.4	0.6		32	13	YES	NO
G	State Game Lands No. 168	1,241.5	0.0		18	06	YES	NO
	TOTAL ACREAGE - PARKS	2,518.8	24.1					0.0
	Bushkill Elementary School	19.0	5.0		08	11	YES	NO
	TOTAL ACREAGE	2,537.8	29.1					0.0

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: EASTON CITY  
 COUNTY: Northampton  
 ID NUMBER: 34

LAST UPDATED: 06/10/94

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	MCD Acreage
		Total	Active Rec.					
N	Bushkill Street Park	0.1	0.0	01	01	YES	NO	
N	Butz Park	1.4	0.0	41	01	YES	NO	
N	Centennial Park	0.2	0.2	01	01	YES	NO	
N	Cheston/Pioneer Park	0.6	0.6	01	01	YES	NO	
N	Circle Park	0.6	0.0	01	01	YES	NO	
N	Condram Playlot	0.1	0.1	01	01	YES	NO	
N	Cooper Street Park	0.6	0.6	01	01	YES	NO	
N	Cottingham Stadium	5.4	4.0	08	11	YES	NO	
L	Delaware Canal State Park							
N	Easton Area Neighborhood Center	2.7	1.0	01	01	YES	NO	
N	Eddyside Park	3.6	3.6	02	01	YES	NO	
N	Hackett Park	92.8	30.0	03	01	YES	NO	
N	Heil Park	15.9	10.0	02	01	YES	Glendon	4.8
L	Hugh Moore Historical Park	258.8	20.0	28	01	YES	YES	
N	Jackson Street Park	0.2	0.2	01	01	YES	NO	
N	Lachenour Park	8.3	8.3	02	01	YES	NO	
N	Mauch Chunk Park	1.2	1.2	01	01	YES	NO	
N	McKeen Park	1.5	0.0	01	01	YES	NO	
N	Milton Street Park	1.3	0.8	01	01	YES	NO	
N	Municipal Beach	0.9	0.3	11	01	YES	NO	
N	Nesquehoning Street Park	0.3	0.3	02	01	YES	NO	
N	Nevin Park	5.5	0.5	02	01	YES	NO	
C	Open Space - Midlands Conservancy	7.0	0.0	24	14	YES	NO	
N	Raspberry-Spruce Streets Park	0.3	0.3	01	15	YES	NO	
N	Riverside Park	1.8	0.0	41	01	YES	NO	
N	Scott Park	2.4	0.0	41	01	YES	NO	
N	Spruce-Way Park	0.4	0.4	01	01	YES	NO	
N	St. Joseph Street Park	1.0	0.5	01	01	YES	NO	
N	Stonehouse Park	0.2	0.0	41	01	YES	NO	
N	Sullivan Park	5.1	2.0	02	01	YES	NO	
N	Vanderveer Park	0.3	0.3	01	01	YES	NO	
N	TOTAL ACREAGE - PARKS	420.5	85.2					4.8
	Cheston Elementary School	8.6	4.0	08	11	YES	NO	
	Easton Area Middle School	6.5	0.0	08	11	YES	NO	
	Easton Catholic Elementary School	0.8	0.1	08	12	NO	NO	
	Lafayette College	81.6	5.0	09	12	NO	NO	
	March Elementary School	1.0	0.3	08	11	YES	NO	
	TOTAL ACREAGE -SCHOOLS	98.5	9.4					
	TOTAL ACREAGE	519.0	94.6					4.8

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: FORKS TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 35

LAST UPDATE: 06/16/99

Class.	Site Name	Acreage		Type of park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
N	Braden Park (see note below)	7.9	7.0	02	02	YES	NO	NO
S	The Brocknell Farm	(see Plainfield Township)						
S	Bushkill Park	11.4	11.0	42	13	YES	NO	NO
N	Community Park	47.4	20.0	03	03	YES	NO	NO
S	Frost Hollow Overlook	2.5	1.5	25	04	YES	NO	NO
N	Gollub Park	16.3	0.0	41	03	YES	NO	NO
S	Lafayette University Athletic Fields	60.0	55.0	09	12	NO	NO	NO
S	Out Back Farm	10.2	1.0	33	13	YES	NO	NO
N	Park (along Bushkill Creek)	2.8	0.0	11	03	YES	NO	NO
N	Ramblewood Recreation Swale	3.8	0.0	01	03	YES	NO	NO
L	Recreation Trail	17.6	17.6	42	03	YES	NO	NO
S	Two T's Mini Golf & Driving Range	15.0	12.0	32	13	YES	NO	NO
	<b>TOTAL ACREAGE - PARKS</b>	<b>194.9</b>	<b>125.1</b>					
	Eastern Northampton Co. Vo-Tech School	31.0	0.0	08	11	NO	NO	NO
	Forks Elementary School	16.0	5.0	08	11	YES	NO	NO
	Paxinosa Elementary School	58.1	0.5	08	11	YES	NO	NO
	Shawnee Intermediate School	(see Paxinosa Elementary School)						
	<b>TOTAL ACREAGE - SCHOOLS</b>	<b>105.1</b>	<b>5.5</b>					
	<b>TOTAL ACREAGE</b>	<b>300.0</b>	<b>130.6</b>					

Note: Braden Park is owned by Tatamy Borough and is used as a borough park.

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: GLENDON BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 37

LAST UPDATE: 1989

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	MCD	Acreage
NO OUTDOOR RECREATION FACILITIES									

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: LOWER NAZARETH TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 42

LAST UPDATE: 06/16/99

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
R	Louise W. Moore Park	106.5	60.0	04	04	YES	Bethlehem T.	47.0
S	Lower Nazareth Rod & Gun Club	25.6	4.0	20	14	NO	NO	
TOTAL ACREAGE - PARKS		132.1	64.0					
TOTAL ACREAGE		132.1	64.0					

AGRICULTURAL CONSERVATION EASEMENT PURCHASES

Name	Acreage	Settlement
Willard & Grace Setzer	273.3	01/02/98

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: MOORE TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 44

LAST UPDATED: 06/26/96

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
L	Appalachian Trail Lands	183.3	0.0	27	10	YES	YES	
C	Moore Township Appalachian Park	168.2	0.0	41	03	YES	NO	
S	Point Phillip Rod & Gun Club	45.0	15.0	20	14	NO	NO	
G	State Game Lands No. 168	1,581.9	0.0	18	06	YES	YES	
TOTAL ACREAGE - PARKS		1,978.4	15.0					
TOTAL ACREAGE		1,978.4	15.0					

AGRICULTURAL CONSERVATION EASEMENT PURCHASES

Name	Acreage	Settlement
Daniel & Diane Schlegel	93.9	09/13/94

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: NAZARETH BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 45

LAST UPDATE: 1989

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
S	Black Rocks Camp	39.4	0.0	41	14	YES	NO	
N	Coplay Park	1.6	0.3	01	02	YES	NO	
N	Fairview Playlot	0.3	0.3	01	02	YES	NO	
N	Kraemer Park	2.3	2.0	39	13	YES	NO	
N	Midget League Field	2.5	2.5	39	13	YES	NO	
N	Nazareth Community Park	40.5	35.0	03	02	YES	NO	
N	Nazareth Hall Park	2.2	1.0	39	02	YES	NO	
N	Sauerzopf Park	2.5	2.5	01	13	YES	NO	
S	Square (Center & Main streets)	1.0	0.0	41	02	YES	NO	
N	Washington Park	0.7	0.7	01	02	YES	NO	
	TOTAL ACREAGAE - PARKS	93.0	44.3					
	Floyd R. Shafer Elementary School	8.5	4.0	08	11	YES	NO	
	Holy Family School	4.6	0.0	08	12	NO	NO	
	Nazareth Area Jr. & Sr. High Schools	41.9	10.0	08	11	YES	NO	
	TOTAL ACREAGE - SCHOOLS	55.0	14.0					
	TOTAL ACREAGE	148.0	58.3					

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: PALMER TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 48

LAST UPDATED: 06/16/98

Class.	Site Name	Total	Active Rec.	Type of Park	Ownership	Open to		Part in another MCD	Acreage
						Public	MCD		
N	Briarcliffe Park	17.6	17.6	02	03	YES	NO		
N	Fairview Park	14.1	14.1	02	03	YES	NO		
N	Keystone Park	10.5	8.0	02	03	YES	NO		
N	LaBarre Park	6.1	6.1	02	03	YES	NO		
N	Newburg Park	0.6	0.6	01	03	YES	NO		
N	Old Orchard Park	5.1	5.1	02	03	YES	NO		
L	Palmer - Bethlehem Twp. Bikeway	70.2	70.2	42	03	YES	Bethlehem T.	40.1	
N	Palmer Complex	19.2	19.2	02	11	YES	NO		
N	Penn Pump Park	8.0	6.0	02	03	YES	NO		
C	Penn's Grant Open Space	7.1	0.0	41	03	YES	NO		
N	Riverview Park	57.8	30.0	03	03	YES	NO		
N	Stephens Street Park	1.0	0.8	01	03	YES	NO		
N	Stone's Crossing Swim Club	5.7	4.0	10	14	NO	NO		
C/N	Wolfs Run Open Space	32.0	2.0	41	03	YES	NO	40.1	
	TOTAL ACREAGE - PARKS	255.0	183.7						
	Easton Area High School	45.4	20.0	08	11	YES	NO		
	Palmer Elementary School	20.3	5.0	08	11	YES	NO		
	Tracy Elementary School	10.1	1.5	08	11	YES	NO		
	TOTAL ACREAGE - SCHOOLS	75.8	26.5						
	TOTAL ACREAGE	330.8	210.2					40.1	

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: PLAINFIELD TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 50

LAST UPDATED: 06/09/98

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD
		Total	Active Rec.			Public	MCD	
S	Belfast-Edelman Sportsman Assoc.	19.4	0.0	20	14	NO	Bushkill	12.4
N	Belfast-Edelman Youth Club	12.4	10.0	02	14	NO	NO	
S	Bit-By-Bil	25.0	10.0	33	13	YES	Bushkill	3.3
S	Blue Valley Riding Center	15.1	0.0	33	13	YES	NO	
S	The Brocknell Farm	20.4	1.0	33	13	YES	Forks	10.6
S	Cortez Picnic Grove	30.1	5.0	38	13	YES	NO	
S	Hillside Rod & Gun Club	25.5	2.0	20	13	NO	NO	
S	Plainfield Riding Club	4.6	4.0	33	13	NO	NO	
L	Plainfield Township Recreation Trail	51.8	?	42	03	YES	NO	
N	Recreation Area (at Township Building)	1.0	1.0	01	03	YES	NO	
S	Sawmill Golf Course	73.5	70.0	30	13	YES	NO	
G	State Game Lands No. 168	213.3	0.0	18	06	YES	YES	
	TOTAL ACREAGE - PARKS	492.1	103.0					26.3
	TOTAL ACREAGE	492.1	103.0					26.3

AGRICULTURAL CONSERVATION EASEMENT PURCHASES

Name	Acreage	Settlement
Robert, Ruth & Fay Fulmer	158.0	06/15/95

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: STOCKERTOWN BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 53

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	Acreage	
N	Newhart Park	3.1	2.0	02	02	YES	NO		
N	schoolground	1.7	1.0	01	02	YES	NO		
S	Stockertown Rod & Gun Club (1)	24.4	10.0	20	14	NO	NO		
<b>TOTAL ACREAGE</b>		<b>29.2</b>	<b>13.0</b>						

(1) - includes the Stockertown Baseball Field

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: TATAMY BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 54

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
N	Mark A. Metz Memorial Park	0.6	0.6	01	02	YES	NO	NO
N	playground	0.7	0.3	01	02	YES	NO	NO
<b>TOTAL ACREAGE</b>		<b>1.3</b>	<b>0.9</b>					

Note: Braden Park (7.9 acres) in Forks Township is owned by Tatamy and used as a borough park.

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: UPPER NAZARETH TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 56

LAST UPDATE: 06/09/98

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
N	Ballfield	3.0	3.0	39	14	YES		NO
N	Liebert School Play Area	3.1	0.5	01	03	YES		NO
N	Mini Park	1.7	1.7	01	03	YES		NO
L	Northampton County Recreation Trail (see East Allen Township)							
N	Upper Nazareth Athletic Association	5.4	5.4	02	13	YES		NO
	<b>TOTAL ACREAGE - PARKS</b>	13.2	10.6					
	Nazareth Area Middle School	42.1	?	08	11	YES		NO
	<b>TOTAL ACREAGE</b>	<b>55.3</b>	<b>10.6</b>					

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WEST EASTON BOROUGH

COUNTY: Northampton

ID NUMBER: 59

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	Acreage	
N	Borough Park	2.0	0.5	01	02	YES		NO	
N	park	0.8	0.0	41	02	YES		NO	
<b>TOTAL ACREAGE</b>		<b>2.8</b>	<b>0.5</b>						<b>0.0</b>

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WILLIAMS TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 60

LAST UPDATED: 06/17/99

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
S	Camptown	39.8	6.0	14	14	NO	NO	
L	Delaware Canal State Park	111.5	40.0	05	05	YES	Easton	45.1
S	Easton Fish and Game Association	20.0	5.0	20	14	NO	NO	
N	Fry's Run Park	5.8	4.0	25	04	YES	NO	
C	Marion Wildlife Sanctuary	198.4	0.0	24	13	YES	NO	
C	Melchor Tract	27.9	0.0	41	03	YES	NO	
S	Muellers Riverside Greens	2.0	0.3	32	13	YES	NO	
N	Raubsville Park	3.0	3.0	02	03	YES	NO	
N	Williams Township Park	26.0	10.0	03	03	YES	NO	
S	Williams Township Sportsman's Assoc.	11.0	2.0	20	14	NO	NO	
N	Wy-Hit-Tuk Park	23.1	23.1	03	04	YES	NO	45.1
	TOTAL ACREAGE - PARKS	468.5	93.4					
	Williams Township Elementary School	17.3	7.0	08	11	YES	NO	
	TOTAL ACREAGE	485.8	100.4					45.1

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WILSON BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 61

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
N	James H. Jeffery Athletic Field	3.0	3.0	39	13	YES	NO	
N	Liberty Playground	0.5	0.5	01	02	YES	NO	
N	Meuser Park	15.0	15.0	02	02	YES	NO	
N	totlot	0.1	0.0	01	02	YES	NO	
N	Wilson Midget Football	2.0	2.0	40	02	YES	NO	0.0
	TOTAL ACREAGE - PARKS	20.6	20.5					
	Avona Elementary School	0.7	0.3	08	11	YES	NO	
	Easton Children's Home	18.1	5.0	08	14	NO	NO	
	Philip F. Lauer Middle School	35.4	12.0	08	11	YES	NO	
	St. Jane Frances De Chantal School	1.0	0.0	08	12	NO	NO	
	Wilson Area High School	9.0	4.5	08	11	YES	NO	
	Wilson Borough Elementary School	5.2	0.0	08	11	YES	NO	0.0
	TOTAL ACREAGE - SCHOOLS	69.4	21.8					
	TOTAL ACREAGE	90.0	42.3					0.0

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WIND GAP BOROUGH

COUNTY: Northampton

ID NUMBER: 62

LAST UPDATED: 06/10/94

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
S	Puttorama	0.8	0.4	32	13	YES	NO	
N	Wind Gap Park	33.9	18.0	03	02	YES	NO	
<b>TOTAL ACREAGE</b>		<b>34.7</b>	<b>18.4</b>					

The following is a list of code denoters for • **Site Ownership** • **Type of Establishment**  
 • **Recreational Activities** at site for the above inventory.

**Site Ownership**

- 01 - City Borough
- 02 - Township
- 03 - County
- 04 - Pennsylvania Dept. of Environmental Resources (DCNR)
- 05 - Pennsylvania Game Commission
- 06 - Pennsylvania Fish Commission
- 07 - Pennsylvania Historical and Museum Commission
- 08 - Other PA (PennDOT, etc.)
- 09 - Federal Agency
- 10 - Public School District
- 11 - Private Schools and Church Schools
- 12 - Private -for Profit
- 13 - Private Non-Profit / Membership and Community Service
- 14 - Public and Private Historical
- 15 - Utility or Authority
- 16 - Other

**Type of Establishment**

**Multi-Purpose Parks**

- 01 - Sub Neighborhood Park (Mini-Park)
- 02 - Neighborhood Park/Playground
- 03 - Community Park
- 04 - Regional Park
- 05 - State Park
- 06 - National Park or Recreation Area
- 07 - Private Multi-Purpose Park

**Schools**

- 08 - School Recreation Area
- 09 - College or University Area

**Swimming**

- 10 - Outdoor Swimming Pool

**Fishing Areas**

- 10 - Fishing (public access)
- 11 - Fishing (private or club membership)

**Camping**

- 10 - Organized Group Camp
- 11 - Day Camp
- 12 - Church Camp
- 13 - Special Sports/Recreation Camp
- 14 - General Camping

**Hunting**

- 10 - State Game Lands
- 11 - Private Hunting Area
- 12 - Sportsmen Club (rod, gun, trap etc.)

**Winter Sports**

- 10 - Cross-country (X) Skiing
- 11 - Outdoor Skating Rink

**Conservation, Natural/Open Space Area**

- 10 - Nature Center
- 11 - Land Preserve (conservancy owned)
- 12 - County Natural Area
- 13 - State Natural Area
- 14 - National Natural Area

**Historic Areas**

- 10 - National Register Historic Site
- 11 - Other Historic Area

**Golf**

- 10 - Regular Course
- 11 - Par 3 Course
- 12 - Golf related (miniature golf, driving range)

**Equestrian Establishment**

- 10 - Riding Stable

**Educational-Museum Cultural Areas**

- 10 - Zoo
- 11 - Museum
- 12 - Other

**Homeowners' Related Recreation**

- 10 - Homeowners' Related Recreation

**Single Purpose Parks & Miscellaneous**

- 10 - Picnic Grove
- 11 - Ball Field (baseball/softball)
- 12 - Multi-purpose Field (soccer, etc.)
- 13 - Open Space
- 14 - Recreation Trail
- 15 - Miscellaneous

**Recreational Activities at this Site**

- 01 - Boating (motor)
- 02 - Boating (non-motor)
- 03 - Fishing
- 04 - Swimming (pool)
- 05 - Swimming (fresh water)
- 06 - Camping
- 07 - Hiking
- 08 - Hunting
- 09 - Historical/Cultural
- 10 - Nature Observing (study)
- 11 - Picnicking
- 12 - Sight-Seeing
- 13 - Walking-Jogging
- 14 - Archery/Target Shooting
- 15 - Baseball/Softball
- 16 - Football/Soccer
- 17 - Basketball

## **Critical Assessment of Inventoried Open Space Recreational Areas relative to Stabilization and Maintenance of Surface Water and Groundwater Resources and Natural Area Habitats and their Affiliated Ecological Systems**

Within the Two Rivers Area - River Conservation Planning Area, there is the following overall level of secured lands which in full or part reserve land which can assist stabilizing and enhancing the area's waterways and groundwater and natural habitats.

- 7,137.3 acres of land in public or private ownership and/ or easement

of which

- 890.9 acres of land is used for active recreational purposes open and/or available to the public.

More specifically, only over 5,706.4 acres of the total land acreage can be considered open space land areas which directly support water surface recharge and/or are suitable for habitat protection. As stated before, only a limited number of these open space/recreational locales are laid out in an intermunicipal, physically integrated manner which could lead to broader water resource protection and habitat conservation. (These resource locales are Pennsylvania State Game Lands No. 168, Jacobsburg State Park, Delaware Canal State Park, and Hugh Moore Historical Park). Additionally, there is only a minimum of 525.5 total acres of farmland permanently covered by an agricultural easement under Act 149 within the Two Rivers Area.

In physical fact, at present there is no integration of surface land resources which tie into and relate to the protection and conservation of leading land and water surface features which support the immediate and healthful long-term functioning of the Two Rivers Area waterways and groundwater resources. The following overall recommendations are directed to cause such integration and are intended to reinforce the conservation enhancement to the area's previously identified critical natural habitats, sensitive water-bearing soils, and primary wooded cover. Within this framework of eased and/or purchased lands, a selection of public recreational uses can occur which are sensitive to the resource base. The level at which future open space and park lands and facilities are developed should be addresses by long range planning. This activity should be determined upon a basis of projections for the next 50 year cycle.

Presently there are over 107,394 people within the Two Rivers Area - River Conservation Plan planning area. It is reasonable to assume that within those 50 years the Two Rivers Area's population could increase up to, conservatively, 167,593. This is plausible in view of:

- long established regional population trends
- projected patterns of national economic and population growth
- the attractiveness of the area and its civic infrastructure, and its immediate potential population carrying capacity.

Much of this population expansion will be within middle and upper income groups which are typically oriented to ex-urban and suburban style residential developments. The consumption of the area's land surface by scattered, physically non-integrated subdivisions will be, theoretically, all-encompassing.

This general 50 year trend of continued surface land development places all of the Two Rivers Area municipalities at a point in civic time when clear and focused leadership decisions need to occur concerning open space and recreational land resources. The cost of land purchases and development for open space and/or recreational facilities required to maintain the area's quality of life and attractiveness will only continue to increase in response to price pressure caused by expanding speculative land development.

If the Two Rivers Area Council of Governments accepts the projection of an in-regional population of up to 167,593 within the next 50 years, we advise that the following Management Initiatives outlined in Section #6 regarding open space, recreational and natural resources, and the healthful support of water surface and groundwater systems of the area be considered and undertaken.

## **Section #4 —Recreational, Open Space Resources**

### **Current Status of Publicly Owned and Accessible, Private, and Land/Conservation**

#### **Easement Land Areas**

The Joint Planning Commission of Lehigh and Northampton Counties actively maintains an updated inventory of Outdoor Recreational Sites for the Lehigh Valley. This inventory is the most thorough and encompassing inventory of park/recreational public, private and/or land areas covered by conservation easement which serve a role as open space lands within the Two Rivers Area - River Conservation Planning Area. The following inventory outlines a complex of mostly scattered park and/or open space lands, which are physically non-integrated for broader open space and recreational planning purposes. The exception to this general characteristic are the integrated, larger open space land areas of the following:

#### **Owned by the Commonwealth of Pennsylvania**

- Pennsylvania State Game Lands No. 168 along the Blue Mountain Ridge formation • over 3,036.7 acres
- Jacobsburg State Park • 1,168 acres
- Delaware Canal State Park ( a lineal riverside park) • 111.5 acres

#### **Owned by the City of Easton**

- Hugh Moore Historical Park ( a lineal riverside park) • 258.8 acres

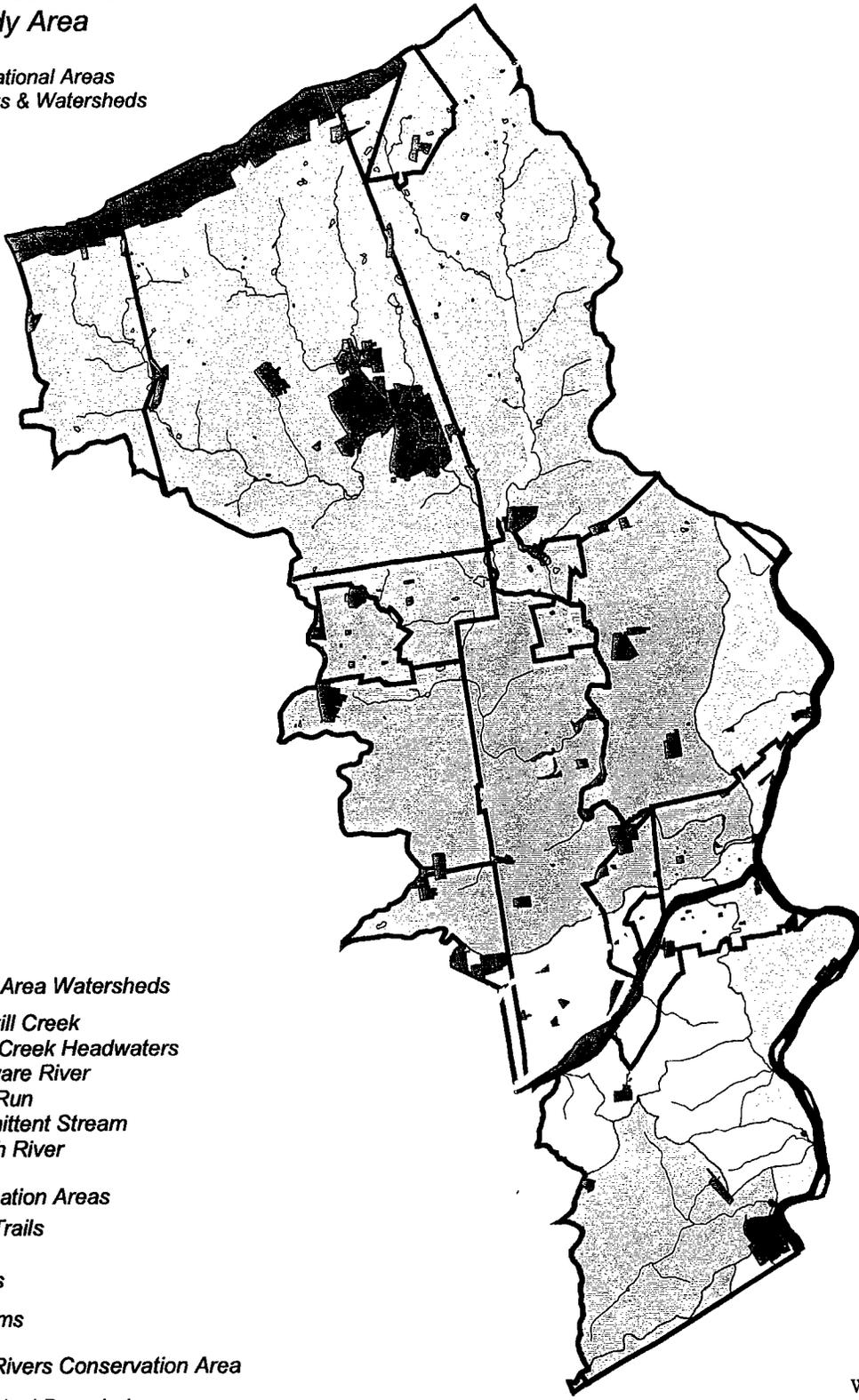
As per the Joint Planning Commission's updated inventory issued June 16, 1999 the following open space-recreational and/or land easement land areas exist within each municipality within the Two Rivers Area Planning Area.



**Two Rivers  
Conservation Plan  
Study Area**

**Map #7**

*Recreational Areas  
Waterways & Watersheds*



**Two Rivers Area Watersheds**

-  Bushkill Creek
-  Cook Creek Headwaters
-  Delaware River
-  Fry's Run
-  Intermittent Stream
-  Lehigh River
-  Recreation Areas
-  Bike Trails
-  Rivers
-  Streams
-  Two Rivers Conservation Area
-  Municipal Boundaries



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REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: BUSHKILL TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 30

LAST UPDATED: 06/16/99

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				M.C.D.	Acreage
S	Bady's Grove	9.7	2.0		38	13	YES	NO
S	Belfast Edelman Sportsman Assoc.			(see Plainfield Township)				
N	Bushkill Township Recreation Center	44.4	20.0		03	03	YES	NO
S	Graver Arboretum	48.0	0.0		36	12	YES	NO
S	4-H Center of Northampton	4.8	1.5		42	14	YES	NO
R	Jacobsburg Environmental Education Center	1,168.0	0.0		05	05	YES	NO
S	Mountainview Drive Inn & Miniature Golf	2.4	0.6		32	13	YES	NO
G	State Game Lands No. 168	1,241.5	0.0		18	06	YES	NO
	TOTAL ACREAGE - PARKS	2,518.8	24.1					0.0
	Bushkill Elementary School	19.0	5.0		08	11	YES	NO
	TOTAL ACREAGE	2,537.8	29.1					0.0

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: EASTON CITY  
 COUNTY: Northampton  
 ID NUMBER: 34

LAST UPDATED: 06/10/94

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	Acreage
		Total	Active Rec.					
N	Bushkill Street Park	0.1	0.0	01	01	YES	NO	
N	Bulz Park	1.4	0.0	41	01	YES	NO	
N	Centennial Park	0.2	0.2	01	01	YES	NO	
N	Cheston/Pioneer Park	0.6	0.6	01	01	YES	NO	
N	Circle Park	0.6	0.0	01	01	YES	NO	
N	Condran Playlot	0.1	0.1	01	01	YES	NO	
N	Cooper Street Park	0.6	0.6	01	01	YES	NO	
N	Cottingham Stadium	5.4	4.0	08	11	YES	NO	
L	Delaware Canal State Park							
	(see Williams Township)							
N	Easton Area Neighborhood Center	2.7	1.0	01	01	YES	NO	
N	Eddyside Park	3.6	3.6	02	01	YES	NO	
N	Hackett Park	92.8	30.0	03	01	YES	NO	
N	Heil Park	15.9	10.0	02	01	YES	Glendon	4.8
L	Hugh Moore Historical Park	258.8	20.0	28	01	YES	YES	
N	Jackson Street Park	0.2	0.2	01	01	YES	NO	
N	Lachenour Park	8.3	8.3	02	01	YES	NO	
N	Mauch Chunk Park	1.2	1.2	01	01	YES	NO	
N	McKeen Park	1.5	0.0	01	01	YES	NO	
N	Milton Street Park	1.3	0.8	01	01	YES	NO	
N	Municipal Beach	0.9	0.3	11	01	YES	NO	
N	Nesquehoning Street Park	0.3	0.3	01	01	YES	NO	
N	Nevin Park	5.5	0.5	02	01	YES	NO	
C	Open Space - Midlands Conservancy	7.0	0.0	24	14	YES	NO	
N	Raspberry-Spruce Streets Park	0.3	0.3	01	15	YES	NO	
N	Riverside Park	1.8	0.0	41	01	YES	NO	
N	Scott Park	2.4	0.0	41	01	YES	NO	
N	Spruce-Way Park	0.4	0.4	01	01	YES	NO	
N	St. Joseph Street Park	1.0	0.5	01	01	YES	NO	
N	Stonehouse Park	0.2	0.0	41	01	YES	NO	
N	Sullivan Park	5.1	2.0	02	01	YES	NO	
N	Vanderveer Park	0.3	0.3	01	01	YES	NO	
	TOTAL ACREAGE - PARKS	420.5	85.2					4.8
	Cheston Elementary School	8.6	4.0	08	11	YES	NO	
	Easton Area Middle School	6.5	0.0	08	11	YES	NO	
	Easton Catholic Elementary School	0.8	0.1	08	12	NO	NO	
	Lafayette College	81.6	5.0	09	12	NO	NO	
	March Elementary School	1.0	0.3	08	11	YES	NO	
	TOTAL ACREAGE - SCHOOLS	98.5	9.4					
	TOTAL ACREAGE	519.0	94.6					4.8

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: FORKS TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 35

LAST UPDATE: 06/16/99

Class.	Site Name	Acreage		Type of park	Ownership	Open to		Part in another MCD
		Total	Active Rec.			Public	MCD	
N	Braden Park (see note below)	7.9	7.0	02	02	YES	NO	
S	The Brocknell Farm	(see Plainfield Township)						
S	Bushkill Park	11.4	11.0	42	13	YES	NO	
N	Community Park	47.4	20.0	03	03	YES	NO	
S	Frost Hollow Overlook	2.5	1.5	25	04	YES	NO	
N	Gollub Park	16.3	0.0	41	03	YES	NO	
S	Lafayette University Athletic Fields	60.0	55.0	09	12	NO	NO	
S	Out Back Farm	10.2	1.0	33	13	YES	NO	
N	Park (along Bushkill Creek)	2.8	0.0	11	03	YES	NO	
N	Ramblewood Recreation Swale	3.8	0.0	01	03	YES	NO	
L	Recreation Trail	17.6	17.6	42	03	YES	NO	
S	Two T's Mini Golf & Driving Range	15.0	12.0	32	13	YES	NO	
	<b>TOTAL ACREAGE - PARKS</b>	<b>194.9</b>	<b>125.1</b>					
	Eastern Northampton Co. Vo-Tech School	31.0	0.0	08	11	NO	NO	
	Forks Elementary School	16.0	5.0	08	11	YES	NO	
	Paxinosa Elementary School	58.1	0.5	08	11	YES	NO	
	Shawnee Intermediate School	(see Paxinosa Elementary School)						
	<b>TOTAL ACREAGE - SCHOOLS</b>	<b>105.1</b>	<b>5.5</b>					
	<b>TOTAL ACREAGE</b>	<b>300.0</b>	<b>130.6</b>					

Note: Braden Park is owned by Tatamy Borough and is used as a borough park.

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: GLENDON BOROUGH

COUNTY: Northampton

ID NUMBER: 37

LAST UPDATE: 1989

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	Acreage	
NO OUTDOOR RECREATION FACILITIES									

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: LOWER NAZARETH TOWNSHIP

COUNTY: Northampton

ID NUMBER: 42

LAST UPDATE: 06/16/99

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD
		Total	Active Rec.				
R	Louise W. Moore Park	106.5	60.0	04	04	YES	Bethlehem T.
S	Lower Nazareth Rod & Gun Club	25.6	4.0	20	14	NO	NO
TOTAL ACREAGE - PARKS		132.1	64.0				
TOTAL ACREAGE		132.1	64.0				

AGRICULTURAL CONSERVATION EASEMENT PURCHASES

Name	Acreage	Settlement
Willard & Grace Setzer	273.3	01/02/98

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: MOORE TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 44

LAST UPDATED: 06/26/96

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
L	Appalachian Trail Lands	183.3	0.0	27	10	YES	YES	
C	Moore Township Appalachian Park	168.2	0.0	41	03	YES	NO	
S	Point Phillip Rod & Gun Club	45.0	15.0	20	14	NO	NO	
G	State Game Lands No. 168	1,581.9	0.0	18	06	YES	YES	
TOTAL ACREAGE - PARKS		1,978.4	15.0					
TOTAL ACREAGE		1,978.4	15.0					

AGRICULTURAL CONSERVATION EASEMENT PURCHASES

Name	Acreage	Settlement
Daniel & Diane Schlegel	93.9	09/13/94

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: NAZARETH BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 45

LAST UPDATE: 1989

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
S	Black Rocks Camp	39.4	0.0	41	14	YES	NO	
N	Coplay Park	1.6	0.3	01	02	YES	NO	
N	Fairview Playlot	0.3	0.3	01	02	YES	NO	
N	Kraemer Park	2.3	2.0	39	13	YES	NO	
N	Midget League Field	2.5	2.5	39	13	YES	NO	
N	Nazareth Community Park	40.5	35.0	03	02	YES	NO	
N	Nazareth Hall Park	2.2	1.0	39	02	YES	NO	
N	Sauerzopf Park	2.5	2.5	01	13	YES	NO	
S	Square (Center & Main streets)	1.0	0.0	41	02	YES	NO	
N	Washington Park	<u>0.7</u>	<u>0.7</u>	01	02	YES	NO	
	TOTAL ACREAGAE - PARKS	93.0	44.3					
	Floyd R. Shafer Elementary School	8.5	4.0	08	11	YES	NO	
	Holy Family School	4.6	0.0	08	12	NO	NO	
	Nazareth Area Jr. & Sr. High Schools	<u>41.9</u>	<u>10.0</u>	08	11	YES	NO	
	TOTAL ACREAGE - SCHOOLS	55.0	14.0					
	TOTAL ACREAGE	148.0	58.3					

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: PALMER TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 48

LAST UPDATED: 06/16/98

Class.	Site Name	Total	Active Rec.	Type of Park	Ownership	Open to		Part in another MCD	Acreage
						Public	MCD		
N	Briarcliffe Park	17.6	17.6	02	03	YES	NO		
N	Fairview Park	14.1	14.1	02	03	YES	NO		
N	Keystone Park	10.5	8.0	02	03	YES	NO		
N	LaBarre Park	6.1	6.1	02	03	YES	NO		
N	Newburg Park	0.6	0.6	01	03	YES	NO		
N	Old Orchard Park	5.1	5.1	02	03	YES	NO		
L	Palmer - Bethlehem Twp. Bikeway	70.2	70.2	42	03	YES	Bethlehem T.	40.1	
N	Palmer Complex	19.2	19.2	02	11	YES	NO		
N	Penn Pump Park	8.0	6.0	02	03	YES	NO		
C	Penn's Grant Open Space	7.1	0.0	41	03	YES	NO		
N	Riverview Park	57.8	30.0	03	03	YES	NO		
N	Stephens Street Park	1.0	0.8	01	03	YES	NO		
N	Stone's Crossing Swim Club	5.7	4.0	10	14	NO	NO		
C/N	Wolf's Run Open Space	32.0	2.0	41	03	YES	NO	40.1	
	TOTAL ACREAGE - PARKS	255.0	183.7						
	Easton Area High School	45.4	20.0	08	11	YES	NO		
	Palmer Elementary School	20.3	5.0	08	11	YES	NO		
	Tracy Elementary School	10.1	1.5	08	11	YES	NO		
	TOTAL ACREAGE - SCHOOLS	75.8	26.5						
	TOTAL ACREAGE	330.8	210.2					40.1	

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: PLAINFIELD TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 50

LAST UPDATED: 06/09/98

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	Acreage	Acreage
S	Belfast-Edelman Sportsman Assoc.	19.4	0.0	20	14	NO	NO	Bushkill	12.4
N	Belfast-Edelman Youth Club	12.4	10.0	02	14	NO	NO	NO	
S	Bit-By-Bit	25.0	10.0	33	13	YES	YES	Bushkill	3.3
S	Blue Valley Riding Center	15.1	0.0	33	13	YES	YES	NO	
S	The Brocknell Farm	20.4	1.0	33	13	YES	YES	Forks	10.6
S	Cortez Picnic Grove	30.1	5.0	38	13	YES	YES	NO	
S	Hillside Rod & Gun Club	25.5	2.0	20	13	NO	NO	NO	
S	Plainfield Riding Club	4.6	4.0	33	13	NO	NO	NO	
L	Plainfield Township Recreation Trail	51.8	?	42	03	YES	YES	NO	
N	Recreation Area (at Township Building)	1.0	1.0	01	03	YES	YES	NO	
S	Sawmill Golf Course	73.5	70.0	30	13	YES	YES	NO	
G	State Game Lands No. 168	213.3	0.0	18	06	YES	YES	YES	
	TOTAL ACREAGE - PARKS	492.1	103.0						26.3
	TOTAL ACREAGE	492.1	103.0						26.3

AGRICULTURAL CONSERVATION EASEMENT PURCHASES

Name	Acreage	Settlement
Robert, Ruth & Fay Fulmer	158.0	06/15/95

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: STOCKERTOWN BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 53

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	Acreage	
N	Newhart Park	3.1	2.0	02	02	YES	NO		
N	schoolground	1.7	1.0	01	02	YES	NO		
S	Stockertown Rod & Gun Club (1)	24.4	10.0	20	14	NO	NO		
<b>TOTAL ACREAGE</b>		<b>29.2</b>	<b>13.0</b>						

(1) - includes the Stockertown Baseball Field

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: TATAMY BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 54

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in: another MCD	
		Total	Active Rec.			Public	MCD	Acreage	
N	Mark A. Metz Memorial Park	0.6	0.6	01	02	YES		NO	
N	playground	0.7	0.3	01	02	YES		NO	
<b>TOTAL ACREAGE</b>		<b>1.3</b>	<b>0.9</b>						

Note: Braden Park (7.9 acres) in Forks Township is owned by Tatamy and used as a borough park.

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: UPPER NAZARETH TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 56

LAST UPDATE: 06/09/98

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
N	Ballfield	3.0	3.0	39	14	YES	NO	NO
N	Liebert School Play Area	3.1	0.5	01	03	YES	NO	NO
N	Mini Park	1.7	1.7	01	03	YES	NO	NO
L	Northampton County Recreation Trail (see East Allen Township)							
N	Upper Nazareth Athletic Association	5.4	5.4	02	13	YES	NO	NO
	TOTAL ACREAGE - PARKS	13.2	10.6					
	Nazareth Area Middle School	42.1	?	08	11	YES	NO	NO
	TOTAL ACREAGE	55.3	10.6					

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WEST EASTON BOROUGH

COUNTY: Northampton

ID NUMBER: 59

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	Acreage	
N	Borough Park	2.0	0.5	01	02	YES		NO	
N	park	0.8	0.0	41	02	YES		NO	
<b>TOTAL ACREAGE</b>		<b>2.8</b>	<b>0.5</b>						<b>0.0</b>

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WILLIAMS TOWNSHIP  
 COUNTY: Northampton  
 ID NUMBER: 60

LAST UPDATED: 06/17/99

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
S	Camptown	39.8	6.0	14	14	NO	NO	
L	Delaware Canal State Park	111.5	40.0	05	05	YES	Easton	45.1
S	Easton Fish and Game Association	20.0	5.0	20	14	NO	NO	
N	Fry's Run Park	5.8	4.0	25	04	YES	NO	
C	Marion Wildlife Sanctuary	198.4	0.0	24	13	YES	NO	
C	Melchor Tract	27.9	0.0	41	03	YES	NO	
S	Muellers Riverside Greens	2.0	0.3	32	13	YES	NO	
N	Raubsville Park	3.0	3.0	02	03	YES	NO	
N	Williams Township Park	26.0	10.0	03	03	YES	NO	
S	Williams Township Sportsman's Assoc.	11.0	2.0	20	14	NO	NO	
N	Wy-Hit-Tuk Park	23.1	23.1	03	04	YES	NO	
	TOTAL ACREAGE - PARKS	468.5	93.4					45.1
	Williams Township Elementary School	17.3	7.0	08	11	YES	NO	
	TOTAL ACREAGE	485.8	100.4					45.1

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WILSON BOROUGH  
 COUNTY: Northampton  
 ID NUMBER: 61

LAST UPDATED: 06/27/97

Class.	Site Name	Acreage		Type of Park	Ownership	Open to Public	Part in another MCD	
		Total	Active Rec.				MCD	Acreage
N	James H. Jeffery Athletic Field	3.0	3.0	39	13	YES	NO	
N	Liberty Playground	0.5	0.5	01	02	YES	NO	
N	Meuser Park	15.0	15.0	02	02	YES	NO	
N	totlot	0.1	0.0	01	02	YES	NO	
N	Wilson Midget Football	2.0	2.0	40	02	YES	NO	0.0
	TOTAL ACREAGE - PARKS	20.6	20.5					
	Avona Elementary School	0.7	0.3	08	11	YES	NO	
	Easton Children's Home	18.1	5.0	08	14	NO	NO	
	Philip F. Lauer Middle School	35.4	12.0	08	11	YES	NO	
	St. Jane Frances De Chantal School	1.0	0.0	08	12	NO	NO	
	Wilson Area High School	9.0	4.5	08	11	YES	NO	
	Wilson Borough Elementary School	5.2	0.0	08	11	YES	NO	
	TOTAL ACREAGE - SCHOOLS	69.4	21.8					0.0
	TOTAL ACREAGE	90.0	42.3					0.0

REGIONAL OUTDOOR RECREATION INVENTORY

MUNICIPALITY: WIND GAP BOROUGH

COUNTY: Northampton

ID NUMBER: 62

LAST UPDATED: 06/10/94

Class.	Site Name	Acreage		Type of Park	Ownership	Open to		Part in another MCD	
		Total	Active Rec.			Public	MCD	Acreage	
S	Puttorama	0.8	0.4	32	13	YES		NO	
N	Wind Gap Park	33.9	18.0	03	02	YES		NO	
<b>TOTAL ACREAGE</b>		<b>34.7</b>	<b>18.4</b>						

The following is a list of code denoters for • **Site Ownership** • **Type of Establishment**  
 • **Recreational Activities** at site for the above inventory.

**Site Ownership**

- 01 - City Borough
- 02 - Township
- 03 - County
- 04 - Pennsylvania Dept. of Environmental Resources (DCNR)
- 05 - Pennsylvania Game Commission
- 06 - Pennsylvania Fish Commission
- 07 - Pennsylvania Historical and Museum Commission
- 08 - Other PA (PennDOT, etc.)
- 09 - Federal Agency
- 10 - Public School District
- 11 - Private Schools and Church Schools
- 12 - Private -for Profit
- 13 - Private Non-Profit / Membership and Community Service
- 14 - Public and Private Historical
- 15 - Utility or Authority
- 16 - Other

**Type of Establishment**

**Multi-Purpose Parks**

- 01 - Sub Neighborhood Park (Mini-Park)
- 02 - Neighborhood Park/Playground
- 03 - Community Park
- 04 - Regional Park
- 05 - State Park
- 06 - National Park or Recreation Area
- 07 - Private Multi-Purpose Park

**Schools**

- 08 - School Recreation Area
- 09 - College or University Area

**Swimming**

- 10 - Outdoor Swimming Pool

**Fishing Areas**

- 10 - Fishing (public access)
- 11 - Fishing (private or club membership)

**Camping**

- 10 - Organized Group Camp
- 11 - Day Camp
- 12 - Church Camp
- 13 - Special Sports/Recreation Camp
- 14 - General Camping

**Hunting**

- 10 - State Game Lands
- 11 - Private Hunting Area
- 12 - Sportsmen Club (rod, gun, trap etc.)

**Winter Sports**

- 10 - Cross-country (X) Skiing
- 11 - Outdoor Skating Rink

**Conservation, Natural/Open Space Area**

- 10 - Nature Center
- 11 - Land Preserve (conservancy owned)
- 12 - County Natural Area
- 13 - State Natural Area
- 14 - National Natural Area

### **Historic Areas**

- 10 - National Register Historic Site
- 11 - Other Historic Area

### **Golf**

- 10 - Regular Course
- 11 - Par 3 Course
- 12 - Golf related (miniature golf, driving range)

### **Equestrian Establishment**

- 10 - Riding Stable

### **Educational-Museum Cultural Areas**

- 10 - Zoo
- 11 - Museum
- 12 - Other

### **Homeowners' Related Recreation**

- 10 - Homeowners' Related Recreation

### **Single Purpose Parks & Miscellaneous**

- 10 - Picnic Grove
- 11 - Ball Field (baseball/softball)
- 12 - Multi-purpose Field (soccer, etc.)
- 13 - Open Space
- 14 - Recreation Trail
- 15 - Miscellaneous

### **Recreational Activities at this Site**

- 01 - Boating (motor)
- 02 - Boating (non-motor)
- 03 - Fishing
- 04 - Swimming (pool)
- 05 - Swimming (fresh water)
- 06 - Camping
- 07 - Hiking
- 08 - Hunting
- 09 - Historical/Cultural
- 10 - Nature Observing (study)
- 11 - Picnicking
- 12 - Sight-Seeing
- 13 - Walking-Jogging
- 14 - Archery/Target Shooting
- 15 - Baseball/Softball
- 16 - Football/Soccer
- 17 - Basketball

## **Critical Assessment of Inventoried Open Space Recreational Areas relative to Stabilization and Maintenance of Surface Water and Groundwater Resources and Natural Area Habitats and their Affiliated Ecological Systems**

Within the Two Rivers Area - River Conservation Planning Area, there is the following overall level of secured lands which in full or part reserve land which can assist stabilizing and enhancing the area's waterways and groundwater and natural habitats.

- 7,137.3 acres of land in public or private ownership and/ or easement

of which

- 890.9 acres of land is used for active recreational purposes open and/or available to the public.

More specifically, only over 5,706.4 acres of the total land acreage can be considered open space land areas which directly support water surface recharge and/or are suitable for habitat protection. As stated before, only a limited number of these open space/recreational locales are laid out in an intermunicipal, physically integrated manner which could lead to broader water resource protection and habitat conservation. (These resource locales are Pennsylvania State Game Lands No. 168, Jacobsburg State Park, Delaware Canal State Park, and Hugh Moore Historical Park). Additionally, there is only a minimum of 525.5 total acres of farmland permanently covered by an agricultural easement under Act 149 within the Two Rivers Area.

In physical fact, at present there is no integration of surface land resources which tie into and relate to the protection and conservation of leading land and water surface features which support the immediate and healthful long-term functioning of the Two Rivers Area waterways and groundwater resources. The following overall recommendations are directed to cause such integration and are intended to reinforce the conservation enhancement to the area's previously identified critical natural habitats, sensitive water-bearing soils, and primary wooded cover. Within this framework of eased and/or purchased lands, a selection of public recreational uses can occur which are sensitive to the resource base. The level at which future open space and park lands and facilities are developed should be addresses by long range planning. This activity should be determined upon a basis of projections for the next 50 year cycle.

Presently there are over 107,394 people within the Two Rivers Area - River Conservation Plan planning area. It is reasonable to assume that within those 50 years the Two Rivers Area's population could increase up to, conservatively, 167,593. This is plausible in view of:

- long established regional population trends
- projected patterns of national economic and population growth
- the attractiveness of the area and its civic infrastructure, and its immediate potential population carrying capacity.

Much of this population expansion will be within middle and upper income groups which are typically oriented to ex-urban and suburban style residential developments. The consumption of the area's land surface by scattered, physically non-integrated subdivisions will be, theoretically, all-encompassing.

This general 50 year trend of continued surface land development places all of the Two Rivers Area municipalities at a point in civic time when clear and focused leadership decisions need to occur concerning open space and recreational land resources. The cost of land purchases and development for open space and/or recreational facilities required to maintain the area's quality of life and attractiveness will only continue to increase in response to price pressure caused by expanding speculative land development.

If the Two Rivers Area Council of Governments accepts the projection of an in-regional population of up to 167,593 within the next 50 years, we advise that the following Management Initiatives outlined in Section #6 regarding open space, recreational and natural resources, and the healthful support of water surface and groundwater systems of the area be considered and undertaken.

## **Section #5— Land Use and Zoning**

### **Recent Environmental History and Land Use**

With historic settlement for the Two Rivers Area, this fire based ecology stopped. The general overall nature of historic settlement was one oriented to the development of agriculture along with initial exploration of iron ore deposits (in Williams Township) in the second half of the 18th century. Between the 1750's and the early 19th century, practically all of the standing timber, from the time of historic settlement, had been cut down for domestic use and fuel, construction and early iron furnace needs, with the exception of the conifer stands along the Bushkill Creek in the Jacobsburg State Park area.

By the 1830's, all primary, secondary and even marginal soils within the Two Rivers Area had been clear cut and placed mostly into farming uses, not including the upper elevation reaches and wetlands of the following, within Williams Township:

- Morgan Hill
- Hexenkopf Rock
- Christines Hill
- the steep slope lands adjacent to the Lehigh River, Delaware River, Bushkill Creek, Kittatinny (Blue) Ridge
- Gaffney Hill
- Bougher Hill
- Elephant Rock
- all constantly wet marshy soil areas. (There is very little evidence of large scale draining in the Two Rivers Area.)

Almost in total, the area's agricultural lands from 1800 through and into the early 20th century were family owned farms devoted to "Crop Rotation" farming. This involved, after 1790, rotations "in which red clover and grass were alternated with corn and small grains." After 1790, the application of gypsum and lime to the tilled soils to raise soil fertility became widespread. The addition of gypsum and lime greatly enhanced the fertility of Pre-Cambrian rock based farm soils of Williams Township and shale based soils throughout the Slate Belt. This fertilization, coupled with the tradition of the application of barnyard manure, aided in securing the region's agricultural leadership in yield and production of corn and grain products, statewide, for over 30 years in the early 19th century.

Throughout southeastern Pennsylvania, crop rotation "was for six years— 1, corn; 2, oats or barley; 3 and 4, wheat; 5 and 6, mixed clover and grass" (mainly red clover, timothy and orchard grass). Typically, a farm was organized into a six-field arrangement. Soils received a coat of manure every sixth year, before wheat, and a dressing of one hundred bushels of lime every sixth year, usually before corn, sometimes before grass. This soil replenishing system was termed the "cropping system". It is important to recall that almost all plowing of soils well into the 1920's and early 1930's in the Two Rivers Area was done by horse drawn plows. The horse drawn plow action was not as deep cutting as today's plows, upturning less of the soil cover for exposure to possible erosion factors.

Another important soil protection/conservation element of these pre-gasoline powered tractor farms was the establishment and retention of narrow, unbroken sod and walled and/or tree lined fence rows, termed "enclosures". All tilled fields were fenced in to protect crops from stray grazing animals. These enclosed fields were once a major cultural landscape feature, some still surviving in a number of locales today. The enclosed fields were often planted with osage orange tree lined fence rows. Such tree lines created:

- wind breaks to discourage the blowing of exposed plowed dry soils.
- narrow protected habitats where native plants and game were sheltered from removal

- tree root secured soils, and solid sod barriers against possible erosion of sediments from plowed fields, thus reducing soil loss, and movement of soil sediments into adjacent streams and runs.
- narrow environs of shaded cover and deeper tree root zones which assisted water retention throughout the area.

Another historic agricultural land surface feature significantly enhanced the inhibition of sediment erosion. Throughout most of the Two Rivers Area, and totally within areas of Pre-Cambrian and Cambrian rock strata, rural roads were often built flanked with low, course dry field stone walls, one to three feet high. The presence of these walls greatly inhibited the movement of heavy rain soaked sediments into the area's surface drainage and waterways. Once a prevalent feature, more than 95% of these roadside walls were removed between the 1920's and the 1960's, crushed by state and local municipality road crews for fill during expansion of the area's road network. This same pattern of road improvement started the macadamization of roads which began the incremental process of significantly increasing the impervious drainage surface in the area.

Overall, although the massive scale of farming spanning the 18th to the early 20th century removed most forested natural cover within the Two Rivers Area, its practices contained significant aspects of organic based farming and numerous well advised soil conservation practices. Throughout the 19th and early 20th century, early fishing guidebooks, travel writers and contemporary historians wrote observations of the area's streams which indicated that they were clear, clean and well populated with fish. The only reported obstructions to streamway water movement was the construction of low dams (before the 1830's) to provide water power to the area's numerous grist mills and distilleries.

Although the Two Rivers Area and Northampton County benefited from the careful husbandry of its primarily Pennsylvania German farmers, there were negative outcomes to their land development activities. These include the following:

- The almost universal clear-cutting of what appears to have been 90% of the tree cover caused accelerated water run-off, especially in steep slope, thin soil and rocky, stony soil cover land areas.
- Groundwater pollution did occur due to fecal matter from both farm animals and humans. There are recorded instances of well pollution which resulted in deadly outbreaks of typhus and/or cholera. One incident due west of Factoryville wiped out most of a rural village in less than ten days, prior to the Civil War. The village was leveled and burned, and all bodies buried in a mass grave heavily overlain with lime.
- Heavy fecal pollution occurred along the Bushkill Creek, within the boundaries of present-day Easton, due to a large complex of pig styes directly penned against the creek. This lineal complex of pig styes was built in conjunction with the area's complex of grist mills and distilleries, with the hogs fed the excess decaying vegetable bio mass (distillery process refuse). This practice existed from the late 18th century into the post Civil War era.

The effects of industrialization began to be seen in the Two Rivers Area by the 1820's, in the Easton area and Williams Township. The presence of the Lehigh Canal quickly fostered the building of larger weaving, metals and wood/farm product processing mills. The iron ore deposits of Williams Township began to be exploited first by open pit, then increasingly by deep shaft mining. There were no known demonstrated (recorded) concerns for effects to water and land resources by pollution.

By the 1850's the area was connected into the nation's railroad network and industrial expansion of manufacturing sites, quarries, and mines greatly accelerated. Along the Lehigh River, large coal-fired iron operations were built in South Easton and Glendon, and foundries along the Bushkill Creek. Limestone quarries greatly expanded to provide flux and building stone, and iron ore operations increased throughout Williams Township. Again, there were no (recorded) environmental concerns or controls, although working class families in then South Easton did complain about air pollution and dust from nearby railroad and manufacturing operations.

As the nation's economy expanded, so did the manufacturing plants and mineral extraction operations in the Two Rivers Area. Large slate quarry operations became prominent features within the Slate Belt after the Civil War. Cement Rock near Nazareth began to be quarried by deep cut operations, beginning in the 1890's. The presence of these quarries by the early 20th century had a significant impact on the water table and water supply to the Bushkill Creek.

### **Agricultural Resources of the Two Rivers Area**

Agriculture is one of Pennsylvania's oldest historic industries and its leading industry state-wide in terms of economic value today. However, the economic and social future of the Pennsylvania farming industry is not encouraging, especially within the Lehigh Valley and Two Rivers Area.

Once a leading economic factor and employer in these counties, agriculture is now in a significant state of decline, and in some once rural townships, on the edge of totally disappearing. The factors which have led to these conditions are varied and complex, for each farm is in actuality an individual industrial unit, based upon the characteristics of its soil, topography, hydrology, which are then married to the skills, dedication and business acumen of its owners. The majority of the owners of the region's farms are farming families, who independently own their individual farms which range from sizes of 20 to several hundred acres. The average acreage is about 100 to 150 acres per farm owner. Many farm owners are descendants of the region's earlier Pennsylvania German agrarian settlers, intermixed with later Central European and Mediterranean region agriculturists of the late 19th and early 20th centuries. The exception to this is the post World War II assemblage, within the Lehigh Valley (Northampton and Lehigh Counties), by several large corporate families, of thousands of acres, occupying the choicest of Class 1-A soils of the Lehigh Valley's floor, into corporate farm holdings.

The farming activity within the Two Rivers Area lies within a region termed by the US Department of Agriculture (1957) as the Southeastern Dairy and General Farming Area. The general activity of farming to the present is described in the following passages:

"The Southeastern Dairy and General Farming areas are in the southern part of the region in Pennsylvania, Ohio, Maryland, and Virginia and in southern Maine and New Hampshire. Farming is somewhat more diversified than in the specialized dairy area. Dairying is combined with other livestock enterprises, such as poultry and the production of feed grains and wheat, fruit, truck, or canning crops.

On the basis of land use and location, there are five dairy and general farming areas in the Northeast. Area DG-1 is the most intensively cropped and the most important agriculturally. It includes the northern Piedmont area of Maryland, Virginia and southeast Pennsylvania and part of the Appalachian Valley section inland from the Piedmont. More than 70 percent of the total land in this region is in farms and more

than half of it is in cropland. The soils are among the most productive in the Northeast United States.

Some highly productive soils of the limestone valleys also are included. The Great Valley, 1 to 20 miles wide, extends from eastern Pennsylvania southeastward into Maryland and Virginia.

The long growing season and mild winters, generally favorable topography, low elevation, and productive soils make this area a highly favored agricultural section.

Besides dairy products and poultry, the area produces cash crops, which make for a well-balanced agriculture. A rotation of corn, oats, wheat, and hay is followed on some dairy farms, but row and cash crops not necessary for dairying are grown on most farms.

About 2.1, 3.6, and 3.0 percent of the harvest cropland is devoted to potatoes, vegetables, and fruit crops, respectively. Many farmers grow potatoes for home use. Potatoes are grown commercially in Lehigh, Lancaster, Northampton, and York Counties in Pennsylvania. Poultry is also a major source of income in this area.

The soils in the area DG-1 are not naturally high in fertility. Because they developed under a relatively mild climate that favored microbial activity, the content of native organic matter is lower than in soils to the north. Also, the more extensive use of cash crops results in a lower return of organic matter to the soils.

Most of the soils (including those developed on limestone) are somewhat acid and need lime for best production. As the soils are well-weathered, their native nutrient-supplying power is not high, and they have a tendency to change applied phosphates to insoluble compounds.

The soils respond well to good care, however. Generally they are friable loams and clay loams and are easy to work. Moisture infiltrates readily, and the proportion of well-drained soils favorable. Because farmers can apply enough lime and fertilizer to make up for natural deficiencies of nutrients, yields usually are not limited by poor soil conditions.

Erosion has not become widespread, because of the generally good physical condition of the soils, the gentle slopes, and the use of contour farming.

In some localities, notably the more sloping uplands in the Piedmont area and of the hillsides in the inland valleys and ridges, however, serious sheet erosion has occurred. Much of this land, which at one time was under cultivation, has been allowed to return to forest.

Soil-management practices generally are good. Most row and cash crops receive moderate applications of fertilizer and barnyard manure. Limestone also is applied periodically to replace the lime lost by leaching and crop removal and to make possible the growth of high-yielding legumes.

The farms are considerably smaller than the average for the Northeast, and they are probably more carefully managed than any in the region. Such care is rewarded with high production and the maintenance of soil productivity.

A comparison of average yields with those obtained by better farmers shows that yields can be increased by improved soil management.

The yield of hay crops also is below the potential. County averages of alfalfa seldom are more than 2 tons an acre. Averages of timothy-red clover are generally 1.5 tons or less. Such yields are about half of those obtained when adequate lime and fertilizer are applied and adapted varieties are used.

The increase in the acreage of alfalfa in this area has contributed toward better soil management. The nitrogen and organic matter supplied by growing alfalfa, and the tendency to keep alfalfa stands longer than those of clover and timothy have meant greater protection against erosion and maintenance of greater fertility.

The general adoption of the lime fertilizer, cropping, and cultural practices already in use by some farmers is needed to realize the productive potential of this area. Somewhat greater attention should be paid to liming and fertilizer for forage crops.

### **Profile of Prime Farmland Areas**

Presently there is a highly qualified designation of Prime Farmland Areas within Northampton County and the Two Rivers Area. The attached map, Prime Farmland, locates the following:

- Prime Farmland Soils recognized by the Pennsylvania Department of Agriculture, which are of state and national significance.
- Farmland of Statewide Importance, which can be regarded generally of soil types of good agricultural productivity.

None of the municipalities within the Two Rivers Area currently recognize the presence of these valuable farmland/soil areas. In recognition of this fact, it is a Primary Land Use Identification Recommendation of Section #6 of this study that the following occur:

### **Primary Land Use Identification Recommendation — Agricultural/Land Resource**

That all municipalities of the Two Rivers Area review and formally adopt a new map layer within their individual municipal/comprehensive plan entitled "Prime Farmlands" designated upon the municipalities' mapping as

- Prime Farmland
- Farmland of Statewide Significance
- That each municipality explore and adopt an Intermunicipal Two Rivers Area Farmland Retention Initiative, which explores and acts upon a coordinated intermunicipal effort to identify valuable farmland areas, and establishes overlay protective zoning to retain such land/resource base areas in an economically healthful integrated manner. In consideration of the complexity of established land use interest and the general drive and pressure for increased residential development in those areas identified for farmland protective overlay zoning, a model ordinance from western Montgomery County, Pennsylvania (Upper Frederick Township), which designates such areas as RP - Rural Preservation Districts, is offered for all Two Rivers Area townships to consider. The delineation, coordination and establishment of these districts shall be facilitated intermunicipally through the proposed Two Rivers Area COG Environmental Advisory Council, as empowered by Title 53 of the state's Municipality Government Code(s) and within the framework of a Two Rivers Area - Environmental Improvement Compact.

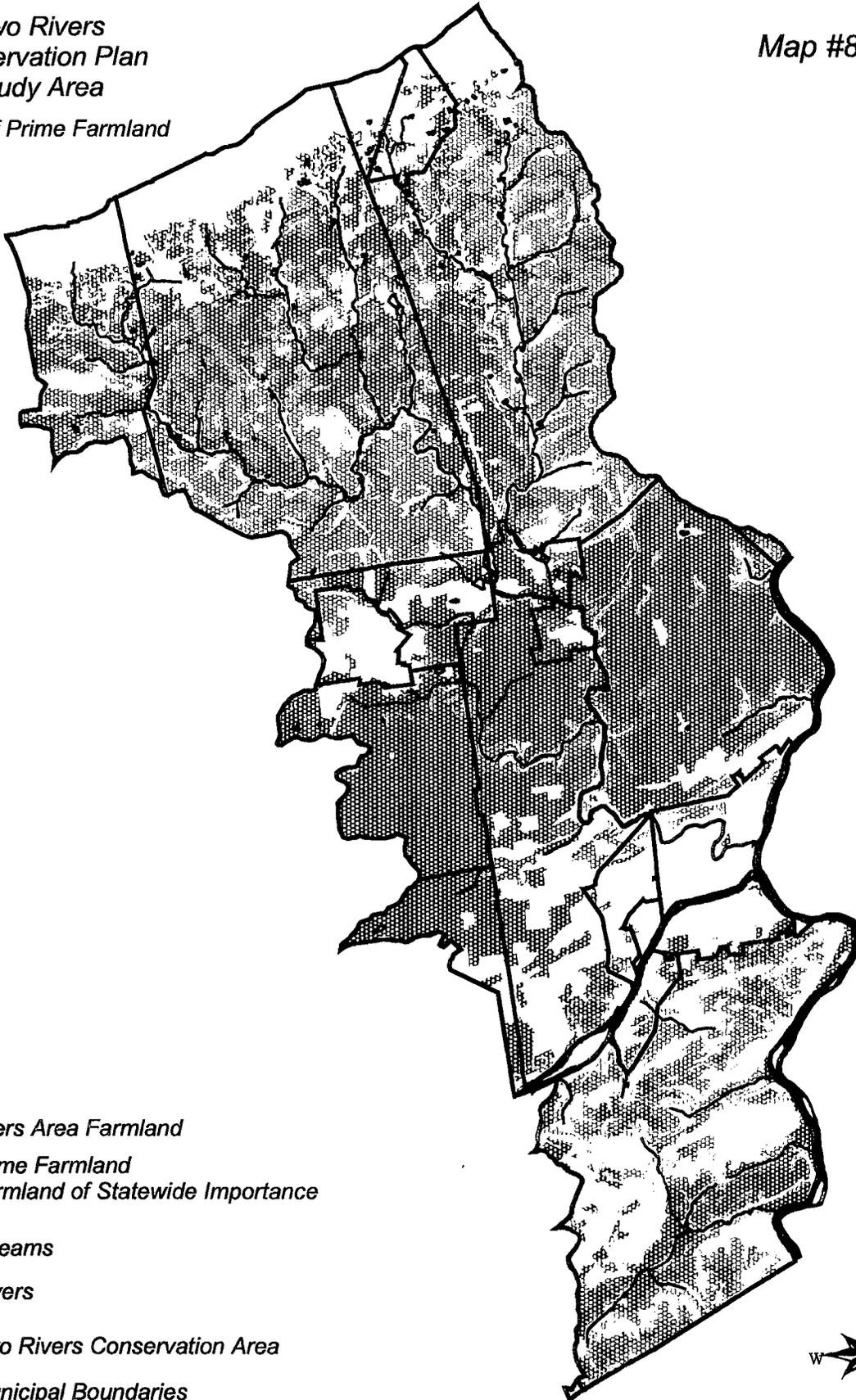
*Note:* Refer to attached Appendices for a full copy of:

- Model Ordinance Rural Preservation district, based upon an ordinance adopted by Upper Frederick Township, Montgomery County, Pennsylvania.
- Title 53 of the State's Municipality Government Code(s).

*Two Rivers  
Conservation Plan  
Study Area*

*Map #8*

*Areas of Prime Farmland*



*Two Rivers Area Farmland*

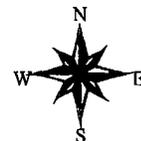
-  *Prime Farmland*
-  *Farmland of Statewide Importance*

 *Streams*

 *Rivers*

 *Two Rivers Conservation Area*

 *Municipal Boundaries*



## **Proposed Areas of Focus for the Consideration of Rural Preservation Districts within the Two Rivers Area**

### **Area**

The following general land areas shall be taken into consideration in the land sections of the following municipalities within the Two Rivers Area, for Rural Preservation District Overlay Zoning.

- |                                |  |
|--------------------------------|--|
| <u>City of Easton</u>          | <ul style="list-style-type: none"><li>• No land areas are available and /or meet resource conditions. Urbanized.</li></ul>   |
| <u>Borough of Wilson</u>       | <ul style="list-style-type: none"><li>• No land areas are available and /or meet resource conditions. Urbanized.</li></ul>   |
| <u>Borough of West Easton</u>  | <ul style="list-style-type: none"><li>• No land areas are available and /or meet resource conditions. Urbanized.</li></ul>   |
| <u>Borough of Stockertown</u>  | <ul style="list-style-type: none"><li>• Rural land areas is extant in southeast portion of borough along Bushkill Creek at border with the Borough of Tatamy</li></ul>                               |
| <u>Borough of Tatamy</u>       | <ul style="list-style-type: none"><li>• Rural land area is extant in northeast portion of borough on flood plain of Bushkill Creek at border with Borough of Stockertown.</li></ul>                  |
| <u>Borough of Nazareth</u>     | <ul style="list-style-type: none"><li>• Rural land area is extant in northwest section of borough in area of historic Moravian Cemetery and Public Poor Cemetery</li></ul>                           |
| <u>Borough of Wind Gap</u>     | <ul style="list-style-type: none"><li>• Rural land area is extant in southeast section of borough in locale of abandoned slate quarries.</li></ul>   |
| <u>Borough of Pen Argyl</u>    | <ul style="list-style-type: none"><li>• No direct land areas is available and/or meets required conditions (land along base of Blue Mountain is already protected by Conservation Zoning.)</li></ul> |
| <u>Williams Township</u>       | <ul style="list-style-type: none"><li>• Consider all current rural by physical character land areas.</li></ul>   |
| <u>Palmer Township</u>         | <ul style="list-style-type: none"><li>• Consider all current Rural by physical character land areas.</li></ul>   |
| <u>Forks Township</u>          | <ul style="list-style-type: none"><li>• Consider all current Rural by physical character land areas.</li></ul>   |
| <u>Lower Nazareth Township</u> | <ul style="list-style-type: none"><li>• Consider all current Rural by physical character land areas.</li></ul>   |
| <u>Upper Nazareth Township</u> | <ul style="list-style-type: none"><li>• Consider all current Rural by physical character land areas.</li></ul>   |
| <u>Bushkill Township</u>       | <ul style="list-style-type: none"><li>• Consider all current Rural by physical character land areas.</li></ul>   |
| <u>Moore Township</u>          | <ul style="list-style-type: none"><li>• Consider all current Rural by physical character land areas.</li></ul>   |
| <u>Plainfield Township</u>     | <ul style="list-style-type: none"><li>• Consider all current Rural by physical character land areas.</li></ul>   |

Each municipality should critically consider their current rural land areas within the Two Rivers Area. The cooperating local municipalities should view their Two Rivers Area Council of Governments as they entity through which they shall undertake a long term intermunicipally coordinated Rural Preservation District initiative. All such activity will be subject to other zoning factors and requirements, however, the overall intent is one in which a sincere concerted effort will be made to seek coordinated conservation of open space, natural resources and agricultural assets in the area.

## **The Role of Agriculture as a Source of Chemical and Sedimentation Pollution to Water Resources**

The United States Department of Agriculture has estimated that the region in which the Two Rivers Area is situated has lost over one-half (1/2) of the original fertile soil cover layers that existed here in the 1750's. The primary agent for this soil loss historically has been two land use activities:

- Deforestation through timber cutting activities.
- Soil erosion from plow-cut agricultural fields.

The trend of reforestation in the last 40 years has aided soil retention in the Two Rivers Area. However, future poorly managed timber cutting will cause soil loss to occur quickly in exposed areas, especially steep slopes. The aforementioned Forest Management Plan recommended in Section #6 should be conducted and implemented to prevent future cycles of sedimentation of waterways. However, the trends in agriculture need to be addressed by a much more dynamic approach. Although the soil husbandry practices in the area are greatly improved by the application of 20th century soil conservation practices, the economic pressure to farm every tillable acre and increasing use of chemical farming practices needs a new approach which actually falls into the realm of economic restructuring. It is the position of this study that improvement of the area's soils from erosion and from chemical pollution be achieved through a conscious civic effort to encourage Organic Farming practices within the area's agriculture. An economic restructuring effort similar in scope to the region's response to the closing of Bethlehem Steel needs to occur for the area's agricultural economy. The solution towards this is outlined in the following.

## **Agricultural Conservation and Development in the Two Rivers Area**

### Setting and Historic Context

For almost 260 years primarily Anglo-European origin settlers and their descendants have been engaging in intensive forms of agriculture within Two Rivers Area. The physical resource setting that these peoples came upon is sited in one of the more diverse physiographic settings within Pennsylvania's Piedmont Plateau for agricultural development.

However organized, all of these agrarian industrial holdings are facing the same set of problems which are leading to the closing of family farms and/or sale of farmland throughout the region.

These are the following primary factors:

- general land development pressure caused by expanding commercial and residential suburban type land development
- Rising operation costs due to: market reorganization, international competition, insurance, equipment and material inflation, and labor costs, along with availability to quality labor
- Declining profit margins or share of profit by farmer
- Declining assemblage of land acreage adequate to support higher volumes of production to achieve profitable crop volumes.
- Rising costs attendant to expanding state and federal regulations affecting farm operations

Other factors are affecting the viability of the region's farms, but the above are prevalent for this region. As one reflects on this list, the primary reason for the decline of the industrial

unit of the region's farms is economic, and all of the above are the most direct threats to the historic agricultural community of the Two Rivers Area.

Many of the farmer's neighbors who are concerned about the loss of farmland too often fail to realize that the primary threat to the farm is economic, and that to ensure their survival, farms must be made as profitable as possible. No aesthetic concerns and/or reasoning will ultimately save the farms as scenic elements of a historic cultural landscape unless the community, along with their neighbors, the farmers, are fully aware and understand together the economics of today's farming.

The early farmers of the Two Rivers Area were primarily Germanic and were experienced with both basic soil types of the valley floor and the adjacent hills. The Delaware River and early roads gave the community ready access to markets for their produce early on. Throughout the 19th century the area's good market location was only enhanced by transportation improvements such as the Delaware Canal and nearby railroads at Easton.

From its inception, the basic economic organization of the area's farming community was one composed of a sequence of family-owned farms, oriented to convenient road access.

### **Economic Development for Agriculture — Getting Back on the Local Agenda**

Prior to World War II, the Two Rivers Area had fully functioning, highly integrated agricultural communities within their respective local and regional economies. The Grange halls functioned, farmers sat on the boards of local banks. Some farmers were the largest employers in a township; farmers were often the township supervisors. There was a highly integrated presence of the farmer, and their concerns, in major portions of any community's development process. Farmers were local decision-makers; they had a significant voting presence in local elections.

However, the farmers were, for the most part, independent operators of their respective businesses. Their business was the agri-industrial plant, the farm. This independence, embodying the success of Franklin's "American System" and Jefferson's concerns for a national democracy based upon an agrarian American culture, was not adaptive to the rapidly changing conditions of the region's economic agenda after World War II.

If agriculture is to have a future in the Two Rivers Area, an essential first step must occur; organizing for the future. At present, the rural population and agricultural community of the Two Rivers Area is not organized, in a civic sense, for its future. The changes in store for the Two Rivers Area appear, on the surface, to be physically headed towards land areas in which suburban style housing developments will become more prevalent. Agriculture, once the most prominent form of economic activity and social organization, is in a state of decline. But it still is a major factor in land organization. The recent historic facts are that, generally, when a subdivision of an individual lot or multi-lot is proposed, it ultimately gets planning approval. However, recent physical events, such as problems with flag lot access, water run-off, septic and sewage, public roads, and public security, point to a future that is relatively predictable in terms of increasing municipal taxes and divisive community issues.

One of these remaining, and prominent, issues is what to do with the Two Rivers Area agriculture, the agriculture of multi-crop, pasturage and forest. Agriculture provides many passive benefits, including the following:

- Perhaps the highest return on the land taxes paid, with the lowest requirements and requests made for public services, as a land use category.
- Consistent, high quality land use maintenance in terms of surface trash and litter, building and property maintenance, water drainage, and soil conservation.

- Conservation of watersheds, water source, attention to specific locales of natural game habitats in fence row and farm wood lot and forest locales.
- Provides immediate, local and relatively cheap produce and meat supply
- Provides open space, hunting, fishing and recreational activities by permission, scenic areas and historic environs which serve as a passive, but important public quality of life benefit to all residents in the township.

The incremental loss of these benefits needs to be carefully weighed against the perceived gains of expanding, and at present, under planned and guided, residential lot development.

Although no pivotal, single event, invention, or person can be pointed to as responsible for marginalizing, if not eliminating, the region's agriculture from the economic agenda, this has happened. Our region's Chambers of Commerce, and Industrial Development Boards of the 1950's, 60's, 70's and 80's tended to abandon or forget the role and requirements of agriculture in the region's economy for renewal and continuance. Any brief study of the Chambers of Commerce and Industrial Boards will reveal a total lack or presence of agriculturally based persons and committees. The concern for the region's agriculture has been lost in the capitalized and staffed agencies that direct industrial land acquisition, loans, studies, grants and incentive programs. Farming, in the popular mind, is often viewed as something quite separate from "industry", or the "industry" of the factory or warehouse. This notion is unfortunate in that years of potentially productive time of addressing farming's industrial needs within the context of the region's economic agenda have been lost. The bottom result of this process is that farmland is viewed as expendable and available to most industrial boards for industrial suburban style parks and/or housing development. The farms and their by-products, which are locally land-resource based, are not looked upon as industrial, economic assets that could cause product multipliers and create more jobs. The question almost never gets raised, because the farming community is no longer in the meeting room, either by its own efforts or by invitation.

It is essential that any addressment for the continued conservation and renewal of the Two Rivers Area's agricultural community begins on a basic point of economic organization. The following recommendation is "the" starting point for getting agriculture back on the local agenda within the community's development process.

### General Soil & Water Conservation Classification for the Two Rivers Area

Based upon the determination of the physical properties of the above soils within the Two Rivers Area by the Soil Survey of Northampton County (issued 1974), the following general land and development classification and restrictions in order to aid the area's water quality, are advised to be applied as a major part of the Two Rivers Area - Watershed Conservation Plan, as intermunicipal cooperative overlay zoning.

Soil Series Group	Land and Development Classification
<b>A) Hydric Soils</b>	
<b>Slow &amp; Poorly Drained:</b> Ad, AnA, AnB, BuB, BtA, ChA, ChB, CmA, CmB, Ho, ClA, Mu, BB, Bm, Mb, PhB, Rh, UtB	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> <li>• No commercial timber cutting</li> <li>• Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<b>Variable Drainage/Urban Land/Flood Prone:</b> Us (and all 15% and over slope gradient land)	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> </ul>

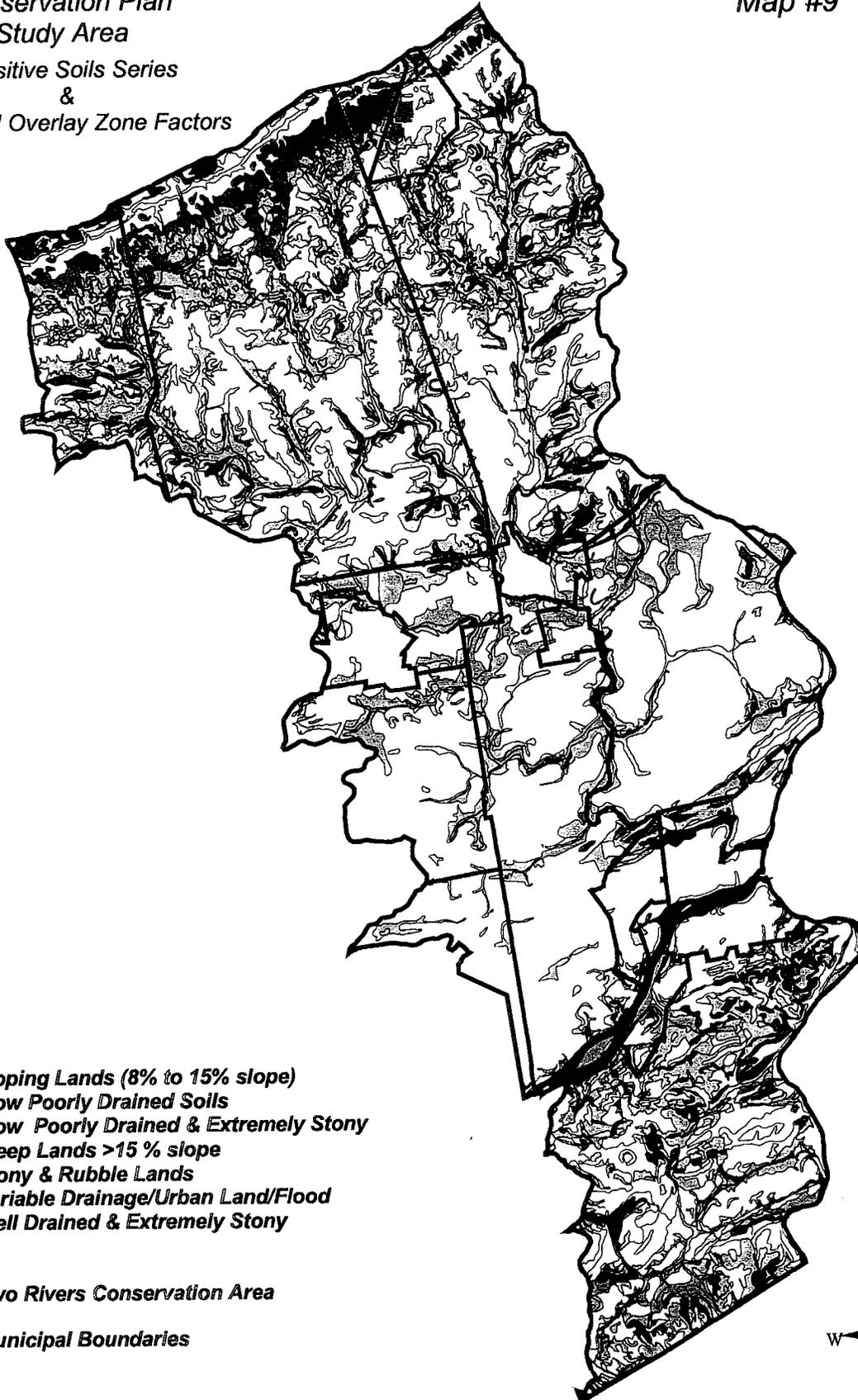
	<ul style="list-style-type: none"> <li>No commercial timber cutting</li> <li>Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<b>Slow, Poorly Drained &amp; Extremely Stony:</b> AoB, BuB, CkB, CnB, BeB	<ul style="list-style-type: none"> <li>No land development</li> <li>No cultivation</li> <li>No commercial timber cutting</li> <li>Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<b>Well Drained &amp; Extremely Stony:</b> Bg, LaB, LaD	<ul style="list-style-type: none"> <li>No land development</li> <li>No cultivation</li> <li>No commercial timber cutting</li> <li>Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>

<b>B) Deep Well Drained Soils</b>	
<p><b><u>Stony &amp; Rubble Lands (All extremely stony)</u></b></p> <p><u>Sloping Steeply:</u> St, Ru, CrD, CrF, LaF, WhF <u>Sloping Gently:</u> CrB</p>	<ul style="list-style-type: none"> <li>No land development</li> <li>No cultivation</li> <li>No commercial timber cutting</li> <li>Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<p><b><u>Steep Lands (&gt;15% slope gradient, not extremely stony)</u></b> : BsF, BrD, WkD, WaD, CoD, HnD, CtD, CfF</p>	<ul style="list-style-type: none"> <li>No land development</li> <li>No cultivation</li> <li>No commercial timber cutting</li> <li>Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<p><b><u>Sloping Lands (8 to 15% slope gradient, not extremely stony):</u></b> BrC, BoC, WkC, RyC, WaC, CoC, HnC, CtC</p>	<ul style="list-style-type: none"> <li>Highly restricted light land development</li> <li>Cultivation: carefully planned Contour Farming, Hayfield, Orchard use only</li> <li>controlled certified sustainable Forest Cutting only.</li> <li>Encourage expansion of native vegetation and tree cover, conserve established wildlife habitats;</li> <li>seek and foster physical connections of established and/or expanding (vacating farmland) natural native vegetation and tree cover to identified and/or evolving greenway corridors.</li> </ul>

*Two Rivers Watershed  
Conservation Plan  
Study Area*

*Map #9*

*Sensitive Soils Series  
&  
Proposed Overlay Zone Factors*



## **Current Evolving Land Use and Zoning: The Pending Impact of Route 33**

All of the land use and zoning within the Two Rivers Area reflects the legal influence of the pre 2000 land use and zoning laws of Pennsylvania, each municipality is zoned for every possible use under the law. This factor, combined with the imprint of historic human development of over 250 years, has created a spreading patchwork of land uses radiating out from main surface transportation features (roads and railroads.) The following map portrays the current publicly filed land use and zoning for the Two Rivers Area. However, as of this date, due to growth, a number of the townships in the area are either completing revisions to their municipal plans or undertaking revisions. The land use and zoning map for this area will change. The main cause for this change will be the completion of the final linkage between State Route 33 to Interstate 78. This major highway linkage is projected to have the greatest impact to land use change in the area, since the construction of Route 22 in the 1950's.

A study prepared by John Rahenkamp Consultants, Inc. Completed in late 1994, entitled "Northampton County Economic Development Policy Framework" focused on the impact and implications to the area of Rt. 33's completion. In that report it was projected that "the county would immediately absorb over 23 million square feet of new construction on presently serviced industrial land and over 65 million square feet can be ultimately developed over time on lands which are already properly zoned." This is compared with a total in 1994 of just 6,538,580 square feet of already built non-residential development in the county.

In the abstract the Rahenkamp study projects that the completion of Route 33 will lead to the significant expansion of industrial facility expansion in four areas within the Two Rivers Area. These are:

- Route 33 Corridor South
- Route 33 Corridor North
- Forks Township
- Route 33 Corridor Far North (Wind Gap Area)
- fostering major development between Routes I-78 and 22.
- fostering major development opportunity which will require extending sewer into Upper and Lower Nazareth Townships from Palmer Township (being effected).
- expand and support existing and ongoing light industrial office development. This will require an improved connection with new interchange access and upgrade existing roads.
- fostering large tract development opportunity, which will require extension of sewer service from Wind Gap Borough.

Since 1994, into the present year (2001) of this study, substantial initiatives have occurred which have borne out these opinions. At present, large scale industrial park development has been undertaken by Lehigh Valley Industrial Park (LVIP) and other entities, which essentially follows the Rahenkamp report's findings. Large industrial park settings have been zoned, created and are now in construction on recent open farmlands. The Two Rivers Area is beginning an almost total land use transformation, led by the:

- conversion of open farmlands at these four locales into large-scale industrial park use.

*Two Rivers Watershed  
Conservation Plan  
Study Area*

*Map #10*

*Land Use & Zoning*



*Land Use & Zoning*

-  *Environmental Protection*
-  *Rural*
-  *Heavy Industrial*
-  *Light Industrial*
-  *Mixed Uses*
-  *Office/Business*
-  *Retail Commercial*
-  *Institutional*
-  *Suburban Residential*
-  *Urban Residential*

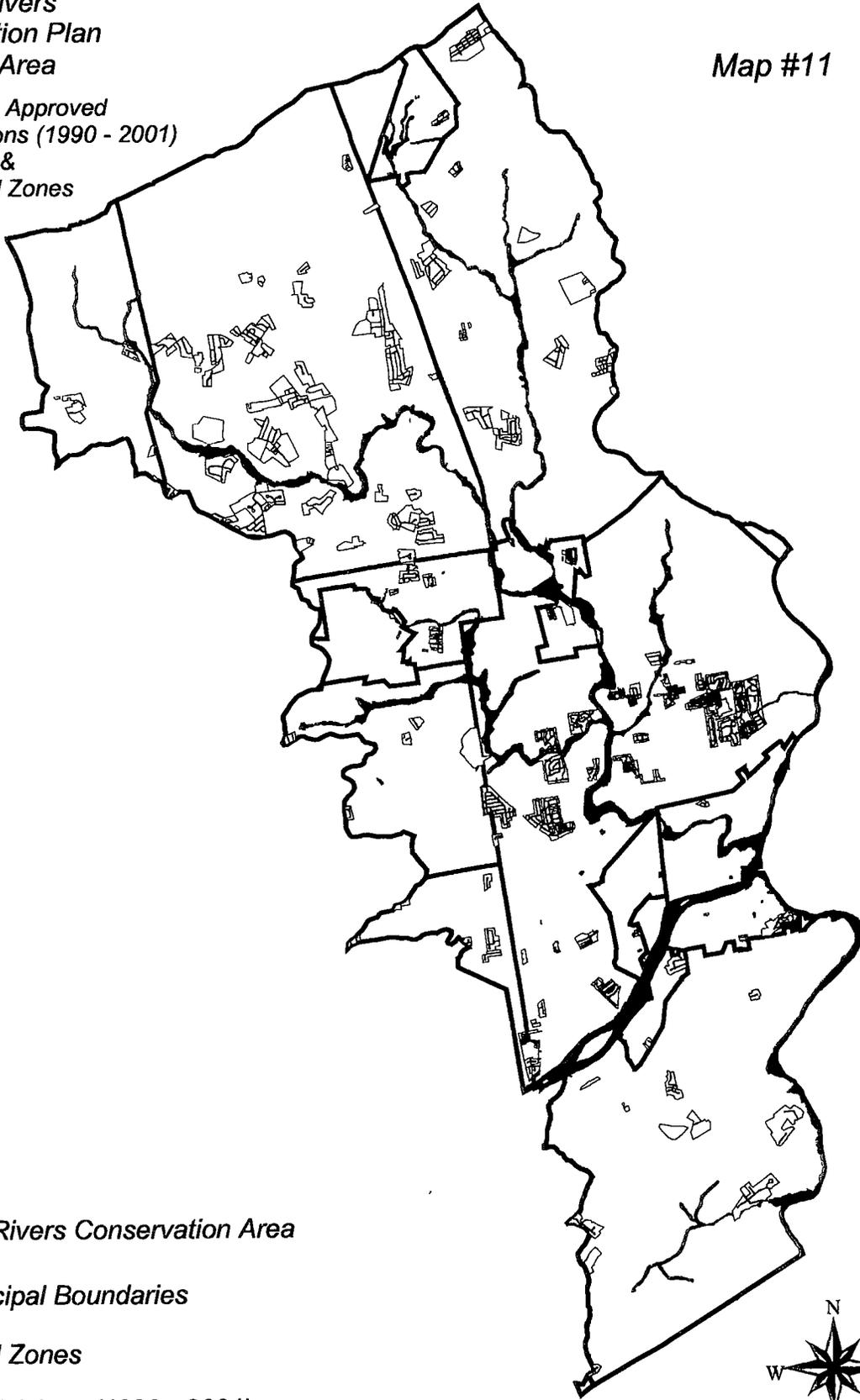
-  *Two Rivers Conservation Area*
-  *Municipal Boundaries*



**Two Rivers  
Conservation Plan  
Study Area**

**Map #11**

**Recently Approved  
Major Subdivisions (1990 - 2001)  
&  
Flood Zones**



-  **Two Rivers Conservation Area**
-  **Municipal Boundaries**
-  **Flood Zones**
-  **Subdivisions (1990 - 2001)**



Which when completed will -

- stimulate financially ( through job creation) the expansion of retail/service locales and significant single tract and/or scattered townhouse and apartment complexes - physically unintegrated suburban development
- Wherever public water and sewer exists or can be extended in the Two Rivers Area, the pressure for the conversion of open space, farmlands and or natural areas will be overwhelming, given the regional and national upward economic and population trends.

At present, all municipal plans and zoning within the Two Rivers Area is highly limited in the manner in which they factor in the:

- formal identification of natural resource base and its quantifiable functioning ecosystem support base.
- formal identification of the quantifiable capacities and constraints of the natural resource base in terms of its continued healthful functioning.

At present the current zoning within the Two Rivers Area identifies and conserves the following land use areas which serve to enhance, conserve and protect the area's watershed's healthful functioning.

**Narrow floodway/flood plain land areas along the following rivers and streams:**

<b><u>Feature River</u></b>	<b><u>Municipality</u></b>
Delaware River	Williams Twp.
Lehigh River	Palmer Twp .
Streams	
Bushkill Stream	Forks Twp.
	Palmer Twp.
<b><u>Geologic Feature</u></b>	
Bougher Hill Area	Williams Twp.

The above brief list reveals the high deficiency of the area's zoning in its lack of recognition of conserving the area's natural resource base. Although there is a high concern in the general public and among public officials towards water, open space, recreation and natural resources, that concern to date has not resulted in the adoption of significant zoning and/or overlay zoning to protect these resources. With time running out rapidly the Two Rivers Area's municipalities must seek to cooperate now to identify and conserve those resources. Given current and projected development and population trends, within the next five years the last opportunities to zone and protect these features in the area's Limestone Belt will pass, shortly followed within fifteen years by large sections of the area's Slate Belt and the gneiss based hills of Williams Township, being developed for increasingly suburban style development.

In a larger part the "Concerns" and "Values" developed during the public participation process for the Two Rivers Area Watershed Conservation Plan" outline clearly the issues this projected pattern of development will have on the area's resources.

# **RIVER CONSERVATION PLAN for the TWO RIVERS AREA**

## **'CONCERNS' Expressed in Community Workshop and Discussions:**

- 1. Industrial control of stream flow (Bushkill Creek and the quarry operations).**
- 2. Protection of supply for all users.**
- 3. Potential and existing impact of soil erosion, sedimentation and excess nutrient loading from new development, suburban developments and agricultural runoff.**
- 4. Inhabitation and occupation of flood prone areas.**
- 5. Recent land development in the northern portion of the Bushkill catchment basin area. Concern over appropriateness in terms of quality and potential impact.**
- 6. Surface runoff impacts from Rt. 33 and I-78 corridor developments.**
- 7. Increases of impervious surface cover and its impacts; in particular the increase of runoff during storm events.**
- 8. The "poor quality, substandard and insensitive" engineering of storm waters and runoff into the streams; resulting in destructive effects on the stream channel and health of the stream(s).**
- 9. The high cost of re-engineering and restoration of a damaged or degraded stream and associated wetlands. (There still is an apparent disregard for wetlands.)**
- 10. Limited or lack of convenient public access to stream(s) for recreation.**
- 11. Lack of protective ordinance and zoning of areas and edges of channels. Existing municipal ordinances are inconsistent along the streams' courses through the different municipalities**
- 12. Proper maintenance of the stream temperature and abatement of thermal pollution for health of the aquatic environment and the natural life of the stream(s).**
- 13. Conservation of historic sites and structures associated with the stream, its use and environs.**
- 14. Conservation and protection of the scenic - aesthetic environments.**
- 15. The Schoeneck Creek is naturally a dry swale except during severe storm events. As a stream its flow is now dependent upon the effluent outfall of the Nazareth Sewage treatment Plant. This stream degrades the water quality of the Bushkill Creek, Careful management is a concern.**
- 16. Stream quality needs to be sustained at a high level of quality in order to maintain attractive development opportunities, especially for residential environments.**

# RIVER CONSERVATION PLAN for the TWO RIVERS AREA

## **"VALUES" Expressed in Community Workshop and Discussions:**

1. in the study area, The Bushkill Creek, Frys Run and other streams are high quality streams and catchment basin environments. These streams are worthy of restoration of any degraded features and aspects, they should have continued management of their quality.
2. Responsible use of the stream for supply is a "value" to the communities and individuals in the area.
3. The quality of the waters for withdrawal for industrial users and other users.
4. The quality of the Bushkill Creek's waters, stream environment, and other stream environments for nature based recreation; (fishing, swimming, hiking, kayaking, etc..).
5. The quality of the Bushkill Creek's and other area streams' fish aquatic environments. ( low sediment load, natural food environment, cool temperature, trout fish)

(Concern was discussed for proper physical maintenance of the streams; the need for the prevention of erosion, for stream side plantings, for design sensitivity, design standards, and for the stringent and careful control of rate of release of industrial process waters into the Bushkill Creek.)

6. The aesthetic "value" of the streams.
7. The cultural--historic "value" of the streams.
8. The high value in the "quality of life" to be found in the residential areas and in the associated environments and features of the Two Rivers Area.

### **Karst Geology and Zoning in the Two Rivers Area**

As previously stated in Section #2 - Geologic Framework, Soils and Critical Areas, the sinkhole or karst activity in the limestone based lands of the Two Rivers Area is a prevalent feature and active geologic hazard. At present no municipality within the Two Rivers Area formally identifies and takes into consideration the fact of this karst (sinkhole) geology in their municipal plans and/or official zoning. Recently the activity of these sinkholes has become prominent to the general public due to highly visible failures, the collapse of sinkholes in the Boroughs of Stockertown, Tatamy and Nazareth. As development expands this silent danger, the collapse of a sinkhole, will only increase. All affected municipalities in the Two Rivers Area should seriously evaluate this study's, and other regional and state scientific studies', finding on the character of this area's karst geology in a formal, public manner. Along with the recommendations towards Karst Geologic Hazards in Section # 6 following, each municipality in the area, either individually or, more ideally, under a Council of Governments led initiative, would consider the creation and adoption of an ordinance for

- Environmentally Sensitive Geological Zone

which addresses the interface with land development and karst (sinkhole) geologic hazards. The following model ordinance for these features is offered to all public bodies for consideration.

**PROPOSED MODEL**  
**ENVIRONMENTALLY SENSITIVE GEOLOGICAL ZONE**

**ESTABLISHMENT OF ESG ZONE.** [City, Township \_\_\_\_\_] land has been divided into the different zoning districts specified in this Ordinance all as set forth in the official \_\_\_\_\_ Zoning Map. However, the \_\_\_\_\_ recognizes the various zoning districts established may encompass all or part of a certain environmentally sensitive area of the \_\_\_\_\_ which because of its unique topographical, geological and hydrological characteristics requires special attention and regulation. Accordingly, \_\_\_\_\_ hereby creates an environmentally sensitive ESG zone with special zoning regulations, (as hereinafter set forth) applicable to all land and structures lying within said ESG zone. The ESG zone constitutes an overlay to the base zoning districts established by the zoning map and encompasses all or portions of more than one base zoning district. The ESG zone hereby established is for the following purpose:

To protect a uniquely sensitive and valuable groundwater resource area, consisting of carbonate geologic formation in \_\_\_\_\_ against land development patterns that would deplete the groundwater supply through excess demand, threaten its quality through wastewater pollution or contact with hazardous or toxic substances, inhibit the recharge capability of the are through excessive impervious surface areas, and increase the dangers of land subsidence and sinkholes.

**USE REGULATIONS.** Notwithstanding the fact that the base zoning district use regulations applicable to a particular lot or structure within an ESG zone may permit the use or occupancy of a particular lot or structure as a "permitted" use or as a "special exception" use or a "conditional" use or as an "Accessory" use, all uses and occupancies within an ESG zone shall be "conditional uses" which may be permitted only following a review by the Planning Commission in accordance with the provisions of this Ordinance and the specific requirements set forth in the Article below and Approval by the Board of Supervisors.

**SPECIFIC ESG ZONE REGULATIONS.** The following specific requirements shall apply to all uses and occupancies in the ESG zone and these requirements shall be in addition to all requirements imposed by any other section of this Ordinance.

1. No stormwater management basin shall be placed in or over the following features:  
Sinkholes, closed depressions, lineaments, fracture traces, caverns, ghost lakes and disappearing streams.
2. Stormwater basins shall be located no closer than 100 feet from the rim of sinkholes, closed depressions and disappearing streams and no closer than 50 feet from lineaments, fracture traces or surface or subsurface pinnacles.
3. Outflow from a stormwater management basin and stormwater flow generated as a result of development shall not empty into or be directed to any of the following carbonate features:  
Sinkholes, closed depressions, lineaments, fracture traces, caverns, ghost lakes and disappearing streams.
4. No principal or accessory building shall be located any closer than 100 feet from the rim of sinkholes or closed depressions or 100 feet from ghost lakes, lineaments, fracture traces or disappearing streams.
5. All underground utility lines pipelines, stormwater sewer lines and utilities to any structure shall have a dike of clay or other suitable material constructed across the width of the trench at intervals not to exceed 20 feet.

6. Impoundments containing toxic substances are not permitted.
7. Storage and handling areas for toxic and harmful materials must have impermeable surfaces designed to contain material and direct it to a predetermined collection point.
8. Storage and handling facilities of toxic and harmful materials should not be sited in areas of public or private water supplies.
9. No underground storage of any toxic materials.
10. All companies handling toxic or harmful materials shall inventory and register these materials with the \_\_\_\_\_ and develop a spill contingency plan acceptable to the \_\_\_\_\_ which includes regular inspection and maintenance programs.
11. Groundwater monitoring devices are required for all facilities handling toxic or harmful materials.
12. Impervious liners are to be installed at all road de-icing salt facilities.

**ENVIRONMENTAL ASSESSMENT.** No structure, lot, land or water shall be used or developed for any purpose (except for exemptions provided in \_\_\_\_\_ (USE REGULATIONS), and no structure shall be located, extended, converted or structurally altered until the applicant has filed an Environmental Assessment Report with the \_\_\_\_\_ in accordance with the provision of this subsection. The Report shall provide information to the \_\_\_\_\_ demonstrating that the applicant can comply with all standards in Section \_\_\_\_\_ (Specific ESG Zone Regulations), or that one or more of such standards would not be applicable, given the conditions of the applicant's property or existing uses thereon, or that applicant's proposed use or action poses no threat to the public's health and safety or to groundwater quality.

A. The format and contents of the Environmental Assessment Report shall be as follows:

1. Statement of Purpose. This section shall indicate those standards in \_\_\_\_\_ being addressed in the Report and whether the applicant is attempting to demonstrate compliance or justify non-compliance with those standards.
2. Description of Existing Conditions. This section shall present a description of existing characteristics of the property with respect to geology, topography, ground and surface water hydrology, soils, vegetation, and existing improvements and uses.
3. A map, at a scale no smaller than 1" = 100' indicating the location of the property and all proposed improvements thereon and their geographic relationship to the \_\_\_\_\_'s ESG zone.

4. For areas proposed for grading, construction of buildings and other improvements, the applicant shall submit information for such areas, indicating the presence of any of the following carbonate features:
  - i) depressions
  - ii) fissures, lineaments, faults or fracture traces
  - iii) "ghost lakes"
  - iv) outcrops of bedrock
  - v) seasonal high water tables
  - vi) sinkholes
  - vii) soil mottling, as defined by a soil scientist
  - viii) springs
  - ix) surface drainage entering the ground
  - x) caverns
  - xi) disappearing lakes
  - xii) disappearing streams

Such information may be based upon field surveys and/or published data, but in either case shall be supported by an explanation of its source including the qualifications of the individuals directly responsible for preparing such information.

5. The applicant shall furnish a map indicating existing and proposed drainage conditions, the locations of all proposed private and public sewage disposal systems, and the locations of existing private and public water supplies on adjoining properties.
6. Description of the Proposed Action. This section shall describe the proposed action including: types, locations and phasing of proposed site disturbances and construction, as well as proposed future ownership and maintenance of the property and the proposed improvements. Plans describing the proposed action may either be included within or accompany the Environmental Assessment Report.
7. Proposed Measures to Control Potential Adverse Environmental Impacts. This section shall describe all measures proposed by the applicant to control any adverse impacts which may occur as a result of the proposed action.
8. List and Qualifications of Preparers. The names, addresses, telephone numbers and professional qualification of persons directly responsible for preparing the Environmental Assessment, shall be provided.
9. Appendices. Any additional information which the applicant wishes to provide may be included in one or more appendices to the report.
10. The \_\_\_\_\_ may require that additional information be submitted if the Engineer or Consultant concludes that such information would be instrumental in assessing the proposed environmental impact subject to Sections \_\_\_\_\_
- B. The Environmental Assessment Report must be received by the \_\_\_\_\_ at the time which conditional use approval is sought. Eight copies of the Report shall be submitted to the \_\_\_\_\_. The Report shall be reviewed by the Engineer and other consultants as designated by the \_\_\_\_\_ in addition to the \_\_\_\_\_ Planning Commission and Board of Supervisors.

**APPROVALS REQUIRED.** Following the review of the \_\_\_\_\_ Engineer or Consultants on any submission under Section [ \_\_\_\_\_ ] the \_\_\_\_\_ shall either approve the application, approve with conditions, or reject it, and shall do so within any applicable time period unless a request to extend the time period is mutually agreed upon in writing.

- a) Where compliance with this section is required as part of an application for subdivision or land development approval, the \_\_\_\_\_'s decision on whether the compliance has been achieved shall be made as part of its review of the subdivision or land development application.
- b) Where the application is part of a request for a zoning permit, the zoning officer shall issue no such permit until the terms of this section, and any conditions imposed upon the use of the property at the time of subdivision or land development approval are satisfied.
- c) In carbonate areas, alternation and development of land may be hazardous with respect to foundation safety of structures, the creation of unstable land as a result of changes in drainage, and the contamination of ground and surface waters. Within the limitations of the information available at the time of review of individual applications, the \_\_\_\_\_ shall attempt to make reasonable judgments as to the applicant's compliance with the ESG zone. Under no circumstances shall \_\_\_\_\_ or any officer or employee of the \_\_\_\_\_ assume any liability for any damages that may result from an applicant's or interested party's reliance upon the regulations of the ESG zone or any decision made by the \_\_\_\_\_ in the administration of such regulations. The \_\_\_\_\_'s Environmentally Sensitive Geological Zone shall not create any liability on the part of \_\_\_\_\_ or any officer or employee thereof from any damages that may result from reliance on its regulations or any decisions made by the \_\_\_\_\_ in the administration of such regulations.

Source: Excerpted from *Upper Saucon Township, Lehigh County - Zoning Ordinance* as supplied by the office of the *Pennsylvania Geologic Survey, Harrisburg, Pennsylvania*.

## **Section #6 — Two Rivers Area Watershed Management Options**

### **Introduction to Plan Recommendations**

All the data and analyses contained within Section #1 - #5 of this report was presented and reviewed in detail at a sequence of workshops with the Two Rivers Area Council of Governemtes, and several public meetings. A multi-month time period was provided for all interested parties and individuals to make and submit their comments on the findings of the plan.

In addition, the review of Sections #1-#5 included extensive discussion on the plans afer client recommendations in Section #6 "Management Options", with only minor revisions. What follows are the specific Recommnedations of this plan to manage the Two Rivers Area's:

- Geologic and Soil Conservation Features
- Forest Cover and Its Affiliated Natural Habitat Area(s) and Afiliated Open Space/Scenic Areas
- Karst/Sinkhole Geology and Groundwater Systems
- Open Space and Recreationsl Resources
- Agricultral Ecoomic Retention and Land Conservation
- Basic Organizational/Intermunicipal Framework

These Plan Recommnedations are based in response to:

- the at present misunderstood physical character and composition of the area's natural resource base.
- the identifiable degradement and threats to the healthful continued functioning of the natural resource base.
- the "Concerns" and "Values" expressed in this Plan's public participation process from which were derived and adopted the following "Goals" and the "Goal Priorities".

# RIVER CONSERVATION PLAN for the TWO RIVERS AREA

## "GOALS" Expressed in Community Workshop and Discussions:

1. Promotion of regional management of on-lot sewage disposal systems, consider alternative disposal systems to discharge into streams, such as constructed lagoons, spray irrigation, and use of common lands.
2. No further degradation of stream values.
3. Improvement of stream values.
4. Identification of all discharges (point and non-point) into streams; sewerage, storm runoff, road runoff, etc.
5. Management of road maintenance techniques to minimize impact on streams.
6. Preserve and enhance the industrial heritage along the Bushkill Creek stream corridor and along other streams in the area with interpretation, education and conservation efforts and prepared programs.
7. Form and implement regionally based land conservation plans.
8. Enhance and assist appropriate quality agricultural uses in the region.
9. Promote community based assistance to agriculture as an industry for its retention and future development as an industry. Encourage wise use of the lands and minimal environmental impact of these uses.
10. Improve educational outreach, public education and passive recreational uses and values, as to increase appreciation of what the Two Rivers Area has and to increase its stewardship. (Sensitizing the region of concerns, needs and values).
11. Improve stream side access and recreation opportunities with the streams.
12. Identify regional recreation needs and desired recreational interaction with streams, (Conduct professional assessment of potentials and survey and assess the regional needs. )
13. Restore and enhance the waterways. Identify opportunities and constraints for waterway restoration.
14. Form design standards for surface water management (regional) for both quantity and quality of all surface waters.
15. Retain and the high value in the "quality of life" to be found in the residential areas and their associated environments and features in the Two Rivers Area.

# **RIVER CONSERVATION PLAN for the TWO RIVERS AREA**

## **"GOAL PRIORITIES" expressed in Community Workshop and Discussions**

### **1. Stop any further decline in stream quality.**

**(Listed Goals Statements from attached "GOALS")**

**"2. No further degradation of stream values."**

**"4. Identification of all discharges (point and non-point) into streams; sewerage, storm runoff, road runoff, etc."**

**"5. Management of road maintenance techniques to minimize impact on streams."**

**"8. Enhance and assist appropriate quality agricultural uses in the region."**

### **2. Improve stream quality, reverse previous declines in quality.**

**(Listed Goals Statements from attached "GOALS")**

**"3. Improvement of stream values."**

**"11. Improve stream side access and recreation opportunities with the streams."**

**"13. Restore and enhance the waterways. Identify opportunities and constraints for waterway restoration."**

**"14. Form design standards for surface water management (regional) for both quantity and quality of all surface waters. "**

### **3. Understand the potentials of the area and encourage growth and development to occur which is sensitive to the natural environment, existing agriculture, residential environments and the area's streams and water features.**

**"10. Improve educational outreach, public education and passive recreational uses and values, as to increase appreciation of what the Two Rivers Area has and to increase its stewardship. (Sensitizing the region of concerns, needs and values).**

**"11. Improve stream side access and recreation opportunities with the streams.**

**"12. Identify regional recreation needs and desired recreational interaction with streams, (Conduct professional assessment of potentials and survey and assess the regional needs. )"**

**"15. Retain the high value in the "quality of life" to be found in the residential areas and their associated environments and features in the Two Rivers Area. "**

**Plan Recommendations: Two Rivers Area Watershed—Geologic and Soil Conservation Features**

**Geologic**

The Two Rivers Area Council of Governments shall seek funds to conduct two thorough studies:

1. Industrial Locales
  - a) Identification of all known and documented locales of industrial operations since historic settlement.
  - b) An assessment of those sites for trace chemicals, waste and drainage, seepage pollution.
  - c) Recommendations and Implementation Plan for any identified environmental clean-up.
2. Mines and Quarries
  - a) Site/locale confirmation of all mines and quarries.
  - b) Critical assessment of each quarry's and mine's condition, nature of fill, water/fill/quality, and value.
  - c) Recommendations and Implementation Plan for any environmental clean-up, filling, land acquisition, water quality conservation.
3. Encourage and request that the Pennsylvania Geologic Survey reconduct and update its field research and description and assessment of the Two Rivers Area's
  - Blue Mountain Ridge, • Martinsburg Shale(s), • Lime-stone Belt, and • Cambrian and Pre-Cambrian Gneiss geologic rock strata, with a special emphasis on its water bearing properties.

**Soils**

Based upon the River Conservation Plan's General Soil & Water Conservation Classification for the Two Rivers Area, the Two Rivers Area Council of Governments shall seek to:

1. Coordinate and promote intergovernmental Overlay Zoning of Hydric, Urban and Deep Well Drained Soils as advised in Plan.
2. Coordinate intermunicipally adopted and mutually consistent affiliated overlay zoning ordinances intent on protecting and conserving Hydric, Urban and Deep Well Drained Soils as identified in Plan.
3. Define and effect an intermunicipal initiative to place into easement and/or conservation land purchase all identified sensitive Hydric, Urban and Deep Well Drained soils, as advised in Plan, for unified watershed and water quality protection.

*\*Note: the following General Soil and Water Conservation Classification for the Two Rivers Area shall serve as the determinant parameter for soil conservation.*

Soil Series Group	Recommended Land and Development Classification
<b>A) Hydric Soils</b>	
<b>Slow &amp; Poorly Drained:</b> Ad, AnA, AnB, BuB, BtA, ChA, ChB, CmA, CmB, Ho, CIA, Mu, BB, Brn, Mb, PhB, Rh, UtB	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> <li>• No commercial timber cutting</li> <li>• Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<b>Variable Drainage/Urban Land/Flood Prone:</b> Us (and all 15% and over slope gradient land)	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> <li>• No commercial timber cutting</li> <li>• Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<b>Slow, Poorly Drained &amp; Extremely Stony:</b> AoB, BuB, CkB, CnB, BeB	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> <li>• No commercial timber cutting</li> <li>• Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<b>Well Drained &amp; Extremely Stony:</b> Bg, LaB, LaD	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> <li>• No commercial timber cutting</li> <li>• Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<b>B) Deep Well Drained Soils</b>	
<p><b><u>Stony &amp; Rubble Lands (All extremely stony)</u></b></p> <p><u>Sloping Steeply:</u> St, Ru, CrD, CrF, LaF, WhF</p> <p><u>Sloping Gently:</u> CrB</p>	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> <li>• No commercial timber cutting</li> <li>• Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<p><b><u>Steep Lands (&gt;15% slope gradient, not extremely stony)</u></b> : BsF, BrD, WkD, WaD, CoD, HnD, CtD, CtF</p>	<ul style="list-style-type: none"> <li>• No land development</li> <li>• No cultivation</li> <li>• No commercial timber cutting</li> <li>• Reserve as open space, wildlife habitat, watershed reserve.</li> </ul>
<p><b><u>Sloping Lands (8 to 15% slope gradient, not extremely stony):</u></b> BrC, BoC, WkC, RyC, WaC, CoC, HnC, CtC</p>	<ul style="list-style-type: none"> <li>• Highly restricted light land development</li> <li>• Cultivation: carefully planned Contour Farming, Hayfield, Orchard use only</li> <li>• controlled certified sustainable Forest Cutting only.</li> <li>• Encourage expansion of native vegetation and tree cover, conserve established wildlife habitats;</li> <li>• seek and foster physical connections of established and/or expanding (vacating farmland) natural native vegetation and tree cover to identified and/or evolving greenway corridors.</li> </ul>

## TWO RIVERS AREA WATERSHED PLAN RECOMMENDATIONS

### **Forest Cover and Its Affiliated Natural Habitat Areas and Affiliated Open Space/Scenic Areas**

#### **Intermunicipal**

- 1) Coordinate and promote intergovernmental Overlay Zoning of
  - Forest Cover
  - Core Natural Habitat Areas
  - Forest Cover/Scenic Areas
  - Forest Cover - Sustainable Forest Yield Areas
- 2) Define and effect an intermunicipal initiative to place into easement and/or conservation land purchase
  - Forest Cover Areas
  - Core Natural Habitat Areas
  - Forest Cover- Sustainable Forest Yield Areas
- 3) Coordinate and promote intergovernmental zoning under land use/regulation/subdivisioning which encourages
  - Restoration of identified areas of lost forest cover along water runs, streams and rivers
  - Encourages the use and plantings of identified native species of trees, shrubs and flowering plants in new subdivisions and land developments.
- 4) Coordinate and promote an intergovernmental Forest Management Plan for the Two Rivers Area, based upon achieving (native) bio-diversity, watershed protection and sound sustainable forest product yield management

principles.

- 5) Encourage the conservation of existing tree lined fence rows, and replanting of tree lined fence rows with native plants, coordinated through intermunicipal cooperation.
- 6) Encourage and support municipally based Shade Tree Commissions, which also seek to utilize native trees and plants in their activities.

#### **Programmatic**

- 1) Request and support the conduction of a comprehensive Two Rivers Area - Forest Cover Conservation Study and Plan. This Plan would —
    - Inventory and critically asses the Two Rivers Area Forest and Wooded Cover.
    - Produce a Forest Site Map.
    - Encourage "short log" timber cutting system on forest cut, public and private designated lands.
- The results of this study shall encompass—
- Private Forest Lands Stewardship Program.
  - Forest Products Utilization Policy(s) and program based upon the Forest Product Yield System.
  - Forest Management Plan (with bio-diversity major component).

## Two Rivers Area Watershed Conservation Plan Recommendations

### Karst / Sinkhole Geology and Groundwater Systems

#### Intermunicipal Government

- 1) Coordinate and promote the formal adoption of a Karst/Sinkhole Feature Map for the Two Rivers Area based exclusively on the findings of the report "Sinkholes and Karst Related Features of Northampton County Pennsylvania by the PA Geological Survey of the Commonwealth of Pennsylvania."
- Such maps should be viewed as official public maps/documents added to each municipalities' Comprehensive Plan mapping sequence, and shall serve as a factor for any future land subdivision activity in each municipality
- 2) That all civil engineers and developers active in the area be sent an official letter and copy of the official karst/sinkhole maps as direct information for them to be aware of and take formally take into consideration in future planning
  - 3) Coordinate, promote and adopt an intergovernmental zoning under Land Use/ Regulation/ Subdivisioning which defines "Environmentally Sensitive Geological Zones" based upon the following model ordinance.

#### Programmatic/ Physical

- 1) That critically active sinkholes shall be identified in consultation with the PA Geological Survey and based upon that review, land conservation easement and/or purchase be considered for such limited sites to protect sites of very direct charge of surface water into the area's underground water reserves.
- 2) That the Two Rivers Area COG request an update of the karst / sinkhole activity by the PA Geological Survey in the year 2001, to improve and update identification of such features.

# Two Rivers Area Watershed Conservation Plan

## Recommendations for Open Space and Recreational Resources

### Governmental

- 1) That the Two Rivers Area Council of Governments (COG) mutually define and initiate a Two Rivers Area Intermunicipal Open Space & Parks Task Force. The purposes of this Task Force will be to undertake and effect:
  - Two Rivers Area Open Space, Parks and Greenway Plan which will plan, effect and develop an intermunicipal and physically integrated open space, park and greenway based on facility development within a projected 50 year population growth horizon of 175,000 residents within the Two Rivers Area. This Task Force shall be a committee of the Two Rivers Area COG and subject to its Charter and by-laws.
- 2) That the Two Rivers Area COG shall consider and advocate for an annual set of public funds, in tandem with local and private funds which shall be used to implement:
  - Conservation easements
  - Open space, natural habitat, park and recreation facility land purchase and development.

The first cycle of this effort was the advocacy of a \$10,000,000 County-level bond issue for such purposes, along with to-be-define local municipalities and private matching dollars.
- 3) The Two Rivers Area COG shall, through its Open Space & Parks Task Force/Committee define and effect a first 5 year Critical Lands Initiative. Identified critical lands for easement and/or purchase shall be areas of strategic—
  - natural habitat
  - water filtering and recharge
  - scenic and historic values
- 4) The Two Rivers Area COG shall, through its Open Space & Parks Task Force/Committee initiate and cause the integration of Greenway Corridors which

are —

- of highest value
- most threatened
- strategically important

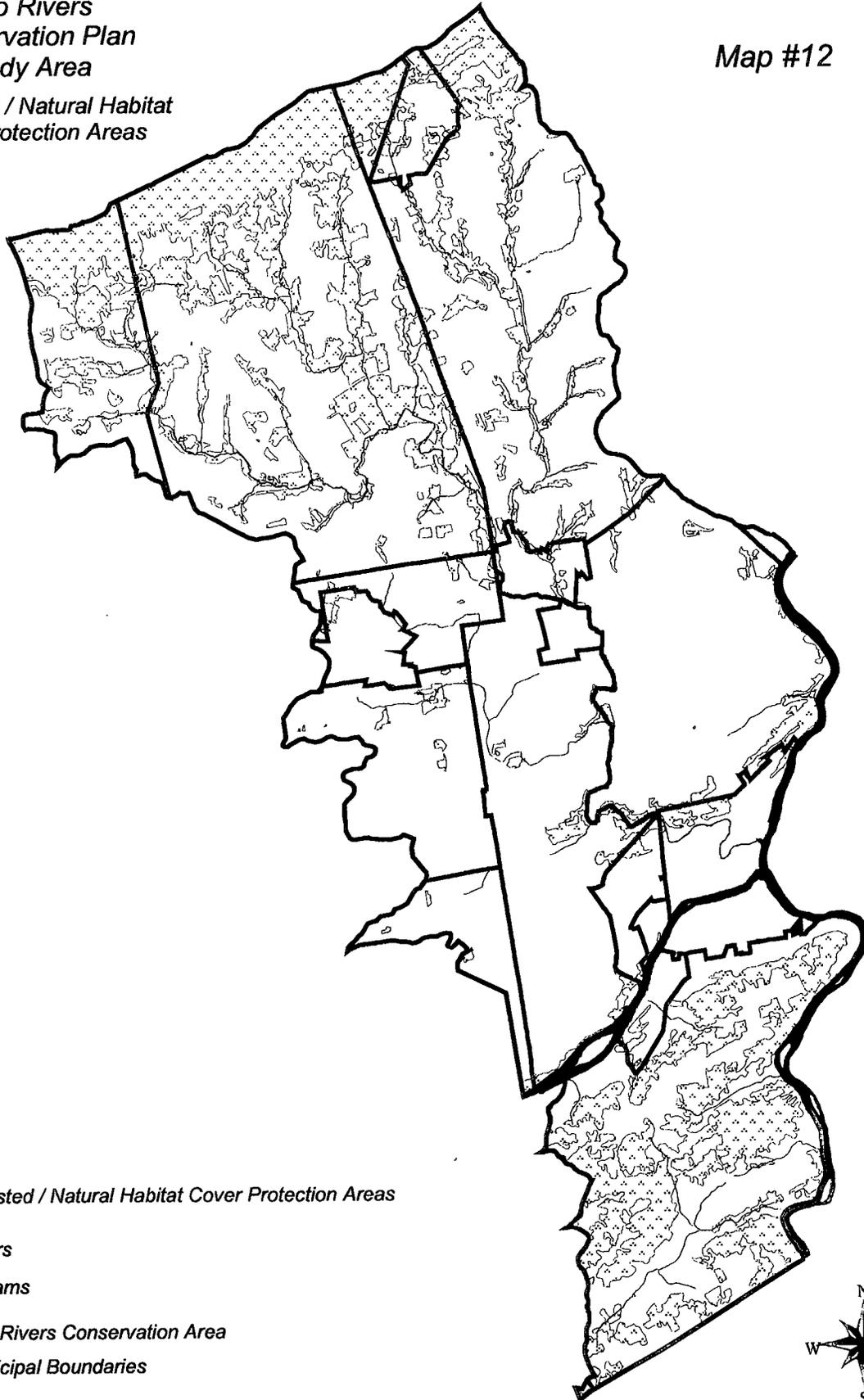
### Physical and Programmatic

- 1) The Two Rivers Area Council of Governments (COG) shall undertake its approved Penna. Dept. of Conservation and Natural Resources (DCNR) Grant for the Two Rivers Area Greenway Plan in partnership with the County of Northampton.
- 2) The Two Rivers Area Greenway Plan shall form the basis for the intermunicipal integration of open space, scenic, natural habitat, water recharge, trails, affiliated recreation sites, historic features within the Two Rivers Area. The core physical basis from which this Greenway Plan shall begin is addressing and assessing the land areas portrayed in this River Conservation Plan's
  - Two Rivers Area Map # 2 - Minimum Overlay Zoning Watershed Protection Areas
  - Two Rivers Area Map # 4 - Woodlands and Flood Plains
  - Two Rivers Area Map # 6 - Minimum Overlay Zoning for Watershed Forest/Natural Habitat Cover Protection
  - Two Rivers Area Map # 7 - Hydric Soils, Woodlands and Flood Zones
  - Sites and lands identified in "A Natural Areas Inventory of Lehigh and Northampton Counties" by the Nature Conservancy, issued April 1999, as reported within this Two Rivers Area Plan - Section #3.

*Two Rivers  
Conservation Plan  
Study Area*

**Map #12**

*Forested / Natural Habitat  
Cover Protection Areas*



 *Forested / Natural Habitat Cover Protection Areas*

 *Rivers*

 *Streams*

 *Two Rivers Conservation Area*

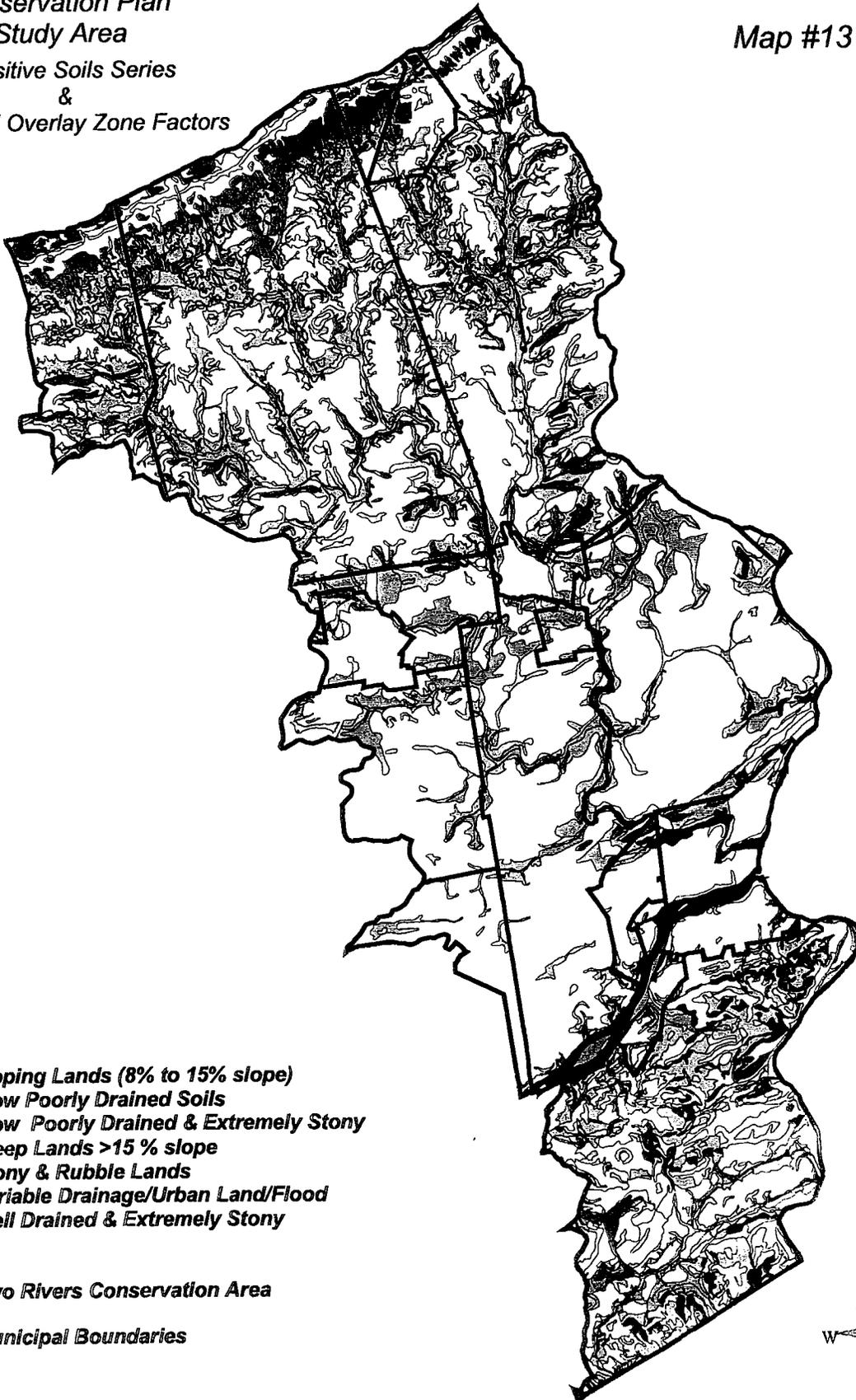
 *Municipal Boundaries*



*Two Rivers Watershed  
Conservation Plan  
Study Area*

*Sensitive Soils Series  
&  
Proposed Overlay Zone Factors*

Map #13



- Sloping Lands (8% to 15% slope)
- Slow Poorly Drained Soils
- Slow Poorly Drained & Extremely Stony
- Steep Lands >15 % slope
- Stony & Rubble Lands
- Variable Drainage/Urban Land/Flood
- Well Drained & Extremely Stony

- Two Rivers Conservation Area
- Municipal Boundaries



# Two Rivers Area Watershed Conservation Plan

## Recommendations for Agricultural Economic Retention and Lands Conservation

### Recommendation #1

That the Two Rivers Area COG seek to encourage the development of economic planning for the area's agriculture community with the following:

- The Lehigh Valley Partnership
- Northampton County Government
- Two Rivers Chamber of Commerce

### Recommendation #2

#### Agricultural Products Business Plan

That, as part of a Two Rivers Area Business Development Plan, and as members of the full business community, the current agriculture community study and effect *an Agricultural Resource and Product Development Plan*, which encompasses the following features:

- formally recognizes an inventory of productive agricultural soils in the area, which shall serve as an informed guide to any planning for business/land development planning by Chambers of Commerce, Industrial Land Authority(s), Development Commission and the area's financing community.
- provides a delineation of land areas that shall be considered as reserves for multi-crop agriculture, grazing and forest products.
- provides a current assessment to the product profile of agriculture and forest industry in the Two Rivers area.
- develops product(s) market trends for current and new multi-crop and forest product development for both bulk volume and special market sectors.
- develops an agricultural capital/investment analysis of new market development for individual farms, and agricultural product development.
- targets and schedules a coordinated screen of economic and physical planning incentives to support and encourage the agricultural industry of the area.

One of the significant options in reorganizing the areas agriculture is to encourage region-wide Organic Farming practices in order to achieve the following basic benefits.

#### Economic

- More direct access of the farmer/entrepreneur to the cash outlay/profit for their agricultural products.

## Land Resource

- The presence of organically-based agricultural practices would further reduce soil erosion in the Two Rivers Area.
- Aid in reducing ground water pollution by reducing chemical applications to farmland

## Two Rivers Area Watershed Conservation Plan Recommendation

### Basic Organizational Intermunicipal Framework

It is the basic recommendation of this study that the Two Rivers Area Council of Governments under its charter and by-laws critically discuss and consider establishing a Two Rivers Area Intermunicipal Environmental Advisory Council. Such an advisory body would derive its legal content from the Pennsylvania Municipality Code *Title 53 Area Government and Intergovernmental Cooperation*, (P.L. 1158 No. 177). Furthermore, in tandem with this Two Rivers Area Intermunicipal Environmental Advisory Council all cooperating municipal governments within the next year would critically discuss and define a Two Rivers Area Environmental Improvement Compact.

It is the intent of this recommendation that all actions by this Council will into the future be subject to the overview of the Two Rivers Council of Governments via an agreed upon —

- Two Rivers Area River Conservation and Greenway Master Plan(s)
- Two Rivers Area Intermunicipal Parks and Recreation Master Plan
- Two Rivers Area Forest Management Plan
- Two Rivers Area Agricultural and Rural Conservation Master Plan

All activities of the Two Rivers Area Intermunicipal Area Environmental Advisory Council will occur within an agreed upon Work Plan, review, approved and adopted by the Two Rivers Area Council of Governments in advance, in the following cycles:

- Annual Work Plan Implementation
- Three-Year Work Plan Projection
- Long Term Goals and Objectives

Historically it is projected that the Council shall in fact be a very active “committee” of the Two Rivers Area Council of Governments that attends and reports to the Two Rivers Area Council of Governments at each of its monthly meetings.

A full copy of Title 53, as it was enacted by the Commonwealth of Pennsylvania for review and deliberation by the Two Rivers Area Council of Governments, is attached in this study’s Appendices. It is the recommendation of this plan’s consultant that the Council of Governments consider this framework for organization to hopefully achieve the recommendations of this Watershed Conservation Plan. The final, fully structured plan will be subject to diligent legal review, your discussion, and overall public discussion in the near future.

## **Concluding Statement and Endorsement**

All of the above data and Plan Recommendations for the Two Rivers Area Watershed Conservation Plan has been formally and publicly reviewed. The following public endorsement of this data and Plan Recommendations is endorsed, as per the following resolution by the Two Rivers Area Council of Governments. The public at large is hereto advised that all these findings and Plan Recommendations shall serve as this area's primary guide and basis for all future initiatives to conserve, protect and manage the following resources within the Two Rivers Area:

- Geologic and Soil Conservation Features
- Forest Cover and its Affiliated Habitat Area(s) and Affiliated Open Space/Scenic Areas
- Karst/Sinkhole Geology and Groundwater System(s)
- Open Space and Recreational Resources
- Agricultural Economic Retention and Lands Conservation
- Basic Organizational/Intermunicipal Framework

For here and into the future, the following basic resolution to initiate and effect this cooperative is placed before the public.

## **Addenda #1**

### **Commentary by the Bushkill Stream Conservancy**

During the course of the conduction of the Two Rivers Area- River Conservation Plan, the Bushkill Stream Conservancy submitted the following Goals and Recommendations. These Goals and Recommendations are supplied in this study as an addenda. Respectfully, a careful reading of the Two Rivers Area-River Conservation Plan should reveal to the reader that many of these points are taken into consideration within this plan, although the wording is not precisely the same. In conclusion, other points brought up by the Bushkill Stream Conservancy are to be directly addressed more appropriately during the conduction of the Two Rivers Area Greenway Plan, to begin in the year 2001.

# ***Bushkill Creek Watershed Management Plan Goals and Recommendations***

*The Bushkill Stream Conservancy has compiled the following recommendations for the Bushkill Creek Watershed which were submitted by its partner organizations for inclusion in the formal watershed plan currently being developed under the DCNR River's Conservation Grant received by the Northampton County Council of Governments (COG) in 1995. The Conservancy looks forward to working with COG in the coordination and implementation of the following goals, objectives and recommendations:*

## ***Goal 1. Land Preservation and Conservation***

### **Objective 1. Preserve of Existing Greenways in the Bushkill Creek Corridor**

**Recommendation:** Working with Bushkill Township, develop and implement a greenway plan for the upper portion of the Watershed which will include specific land use and land acquisition strategies to protect/preserve the significant natural and historical resources within the Township.

### **Objective 2. Enhance and Establish Riparian Buffers.**

**Recommendation:** Working with Watershed municipalities, encourage the inclusion of riparian buffer zone requirements in the review process for all proposed development plans.

### **Objective 3. Preserve Remaining Woodland, Farmland and Open Space**

**Recommendation:** Assist Watershed municipalities in the establishment of conservation easement programs for the preservation of woodlands and open space within the Watershed.

**Recommendation:** Working with the Northampton County Conservation District, promote and implement identified farmland preservation projects within the Watershed.

**Objective 4. Preserve Existing Watershed Wetlands.**

**Recommendation:** Develop and implement a plan for the preservation of those significant wetlands in the upper portion of the Watershed which have been identified by the *Natural Area Inventory* completed by the Nature Conservancy and the Lehigh Valley Joint Planning Commission

**Objective 5. Preserve Identified Watershed Natural Areas of Regional and Statewide Significance.**

**Recommendation:** Incorporate the natural areas of regional and statewide significance identified by the *Natural Areas Inventory* completed by the Nature Conservancy and the Lehigh Valley Joint Planning Commission into greenway preservation/conservation planning efforts for the upper Bushkill Creek Watershed

**Objective 6. Establish and Maintain an Accurate Watershed Mapping and Inventory Management System**

**Recommendation:** Apply for and acquire a grant for Arcview software from DCNR's Rivers Conservation program.

**Recommendation:** Acquire an up-to-date GIS disc from the Lehigh Valley Joint Planning Commission for use during the implementation of the Bushkill Creek Watershed Management Plan.

**Recommendation:** Working with the Lehigh Valley Joint Planning Commission, create accurate digital mapping of Bushkill Creek Watershed. existing and potential environmental problems and of significant Watershed natural and historical resources. Layers of mapping information will include: existing and potential environmental problems, significant natural and historical resources, existing land use, zoning, soils, geology, wetlands, floodplains, sinkholes, proposed development, proposed and existing park and recreation areas, wellhead protection areas, existing open space/greenways, etc.

**Recommendation:** Create a database of current riparian landowners of the Bushkill Creek Watershed.

## ***Goal 2. Protection and Enhancement of the Stream Environment***

### **Objective 1. Improve Municipal Land Use Planning and Ordinances**

**Recommendation:** Working with all Watershed municipalities, incorporate a formal Watershed impact assessment as part of the review process for all proposed development.

**Recommendation:** Work closely with Bushkill Township in its current efforts to update its Comprehensive Plan and subsequent review and revision of its zoning ordinances to insure adequate protection of open space, greenways and stream habitat in the upper Bushkill Creek Watershed.

**Recommendation:** Fill vacant Bushkill Stream Conservancy Board vacancies with representatives from Bushkill, Plainfield and Moore Townships, and the Northampton County Federation of Sportsmen.

**Recommendation:** Working with Bushkill and Plainfield Townships, determine and mitigate potential negative impact on the Bushkill Creek and the landscape of the Boulton portion of the Jacobsburg National Historic district of commercial development spurred by the planned extension of RT. 33 to Interstate 78.

### **Objective 2. Implement Stream Rehabilitation and Fish Habitat Improvement Projects**

**Recommendation:** Develop plan for identification of specific sites on the Upper Bushkill Creek Watershed in need of stream habitat improvement measures.

**Recommendation:** Develop plan for identification of specific sites on the Little Bushkill Creek Watershed in need of stream habitat improvement measures.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion and re-establish fish habitat above and below Uhler Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install boulders for fish habitat at Equipto, Inc. pool.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at springhouse below Bushkill Street (Tatamy) bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion>

**Recommendation:** Move boulders at both pipeline crossings above Newlin's Mill Road to minimize debris collection. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Newlin's Mill Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion above Stocker Mill Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Schoeneck Creek. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion, remove heavy siltation and re-establish fish habitat above dam at Penn Pump and Lions Park. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion, remove heavy siltation and re-establish fish habitat above Bushkill Park Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install in-flow deflectors and rip-rap at "Meadow" section of Special Regulations Area (SRA). Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at proposed Lafayette/Bushkill Drive Overlook. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Easton Cemetery bridge (Bushkill Drive). Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Union Fuel (Bushkill Drive). Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

### **Objective 3. Remove Stream Obstructions**

**Recommendation:** Removal of Stocker dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant trees/shrubs to minimize future erosion.

**Recommendation:** Removal of Penn Pump dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of Binney & Smith dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of Elementis/Minerals Technologies dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of dam at Scott Auto Service (Easton) to decrease siltation and erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of 7<sup>th</sup> Street dam (Easton) to decrease siltation and erosion.

**Recommendation:** Removal of 3<sup>rd</sup> Street dam (Easton) to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

### **Objective 4. Lessen Impact of Point Source Pollution**

**Recommendation:** Working with DEP and Einfalts salvage yard, determine and mitigate stream pollution potential from site recycling activities.

**Recommendation:** Working with DEP and the current owner of the pressure treated lumber operation near Stockertown, determine and mitigate stream pollution potential from pressure treating operation.

**Recommendation:** Working with DEP, ESSROC and Hercules cement Companies, develop and implement a plan for the use of constructed wetlands to reduce sedimentation load on the Schoeneck Creek.

### **Objective 5. Lessen Impact of Non-Point Pollution**

**Recommendation:** Working with DEP, PDA, NRCS, Penn State Cooperative Extension Service, and the Northampton County Conservation District, promote and encourage the use of Best Conservation Management Practices by farmers to conserve and protect the quality and quantity of the soil and water in the Bushkill Creek Watershed. These agencies, along with other participating partners, will continue to develop and support programs which will economically and technically assist the farmers of Northampton County to protect and conserve their land and water resources.

**Recommendation:** (Add here specific recommendation for upper Bushkill Watershed BMP's included in Growing Greener grant application)

**Recommendation:** Working with DEP, PennDOT, the Northampton County Conservation District, and local municipalities, study, monitor and correct run-off pollution effects on water quality from agricultural, residential and roadside application of herbicides.

**Recommendation:** Working with DEP and the Northampton County Conservation District, study, monitor and correct run-off pollution effects on water quality of agricultural and residential application of fertilizer.

**Recommendation:** Working with PennDOT and local municipalities, study, monitor and stop roadside oil application in the upper reaches of the Bushkill Creek Watershed.

### **Objective 6. Prevent Groundwater Pollution**

**Recommendation:** Working with DEP, the Northampton County Conservation District, and local municipalities, install innovative alternative sewage treatment facilities for residential development in the upper Bushkill Creek Watershed.

**Recommendation:** Work directly with DEP and the current owner of the land fill operation on the Little Bushkill Creek to establish permanent monitoring of groundwater in this area.

**Recommendation:** Working with DEP and Einfalt's salvage yard, establish groundwater monitoring in the vicinity of the site's recycling activities.

**Recommendation:** Working with DEP and the owner of the pressure treated lumber operation near Stockertown, establish groundwater monitoring in the vicinity of the treatment plant.

**Recommendation:** Working with DEP and the Lehigh Valley Joint Planning Commission, determine and improve well head protection in the upper Bushkill Creek Watershed.

**Objective 7. Improve Erosion and Sedimentation Control Practices**

**Recommendation:** Plan and implement erosion control measures for the Palmer duck feeding area.

**Recommendation:** Plan and implement effective erosion control measures at the old Boulton Gun Factory dam site and at the main public stream access area in the Henry Woods area of Jacobsburg EE Center.

**Objective 8. Improve Stormwater Management Practices**

**Recommendation:** Working with the appropriate Watershed municipality, conduct a review of current stormwater management practices for existing developments to insure implementation of current BMP's.

**Objective 9. Implement Roadside Cleanup and Beautification Projects**

**Recommendation:** Working with PennDot's Adopt a Highway program and local service groups and organizations, promote and coordinate the cleanup and litter maintenance of all streamside roadways within the Watershed.

**Objective 10. Insure Adequate Stream Flow**

**Recommendation:** Working with ESSROC Cement Company, establish continued quarry pumping operations during times of low stream flow.

**Objective 11. Lessen Impact of Non-Native, Invasive Plant Species in Significant Watershed Natural Areas**

**Recommendation:** Joining efforts currently underway at Jacobsburg EE Center, direct volunteer efforts to non-native, invasive plant removal at Jacobsburg, Stocker Mill Road wetland, and other key Watershed natural areas.

**Recommendation:** Promote the use of native plants in all riparian improvement and land conservation projects within the Watershed.

**Objective 12. Improve Regulatory Protection of the Bushkill Creek and Its Tributaries**

**Recommendation:** Working with DEP and local conservation agencies, acquire “exceptional quality” designation for the Bushkill Creek and its tributaries.

***Goal 3. Water Quality Monitoring and Analysis***

**Objective 1. Improve Chemical and Biological Monitoring and Analysis of the Bushkill Creek and Its Tributaries.**

**Recommendation:** Working with Jacobsburg EE Center, Easton High School, and local colleges and universities, review and improve the effectiveness and coordination of current water quality monitoring efforts in the Watershed.

**Objective 2. Establish Effective Analysis, Management and Distribution of Water Quality Data**

**Recommendation:** Working with DEP and Jacobsburg EE Center, establish a viable system and responsibility for the analysis, management and distribution of Bushkill Creek water quality data. Establish a formal avenue for recommendations for action based on analysis of data.

**Objective 3. Establish a Groundwater Monitoring System within the Watershed**

**Recommendation:** Develop and implement a groundwater monitoring plan for landfill effluent in the Little Bushkill Creek sub-basin and other sites with the potential for significant groundwater pollution.

***Goal 4. Increase Environmental Awareness, Knowledge, Skills and Stewardship Commitment Among Those Living and Working in the Bushkill Creek Watershed In Order To Create the Action(s) Needed To Correct Current Ecological Problems and Prevent New Ones from Developing***

**Objective 1. To provide environmental, heritage, and cultural education opportunities for school groups, the general public, and local government and business leaders that will provide:**

- **An understanding that those who live and work in the Bushkill Creek Watershed are an inseparable part of its ecosystems and whatever humans do or do not do may alter the health of the Watershed.**
- **A basic knowledge of the natural laws which govern the environment of the Bushkill Creek Watershed; of the skills needed to solve its environmental problems; and recognition of each individual's responsibility to find solutions to the environmental problems of the Watershed.**
- **The development of a stewardship ethic that leads to the conservation of the Bushkill Creek Watershed's natural, historical, and cultural heritage, and to the correction and prevention of environmental degradation in the Watershed.**

**Recommendation:** Continue to support and expand the environmental and heritage education program services of DCNR's Jacobsburg Environmental Education Center within the Watershed. Specifically, the Bureau of State Parks' formal Watershed and Land Use education programs will be provided to secondary students and the implementation needs of this watershed plan will be integrated into their learning experience.

**Recommendation:** Focus Jacobsburg EE Center's program services on supporting the implementation needs of this plan. Watershed management-focused programs will be delivered to students of all ages, local business and governmental leaders, and to the general public.

**Recommendation:** Provide educational programming that will familiarize all members of the Bushkill Creek community with Best Management Practices (BMPs) for general stream care and stormwater management. This will be accomplished through educational programs and materials developed by the joint efforts of the Northampton County Conservation District and Jacobsburg EE Center.

**Recommendation:** Support the annual Bushkill Stream Festival in order to provide an enjoyable opportunity for the Bushkill Creek community to learn about this watershed management plan and what they can do to further efforts toward its implementation.

**Recommendation:** Document the entire length of the Bushkill Creek and its major tributaries using video, photos, and written descriptions of significant sites for use in planning and educational efforts.

**Recommendation:** Develop books, brochures, guides, videos, etc. that will be used to promote public awareness of the natural, recreational, and heritage resources of the Bushkill Creek Watershed and of the efforts underway for the implementation of this plan.

**Recommendation:** Create a web site that would house an up-to-date version of the Bushkill Creek Watershed Management Plan and progress being made in its implementation, upcoming projects/events, recreational opportunities, historic sites of interest, and pertinent water quality/environmental data/information.

**Recommendation:** Working with PennDOT, create a system of Watershed information signs/dispensers and interpretive signage/wayside exhibits at key locations such as stream crossings and recreational sites throughout the Watershed.

**Recommendation:** Establish environmental and BMP demonstration areas at key accessible locations in the Watershed such as Jacobsburg EE Center to be use for environmental education programming that addresses the importance of and techniques for maintaining riparian buffers, controlling erosion and sedimentation. In addition, these demonstration sites would target lawn/garden and wildlife habitat practices that could be used by Watershed homeowners to improve the health of the Bushkill Creek and its watershed.

**Recommendation:** Encourage heritage tourism for the Bushkill Creek Watershed by supporting planned development and staffing of a Delaware and Lehigh Canal National Heritage Corridor "landing" at the proposed visitor center at Jacobsburg EE Center. This landing will interpret the Bushkill "Reach" of the National Heritage Corridor including the important history of the Bushkill Creek and its mills, industries of the Slate Belt, the cement industry, and the heritage of the early Moravian community of Nazareth.

**Recommendation:** Establish an upper Bushkill Creek Watershed interpretive and recreational drive to promote awareness and enjoyment of this portion of the Bushkill Creek ecosystem.

**Recommendation:** Working with PennDOT and watershed municipalities, develop and post educational signage in critical sites along the Creek to increase public awareness of threats to the Bushkill. Signs will be posted at duck and geese feeding areas, in neighborhoods where runoff with fertilizers and chemicals flows directly into to stream, on culverts, at dumpsites, etc.

**Recommendation:** Working with the Northampton County Conservation District and Jacobsburg EE Center, develop an series of educational programs for Bushkill Creek Watershed farmers and large land owners that will increase awareness of this watershed management plan and knowledge and skills needed to effect beneficial land management/preservation practices.

**Recommendation:** Provide environmental education programming that focuses on the knowledge and skills needed to help the Bushkill Creek watershed community reduce the problems associated with non-native and invasive plant species.

**Recommendation:** Working with the Northampton County and Jacobsburg Historical Societies, promote the collection and preservation of historic writings, photographs, and paintings of the Bushkill Creek. Support the development of public heritage programming by these organizations that focuses on the important history of the Bushkill Creek in the development of this region and the nation.

**Recommendation:** Working with Northampton County Parks and Jacobsburg EE Center, support the implementation of water-quality-friendly park maintenance and development practices that will set an example for Watershed residents.

**Recommendation:** In cooperation with Trout Unlimited and key historical organizations, provide educational and interpretive programming on the heritage of trout fishing on the Bushkill, fish habitat improvement techniques, catch and release management practices, etc.

**Recommendation:** Working with Lafayette College, Lehigh University, and Muhlenberg College, and local citizen conservation groups such as Lehigh Valley Audubon and the Golden Eagle Bird Club, conduct needed research on the flora and fauna of the Bushkill Creek Watershed, i.e., mammal, bird, fish, native tree/shrub, and wildflower inventories,

**Recommendation:** Establish study and research areas in the upper Bushkill Creek Watershed in those natural areas of statewide significance identified by The Nature Conservancy and Lehigh Valley Planning Commission in their *Natural Areas Inventory* for Northampton County.

## ***Goal 5. Historical Resource Preservation and Heritage Tourism Development***

**Objective 1. Identify and preserve regionally and nationally significant historic sites and landscapes in the Bushkill Creek corridor.**

**Recommendation:** Support watershed heritage tourism and program development efforts of the Delaware and Lehigh National Heritage Corridor and the Jacobsburg National Historic District partnership (Jacobsburg EE Center and the Jacobsburg Historical Society).

**Recommendation:** Working with the Northampton County Historical and Genealogical and the Jacobsburg Historical Society, create and maintain a collection of historical documents, photographs, paintings, etc. of the Bushkill Creek and its Watershed.

**Recommendation:** Working with the Northampton County Historical and Genealogical Society and the Jacobsburg Historical Society, publish heritage

resource publications which focus on the important role that the Bushkill Creek played in the development of the Lehigh Valley and our Nation.

## ***Goal 6 Enhance and Increase Watershed Recreational Opportunities***

### **Objective 1. Implement Rails-to-Trails Conversion Projects**

**Recommendation:** Support existing and potential Watershed rails-to-trail projects: Easton to Stockertown/Stockertown to Jacobsburg/Jacobsburg to Wind Gap and Pen Argyl/Jacobsburg To Nazareth/Wind Gap to Walnutport.

### **Objective 2. Improve and Expand Watershed Recreational Facilities**

**Recommendation:** Working with state, county and local recreational agencies, form a Watershed Recreation Task Group to coordinate planning for and development and operation of recreational facilities within the Watershed.

### **Objective 3. Improve Stream Access and Viewing Areas**

**Recommendation:** Working with Binney and Smith and the City of Easton, complete the Bushkill Creek overlook projects in the Lower Bushkill Watershed.

**Recommendation:** Establish a scenic drive and self-guided brochure along the upper portion of the Watershed from: Douglasville Road to Clearfield Road to Hyers Mill Road to Bushkill Drive to Mountain Road, etc.

### **Objective 4. Maintain and Improve Watershed Hunting and Fishing Opportunities**

**Recommendation:** Working with the PA Game Commission, Trout Unlimited, and the Northampton County Federation of Sportsmen, inventory, preserve, and improve public hunting and fishing opportunities within the Watershed.

**Recommendation:** Working with the PA Game Commission, the Northampton County Federation of Sportsmen, Lehigh Valley Audubon, the Golden Eagle Bird Club, and area colleges and universities, inventory existing bird and mammal populations within the Watershed.

## **Appendices**

- **Title 53 - Municipalities Planning Act / Area Government and Intergovernmental Cooperation**
- **List of Soil Mapping Units that Qualify as Prime Farmland**
- **Model Ordinance: Rural Preservation District**

MUNICIPALITIES GENERALLY  
Title 53

MUNICIPALITIES GENERALLY  
Title 53

SUBPART D  
AREA GOVERNMENT AND INTERGOVERNMENTAL  
COOPERATION

Chapter

- 23. General Provisions
- 25. Environmental Improvement Compacts

CHAPTER 23  
GENERAL PROVISIONS

Subchapter

- A. Intergovernmental Cooperation
- B. Environmental Advisory Councils
- C. Regional Planning

Enactment. Chapter 23 was added December 19, 1996, P.L.1158, No.177, effective in 60 days.

SUBCHAPTER A  
INTERGOVERNMENTAL COOPERATION

Sec.

- 2301. Scope of subchapter.
- 2302. Definitions.
- 2303. Intergovernmental cooperation authorized.
- 2304. Intergovernmental cooperation.
- 2305. Ordinance.
- 2306. Initiative and referendum.
- 2307. Content of ordinance.
- 2308. Bids for certain joint purchases.
- 2309. Direct purchases.
- 2310. Joint purchases with private educational establishments.
- 2311. Written or telephonic price quotations required.
- 2312. Division of transactions provided.
- 2313. Penalty.
- 2314. Review of agreement by Local Government Commission.
- 2315. Effect of joint cooperation agreements.

Cross References. Subchapter A is referred to in section 8002 of this title.

§ 2301. Scope of subchapter.

This subchapter applies to all local governments.

§ 2302. Definitions.

The following words and phrases when used in this subchapter shall have the meanings given to them in this section unless the context clearly indicates otherwise:

"Local government." A county, city of the second class, second class A and third class, borough, incorporated town, township, school district or any other similar general purpose unit of government created by the General Assembly after July 12, 1972.

SUBCHAPTER B  
ENVIRONMENTAL ADVISORY COUNCILS

Sec.

- 2321. Scope of subchapter.
- 2322. Establishment of environmental advisory council.
- 2323. Composition and organization of council.
- 2324. Powers and duties of council.
- 2325. Records and reports.
- 2326. Appropriations for expenses of council.
- 2327. Status of existing agencies unaffected.
- 2328. Assistance from State Conservation Commission.
- 2329. Assistance from Department of Community and Economic Development.

§ 2321. Scope of subchapter.

This subchapter applies to all municipal corporations.

§ 2322. Establishment of environmental advisory council.

The governing body of any municipal corporation or group of two or more municipal corporations may by ordinance establish an environmental advisory council to advise other local governmental agencies, including, but not limited to, the planning commission, park and recreation boards and elected officials, on matters dealing with protection, conservation, management, promotion and use of natural resources, including air, land and water resources, located within its or their territorial limits.

§ 2323. Composition and organization of council.

(a) Composition.--An environmental advisory council shall be composed of no less than three nor more than seven residents of the municipal corporation establishing the council, who shall be appointed and all vacancies filled by the governing body. Where two or more municipal corporations jointly establish an environmental advisory council, the members shall be appointed in the same manner by each of the respective municipal corporations establishing the council, each constituent municipal corporation to have equal membership on the joint council.

(b) Term of office.--Council members shall serve for three years except that initial appointments shall be so staggered that the terms of approximately one-third of the membership shall expire each year, the terms of their successors to be of three years each.

(c) Compensation and expenses.--Members shall receive no compensation for their services but shall be reimbursed for the expenses actually and necessarily incurred by them in the performance of their duties.

(d) Chairman.--The appointing authority shall designate the chairman of the council except that in joint councils the chairman shall be elected by the duly selected members. Whenever possible, one member shall also be a member of the municipal planning board.

§ 2324. Powers and duties of council.

(a) General rule.--An environmental advisory council shall

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have the power to:

(1) Identify environmental problems and recommend plans and programs to the appropriate agencies for the promotion and conservation of the natural resources and for the protection and improvement of the quality of the environment within its territorial limits.

(2) Make recommendations as to the possible use of open land areas of the municipal corporations within its territorial limits.

(3) Promote a community environmental program.

(4) Keep an index of all open areas, publicly or privately owned, including flood-prone areas, swamps and other unique natural areas, for the purpose of obtaining information on the proper use of those areas.

(5) Advise the appropriate local government agencies, including the planning commission and recreation and park board or, if none, the elected governing body or bodies within its territorial limits, in the acquisition of both real and personal property by gift, purchase, grant, bequest, easement, devise or lease, in matters dealing with the purposes of this subchapter.

(b) Limitation.--An environmental advisory council shall not exercise any powers or perform any duties which by law are conferred or imposed upon a Commonwealth agency.

§ 2325. Records and reports.

An environmental advisory council shall keep records of its meetings and activities and shall make an annual report which shall be printed in the annual report of the municipal corporation or, if none, otherwise made known and available.

§ 2326. Appropriations for expenses of council.

The governing body of any municipal corporation establishing an environmental advisory council may appropriate funds for the expenses incurred by the council. Appropriations may be expended for those administrative, clerical, printing and legal services as may be required and as shall be within the limit of funds appropriated to the council. The whole or any part of any funds so appropriated in any year may be placed in a conservation fund and allowed to accumulate from year to year or may be expended in any year.

§ 2327. Status of existing agencies unaffected.

This subchapter shall not be construed to require a municipal corporation to abolish an existing commission with a related responsibility or to prevent its establishment.

§ 2328. Assistance from State Conservation Commission.

The State Conservation Commission shall establish a program of assistance to environmental advisory councils that may include educational services, exchange of information, assignment of technical personnel for natural resources planning assistance and the coordination of State and local conservation activities.

(May 5, 1998, P.L.301, No.50, eff. 60 days)

§ 2329. Assistance from Department of Community and Economic Development.

The Department of Community and Economic Development shall establish a program of assistance to environmental advisory councils in planning for the management, use and development of open space and recreation areas.

(May 5, 1998, P.L.301, No.50, eff. 60 days)

SUBCHAPTER C  
REGIONAL PLANNING

Sec.

- 2341. Short title and scope of subchapter.
- 2342. Definitions.
- 2343. Declaration of policy.
- 2344. Establishment and organization of regional planning commission.
- 2345. Finances, staff and program.
- 2346. Commission to prepare master plan.
- 2347. Cooperation between commission, municipalities and others.
- 2348. Interstate participation.

§ 2341. Short title and scope of subchapter.

(a) Short title of subchapter.--This subchapter shall be known and may be cited as the Regional Planning Law.

(b) Scope of subchapter.--This subchapter applies to all municipalities, but it shall not operate as a reenactment of any provisions repealed by section 1202 of the act of July 31, 1968 (P.L.805, No.247), known as the Pennsylvania Municipalities Planning Code.

§ 2342. Definitions.

The following words and phrases when used in this subchapter shall have the meanings given to them in this section unless the context clearly indicates otherwise:

"Commission." A regional planning commission created in accordance with the terms of this subchapter.

"Governing body." The body or board authorized by law to enact ordinances or adopt resolutions for the municipality.

"Region." An area comprised of two or more municipalities which have joined in creating a regional planning commission.

§ 2343. Declaration of policy.

For the purpose of promoting health, safety, morals and the general welfare of the regions in this Commonwealth through effective development, the powers set forth in this subchapter for the establishment of regional planning commissions are granted.

§ 2344. Establishment and organization of regional planning commission.

(a) General rule.--The governing body of two or more municipalities may, by ordinance or resolution, authorize the establishment or membership in and support of a regional planning commission. The number and qualifications of the members of any commission and their terms and method of appointment or removal shall be determined and agreed upon by the governing bodies. A majority of the members of the commission shall at the time of appointment to the commission and throughout the duration of their service on the commission be locally elected officials. Members of the commission shall serve without salary but may be paid expenses incurred in the performance of their duties. The commission shall elect a chairman whose term shall not exceed one year and who shall be eligible for reelection. The commission may create and fill other offices as it may determine.

(b) Rules and records.--The commission shall adopt rules for the transaction of business and shall keep a record of its resolutions, transactions, findings and determinations, which shall be a public record.

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(c) Assistance from municipality.--Any municipality may, upon the request of the commission, assign or detail to the commission any employees of a municipality to make special surveys or studies requested by the commission.  
§ 2345. Finances, staff and program.

(a) General rule.--The governing bodies of municipalities may appropriate funds for the purpose of contributing to the operation of the commission. The commission may, with the consent of all the governing bodies, also receive grants from the Federal or State governments or from individuals or foundations and shall have the authority to contract therewith. The commission may appoint such employees and staff as it deems necessary for its work and contract with planners and other consultants for the services it may require. The commission may also perform planning services for any municipality which is not a member thereof and may charge fees for the work. The commission may also prepare and sell maps, reports, bulletins or other material and establish reasonable charges therefor.

(b) Planning assistance.--The commission may provide planning assistance and do planning work, including surveys, land use studies, urban renewal plans, technical services and other elements of comprehensive planning programs, for any municipalities within the region. For this purpose, the commission may, with the consent of all the governing bodies, accept any funds, personnel or other assistance made available by the Federal or State government or from individuals or foundations, and, for the purposes of receiving and using Federal or State planning grants for provision of urban planning assistance, the commission may enter into contracts regarding the acceptance or use of the funds or assistance.

§ 2346. Commission to prepare master plan.

The commission shall prepare a master plan, and the surveys and studies essential thereto, for the guidance of the physical development of the region.

§ 2347. Cooperation between commission, municipalities and others.

The commission shall encourage the cooperation of the municipalities within the region in matters which concern the integrity of the master plan or maps prepared by the commission, and, as an aid toward coordination, all municipalities and public officials shall, upon request, furnish the commission within a reasonable time the available maps, plans, reports and statistical or other information it may require for its work.

§ 2348. Interstate participation.

Whenever a regional planning commission has been or is being established to serve the Pennsylvania portion of an area which, for planning purposes, constitutes a logical region as approved by the State Planning Board and which extends beyond the boundaries of this Commonwealth, the commission may admit to membership municipalities that are part of the same region but located in other states. Municipalities may participate, through membership and financial support, in commissions that have been or are being established in other states when the municipalities are part of the same region served by the out-of-State commission.

Subchapter

- A. Preliminary Provisions
- B. Initiative
- C. Municipal Referendum Ordinance
- D. Referendum
- E. Election of Board
- F. Organization of Board

Enactment. Chapter 25 was added December 19, 1996, P.L.1158, No.177, effective in 60 days.

SUBCHAPTER A  
PRELIMINARY PROVISIONS

Sec.

2501. Short title and scope of chapter.

2502. Definitions.

§ 2501. Short title and scope of chapter.

(a) Short title of chapter.--This chapter shall be known and may be cited as the Environmental Improvement Compact Act.

(b) Scope of chapter.--This chapter applies to all municipalities.

§ 2502. Definitions.

The following words and phrases when used in this chapter shall have the meanings given to them in this section unless the context clearly indicates otherwise:

"Board." The Environmental Improvement Compact Board elected under this chapter.

"Election officials." The county boards of election, except in Philadelphia where the term means the city commissioners.

"Electors." The registered voters of any municipality involved in proceedings relating to the environmental improvement compact.

"Environmental improvement compact." A structure of government and powers concerning one or more municipal functions involving two or more municipalities in this Commonwealth under procedures provided in this chapter.

SUBCHAPTER B  
INITIATIVE

Sec.

2511. Proposal by electors.

2512. Initiative petition.

2513. Review of initiative petition.

2514. Petition as public record.

2515. Distribution of petition.

Cross References. Subchapter B is referred to in section 2531 of this title.

§ 2511. Proposal by electors.

A referendum on the question of the creation of an environmental improvement compact may be initiated by electors of two or more municipalities as provided in this chapter.

§ 2512. Initiative petition.

(a) Filing.--A petition containing a proposal for referendum on the question of adopting an environmental improvement compact

on one or more municipal functions, signed by electors comprising 2% of the number of electors voting for the office of Governor in the last gubernatorial general election in each municipality involved, may be filed with the election officials at least 90 days prior to the next primary held in an even-numbered year or general election.

(b) Size of board.--The petition shall designate a five, seven or nine member board.

(c) Designation of petitioners.--The name and address of the person filing the petition shall be clearly stated on the petition.

§ 2513. Review of initiative petition.

The election officials shall, within ten days after filing, review the initiative petition as to the number and qualifications of signers. If the petition appears to be defective, the election officials shall immediately notify the person filing the petition of the defect.

§ 2514. Petition as public record.

The initiative petition as submitted to the election officials along with the list of signatories shall be open to public inspection in the office of the election officials.

§ 2515. Distribution of petition.

When the election officials find that the petition as submitted is in proper order, they shall send copies of the initiative petition without signatures thereon to the governing body of the municipalities involved and to the Department of Community and Economic Development.

(May 5, 1998, P.L.301, No.50, eff. 60 days)

#### SUBCHAPTER C MUNICIPAL REFERENDUM ORDINANCE

Sec.

2521. Referendum ordinance.

2522. Filing of referendum ordinance.

2523. Notice to governing bodies of referendum date.

Cross References. Subchapter C is referred to in section 2531 of this title.

§ 2521. Referendum ordinance..

The governing bodies of two or more municipalities may, by ordinance in each municipality, provide for a referendum on the question of adopting an environmental improvement compact. The ordinance shall designate a five, seven or nine member board.

§ 2522. Filing of referendum ordinance.

(a) Election officials.--The referendum ordinance shall be filed with the election officials at least 90 days prior to the next primary or general election.

(b) Department of Community and Economic Development.--When the ordinances are filed with the election officials, copies of the referendum ordinance shall be immediately filed with the Department of Community and Economic Development.

(May 5, 1998, P.L.301, No.50, eff. 60 days)

1998 Amendment. Act 50 amended subsec. (b).

§ 2523. Notice to governing bodies of referendum date.

The election officials shall notify the governing bodies of the municipalities involved of the date set for the referendum

election on the proposal at least 30 days before the election.

#### SUBCHAPTER D REFERENDUM

Sec.

- 2531. Referendum procedures.
- 2532. Placing question on ballot.
- 2533. Date of election.
- 2534. Public notice of referendum.
- 2535. Approval.
- 2536. Results of election.

§ 2531. Referendum procedures.

(a) Authorization.--A referendum on the question of the adoption of an environmental improvement compact shall be held when initiated by electors of the municipalities in accordance with Subchapter B (relating to initiative) or after authorization by ordinance of the governing bodies of the municipalities in accordance with Subchapter C (relating to municipal referendum ordinance).

(b) Procedure.--The procedure for the referendum shall be governed by the act of June 3, 1937 (P.L.1333, No.320), known as the Pennsylvania Election Code.

§ 2532. Placing question on ballot.

When the election officials find the ordinances authorized by the governing bodies of the municipalities or the initiative petition as submitted by the electors meets the requirements of this chapter, they shall place the proposal on the ballot in a manner fairly representing the content of the ordinances or of the initiative petition for decision by referendum at the proper election.

§ 2533. Date of election.

The election officials shall certify the date for the referendum and shall so notify the governing bodies of the municipalities at least 30 days prior to that date.

§ 2534. Public notice of referendum.

At least 30 days' notice of the referendum shall be given by proclamation of the mayors of the cities, boroughs or incorporated towns, by the chairmen of the boards of county commissioners, by the presidents of the boards of township commissioners or by the chairmen of the boards of township supervisors, as the case may be. A copy of the proclamation shall be posted at each polling place of the municipalities on the day of the election and shall be published once in at least one newspaper of general circulation in the municipalities during the 30-day period prior to the election.

§ 2535. Approval.

Approval of a referendum for the adoption of an environmental improvement compact shall be by a majority vote of those voting in each municipality involved.

§ 2536. Results of election.

The election officials shall certify the results of the referendum to the governing bodies and the Department of Community and Economic Development.

(May 5, 1998, P.L.301, No.50, eff. 60 days)

#### SUBCHAPTER E

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## ELECTION OF BOARD

- Sec.  
2541. Election of board.  
2542. Nomination of candidates.  
2543. Election returns.

Cross References. Subchapter E is referred to in section 2551 of this title.

§ 2541. Election of board.

(a) Petition for election.--If a referendum for the adoption of an environmental improvement compact is approved by a majority of voters in each municipality involved, the governing bodies shall, within 30 days of the certification of the results of the referendum election, submit to the election officials a petition to provide for the election of the board.

(b) Terms of office.--The majority of the members to be elected to the first board receiving the highest number of votes in the election shall serve for four-year terms, while the remainder shall serve for two-year terms. Thereafter, all candidates for the board shall have four-year terms.

(c) Election.--Members of the board shall be elected at the next municipal election not less than 90 days from the date of the referendum.

§ 2542. Nomination of candidates.

Candidates for membership on the board shall be electors of the municipalities involved. Each shall be nominated by nomination papers signed by a number of electors in their municipality or residence which is affected by the compact equal to at least 2% of the largest vote cast for any elected officer of the municipality elected at the last preceding municipal election. Nomination shall be in the manner provided by and subject to the provisions of the act of June 3, 1937 (P.L.1333, No.320), known as the Pennsylvania Election Code, which relate to the nomination of candidates nominated by nomination papers filed by political bodies for other offices elected by the voters of the municipality. Nomination papers shall not be circulated prior to 30 days before the last day on which the papers may be filed and shall be filed with the election officials not less than 44 days prior to the date of the election.

§ 2543. Election returns.

The result of the votes cast for members of the board at the municipal election shall be returned by the election officials to the governing bodies of municipalities involved and to the Department of Community and Economic Development.

(May 5, 1998, P.L.301, No.50, eff. 60 days)

## SUBCHAPTER F ORGANIZATION OF BOARD

- Sec.  
2551. Membership of board.  
2552. Compensation of board.  
2553. Organization of board.  
2554. Secretary and treasurer of board.  
2555. Purposes and powers of board.  
§ 2551. Membership of board.

The board shall be composed of five, seven or nine members as provided in Subchapter E (relating to election of board).

§ 2552. Compensation of board.

A majority of all the members of the governing bodies of the municipalities involved shall set the annual compensation for the members of the board.

§ 2553. Organization of board.

On the first Monday of January following the municipal election, members of the board shall assemble at a designated meeting place and shall organize by electing one of their own members as chairman. This member shall preside at all meetings and perform other duties as the board may prescribe. In the absence of the chairman, the board shall elect a temporary presiding officer. The board shall adopt rules for its procedure and conduct of business. Any vacancy shall be filled by an elector from the municipalities involved appointed by the remaining members of the board.

§ 2554. Secretary and treasurer of board.

(a) Secretary.--The board shall appoint a secretary who shall keep the records and minutes of the board proceedings, maintain a record of other official activities and perform other functions as required by law.

(b) Treasurer.--The board shall appoint a treasurer. The treasurer shall collect or receive taxes, assessments and other funds due the board.

§ 2555. Purposes and powers of board.

(a) Status and purposes.--Every board created under this chapter shall be a body corporate and politic and shall be for the purpose of acquiring, holding, constructing, improving, maintaining and operating, owning or leasing, either in the capacity of lessor or lessee, for any government function of two or more municipalities.

(b) Powers and duties.--The board shall have and may exercise all powers necessary or convenient for the carrying out of the purposes under subsection (a), including the following powers and duties:

(1) Sue and be sued.

(2) Adopt, use and alter at will a seal of the board.

(3) Acquire, purchase, hold, lease as lessee and use any franchise, property, real, personal or mixed, tangible or intangible, or any interest therein necessary or desirable for carrying out the purposes of the board, and sell, lease as lessor, transfer and dispose of any property or interest acquired by it.

(4) Acquire by purchase, lease or otherwise and construct, improve, maintain, repair and operate projects.

(5) Make bylaws for the management and regulation of its affairs.

(6) Appoint officers, agents, employees and servants, prescribe their duties and fix their compensation.

(7) Fix and collect taxes not to exceed two mills of real estate within the municipalities involved and charge and collect rates and other charges in the area served by its facilities, at reasonable and uniform rates to be determined by it, for the purpose of providing for the payment of the expenses of the board, the construction, improvement, repair, maintenance and operation of its facilities and properties and the payment of the principal and interest on its obligations and to fulfill the terms of any agreements made

with the holders of any such obligations or with municipalities served or to be served by the board. Any person questioning the reasonableness or uniformity of any rate fixed by the board or the adequacy, safety and reasonableness of the board's services may bring suit against the board in the court of common pleas of the county where the project is located. If the project is located in more than one county, the suit may be brought in the court of common pleas of the county where the principal office of the project is located.

(8) Borrow money and make and issue negotiable notes, bonds, refunding bonds and other evidences of indebtedness or obligations of the board. These instruments shall have a maturity date not longer than 30 years from the date of issue, except that no refunding bonds shall have a maturity date later than the life of the board. The board may secure the payment of the instruments or any part of them by pledge or deed of trust of all or any of its revenues and receipts and make agreements with the holders of these instruments, or with others in connection with these instruments, whether issued or to be issued, as the board deems advisable. The board shall provide for the security for these instruments and the rights of the holders of them, and in respect to any project constructed and operated under agreement with any board or any public authority of any adjoining state, and may borrow money and issue notes, bonds and other evidences of indebtedness and obligations jointly with any authority.

(9) Make contracts and execute all instruments necessary or convenient for the carrying on of its powers and duties.

(10) Without limitation of the foregoing, borrow money and accept grants from and enter into contracts, leases or other transactions with any Federal agency or Commonwealth municipality, school district, corporation or authority.

(11) Have the power of eminent domain, with the consent of the county commissioners of the county where the land is located and with the consent of council in cities of the first class.

(12) Pledge, hypothecate or otherwise encumber all or any of the revenues or receipts of the board as security for the obligations of the board.

(13) Do all acts and things necessary or convenient for the promotion of its business and the general welfare of the board in order to carry out the powers granted to it by this chapter or any other statutes.

(14) Enter into contracts of group insurance for the benefit of its employees and set up a retirement or pension fund for employees.

## LIST OF SOIL MAPPING UNITS THAT QUALIFY AS PRIME FARMLAND

## Northampton County, Pennsylvania

Manuscript  
Symbol

Mapping Unit Name

Bg	Barbour soils
Bm	Barbour and Middlebury soils, high bottom
BnA	Bedington silt loam, 0 to 3 percent slopes
BoB	Bedington shaly silt loam, 3 to 8 percent slopes
BuB	Buchanan gravelly loam, 3 to 8 percent slopes
ClA	Clarksburg silt loam, 0 to 3 percent slopes
ClB	Clarksburg silt loam, 3 to 8 percent slopes
CmA	Comly silt loam, 0 to 3 percent slopes
CmB	Comly silt loam, 3 to 8 percent slopes
CoB	Conestoga silt loam, 2 to 8 percent slopes
CtA	Conotton gravelly silt loam, 0 to 3 percent slopes
CtB	Conotton gravelly silt loam, 3 to 8 percent slopes
DuA	Duffield silt loam, 0 to 3 percent slopes
DuB	Duffield silt loam, 3 to 8 percent slopes
HnB	Hollinger gravelly silt loam, 3 to 8 percent slopes
Mb	Middlebury soils
PhB	Phelps gravelly silt loam, thick solum variant, 2 to 8 percent slopes
RyB	Ryder silt loam, 2 to 8 percent slopes
SvB	Swartswood gravelly loam, 2 to 8 percent slopes
WaA	Washington silt loam, 0 to 3 percent slopes
WaB	Washington silt loam, 3 to 8 percent slopes
WuB	Wurtsboro gravelly silt loam, 2 to 8 percent slopes

A list of soils that qualify as additional farmland of statewide importance in Northampton County is enclosed with this report.

### Additional Farmland of Local Importance

In some local areas, there is concern for certain additional farmlands for the production of food, feed, fiber, forage and oilseed crops even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by the local agency or agencies concerned.

Northampton County chose not to recognize any land in this category.

### General

A legend on the front of the Important Farmlands Map identifies different kinds of land and their acreage in the county. Areas not colored are other land. These areas do not fit any of the categories listed in the definitions and are not water or urban areas more than 10 acres in size.

The criteria for identification of prime farmland and additional farmland of statewide importance are entirely related to soil characteristics. They were set up to facilitate the identification and inventory of the state's most productive farmland in a reasonable time by using existing soil surveys.

Most of the prime farmland and much of the additional farmland of statewide importance is now used for crops; however, it could be in pasture, range, forest or other land uses and still qualify as prime farmland. Urban and builtup land and water are excluded. The rationale for this approach is that land not committed to irreversible uses may be available for cropping. Decisionmakers must be aware of the long term implications of various land use options for the production of food, feed, etc., and the trade-offs involved. Actions that put high quality farmland in irreversible uses should be initiated only if these actions are clearly in the public interest.

This inventory does not constitute a designation of any land area to a specific land use. Such designations are the prerogative of responsible state and local officials.

Finally, it is important to emphasize that prime farmland is one of the most important resources for the Nation. This exceptional land can be farmed continuously or nearly continuously without degrading the environment. It will produce the most food, feed, etc., with the least amount of energy used. It responds exceptionally well to fertilizer and other chemical applications with limited loss of residues by leaching or erosion. This land has the highest percentage of soils that can be conservation tilled. It is the most responsive to management and requires the least investment for maintaining productivity.

The inventories of prime and unique farmlands and other important farmlands are dynamic. New areas may be developed and others will be converted to irreversible use. Thus, the inventories must be updated periodically to reflect any significant changes.

Revised 8/83

By: GHJ

LIST OF SOIL MAPPING UNITS THAT QUALIFY AS ADDITIONAL FARMLAND OF  
STATEWIDE IMPORTANCE

Northampton County, Pennsylvania

Manuscript  
Symbol

Mapping Unit Name

BoC	Bedington shaly silt loam, 8 to 15 percent slopes
BrA	Berks shaly silt loam, 0 to 3 percent slopes
BrB	Berks shaly silt loam, 3 to 8 percent slopes
BrC	Berks shaly silt loam, 8 to 15 percent slopes
CoC	Conestoga silt loam, 8 to 15 percent slopes
CtC	Conotton gravelly silt loam, 8 to 15 percent slopes
HnC	Hollinger gravelly silt loam, 3 to 15 percent slopes
Rh	Red Hook gravelly silt loam
RyC	Ryder silt loam, 8 to 15 percent slopes
SvC	Swartswood gravelly loam, 8 to 15 percent slopes
UtB	Urbana silt loam, 2 to 10 percent slopes
VoB	Volusia gravelly silt loam, 2 to 8 percent slopes
WaC	Washington silt loam, 8 to 15 percent slopes
WuC	Wurtsboro gravelly silt loam, 8 to 15 percent slopes.

## PART . . .

### RP - RURAL PRESERVATION DISTRICT

#### §1001. DECLARATION OF LEGISLATIVE INTENT.

In expansion of the declaration of legislative intent found in § . . . , of this Chapter, and the Statement of Community Development Objectives found in § . . . , of this Chapter, it is the intent of this Part to maintain the rural character of certain portions of the Township, and promote the preservation of land and waterways which because of location or natural features have a unique character by:

- A. Minimizing the amount of new urban or suburban development which occurs in the portions of the Township that are now rural in character, and to blend that which does occur unobtrusively into the rural environment.
- B. Discouraging the location of nonrural uses which do not blend with and complement the rural character.
- C. Maintaining a sufficiently low density and intensity of uses here to make unnecessary the provision of suburban-type improvements, services, facilities and infrastructure.
- D. Avoiding inducement to further extend existing suburban development by leapfrog or infill development.
- E. Preserving from development natural amenities including prime agricultural soils and farms, woodlands, floodplains, steep slopes, stream valleys and rock outcrops.
- F. Encouraging retention of woodlands, hedgerows, and other vegetation to moderate the effects of storms, absorb pollutants and noise, shelter wildlife and provide a diverse natural environment.
- G. Maintaining rural vistas, especially from public areas such as roads and waterways.
- H. Locating housing units and other nonrural uses where they are least visible and hidden by topography or vegetation and thus minimize perceived density.

#### §1002. PERMITTED USES.

A building may be erected, altered or used, and a lot may be used or occupied for the following purposes and no other:

## ZONING

- A. Single-family detached dwelling, using conventional lotting under the standards contained in §1004, herein, or under the standards of the Land Preservation District (LPD) when applied as an overlay in compliance with §1005, herein.
- B. Agriculture.
- C. Accessory uses, in compliance with § of this Chapter.
- D. Natural open space uses of a passive nature and conducted out-of-doors, including wildlife sanctuary, forest preserve, nature center, arboretum, hiking, bicycling or bridle trails.
- E. Game farm, fish hatchery or similar uses designed for the protection or propagation of wildlife.
- F. Wholesale plant nurseries.
- G. Signs in conformance with Part 23.

### **§1003. SPECIAL EXCEPTION USES.**

The following uses are permitted where authorized by approval of a special exception by the Zoning Hearing Board, in compliance with §1006, herein:

- A. Swimming club, day camp, resident camp, tennis court, golf course, country club and other recreational facility of an outdoor nature, whether open to the public or restricted to private membership.
- B. Equine riding academy or boarding stable.
- C. Outdoor meeting place for cultural or artistic endeavors such as concerts or exhibitions.
- D. Wholesale greenhouses.

### **§1004. DIMENSIONAL STANDARDS FOR CONVENTIONAL LOTTING.**

Conventional lotting in this district shall be subject to the following standards:

- A. Minimum Lot Size. Two hundred twenty thousand square feet.
- B. Minimum Width at Front Building Line. Three hundred feet.

- C. Minimum Front Yard. One hundred feet.
- D. Minimum Side Yard. Each 50 feet.
- E. Minimum Rear Yard. One hundred feet.
- F. Maximum Building Coverage. Seven percent.
- G. Maximum Height.
  - (1) For any dwelling, 35 feet.
  - (2) For any building accessory in any dwelling use: 14 feet, not exceeding one story.
  - (3) For any nonresidential building or other structure, 35 feet, except that such height may be increased to a maximum of 60 feet or such increased height as may be warranted when approved by the Zoning Hearing Board for such structures as water towers, barns, silos, chimneys and stacks provided that for every foot of height in excess of 35 feet there shall be added to each yard requirement one corresponding foot of width or depth.

**§1005. STANDARDS FOR LPD LOTTING.**

Land in the RP District may be subdivided in accord with the standards contained in Part 11, "Land Preservation District," of this Chapter, with the exception that the following requirements shall supersede the LPD standards in the Rural Preservation District

- A. Standard single-family detached dwellings shall be permitted by right at a maximum density of one dwelling unit per 5 acres of gross tract area, as neighborhood lotting, otherwise in compliance with §§1104 and 1106.
- B. For nonneighborhood lots taking access from an existing road external to the subdivision, minimum dimensions shall be those of §1004, herein.
- C. The following LPD standards do not apply to LPD development in the RP District:
  - (1) Section 1102(A) and (B), "Permitted Uses."
  - (2) Section 1109, "Conditional Use Standards and Criteria."
  - (3) Section 1111, "Pre-Neighborhood Lotting Standards and Criteria."
  - (4) Section 1112, "Rural Lotting Standards."

§1006. SPECIAL EXCEPTION STANDARDS.

Applications for uses permitted by special exception in §1003 must be accompanied by materials demonstrating compliance with the following:

- A. Appropriate Use. The function of the proposed facility shall be appropriate to the location proposed and not one which would more logically be located in another district. The proposed use shall not have adverse impacts on neighboring uses due to noise, glare, odor, dust, vibration or similar negative effect.
- B. Natural Features. The buildings and uses shall preserve to the maximum extent possible all floodplains, stream valleys, steep slopes, woodlands, prime agricultural soils, and similar environmentally sensitive areas and shall be planned to minimize perceived density or intensity of development. After development, the site shall retain an essentially rural or open character. Easements may be requested by the Board of Supervisors for interconnection of trails and natural features of Township-wide significance.
- C. Road Capacity. The existing rural road system shall be capable of accommodating peak traffic generated by the facility in a safe and efficient manner or be capable of being improved to that level of accommodation without jeopardizing the rural character of the road system.
- D. Visual Compatibility. The proposed facility must demonstrate visual compatibility with its rural surroundings, or provide plans to provide visual buffering with vegetative species compatible with existing species on the site.
- E. Parking Setback. No parking area shall be closer than 50 feet to any property boundary or right-of-way.
- F. Building coverage shall not exceed 10% of the gross tract acreage.
- G. Paving coverage shall not exceed 10% of the gross tract acreage.

**PART 11**

**R-80 LAND PRESERVATION DISTRICT**

**§1101. DECLARATION OF LEGISLATIVE INTENT.**

In expansion of the Declaration of Legislative Intent found in Part 1, § 1101, of this Chapter, and the Statement of Community Development Objectives found in Part 1, § 1102, of this Chapter, the primary purpose of the R-80 Land Preservation District (LPD) is to preserve open land, sensitive natural areas, and rural community character that would be lost under conventional development. In addition, the intent of this district is to permit a reasonable amount of residential development in the form of small, compact neighborhoods of single-family detached homes in an open space setting, located and designed to reduce the perceived intensity of development, preserve natural features and farmland, and provide privacy and neighborhood identity. Specific objectives are as follows:

- A. To provide for a variety of lotting opportunities consistent with the primary purpose of this district.
- B. To preserve open land, including those areas containing unique and sensitive natural feature such as woodlands, steep slopes, streams, floodplains and wetlands, by setting them aside from development.
- C. To preserve scenic views and elements of the Township's rural character, and to minimize perceived density, by minimizing view of new development from existing roads.
- D. To provide greater design flexibility and efficiency in the siting of services and infrastructure, including the opportunity to reduce length of roads, utility rounds and the amount of paving required for residential development.
- E. To create compact neighborhoods with direct visual access to preserved open land, with amenities in the form of neighborhood open space, and with a strong neighborhood identity.
- F. To implement the goals of the Township's comprehensive plan and open space/recreation plan.
- G. To reduce erosion and sedimentation by the retention of existing vegetation and the minimization of development on steep slopes.
- H. To create new woodlands through natural succession and reforestation where appropriate, and to encourage the preservation and improvement of habitat for various forms of wildlife.
- I. To preserve areas of the Township with productive agricultural soils for continued or future agricultural use, by preserving blocks of land large enough to allow for

Lotting," below.

- (c) **Preneighborhood Lotting.** As a one-time option, tracts of 10 acres or more which are otherwise subject to the neighborhood design standards of §1104, herein, may be subdivided to create from one to four new building lots in compliance with the standards and criteria contained in §1111, herein.
  - (2) Open land shall be permitted when comprising a portion of a residential development, as specified above and according to the requirements of §1105, herein.
- B. **Rural Lotting.** Tracts of 60 acres or more may be subdivided into rural lots of a minimum of 30 acres each, in compliance with the rural lotting standards found in §1112, herein, for the following purposes:
  - (1) Agricultural activities of the following types:
    - (a) The cultivation, harvesting and sale of crops and related farm products.
    - (b) The raising and sale of livestock or flow, along with associated pasture and grazing land.
    - (c) Orchards, nurseries, greenhouses and related horticultural uses.
  - (2) Single-family detached dwellings, one per rural lot.
  - (3) Open space uses, primarily passive in nature, including wildlife sanctuary, forest preserve, nature center and similar uses.
  - (4) Game farm, fish hatchery, hunting or fishing preserve; or similar uses designed for the protection or propagation of wildlife.
  - (5) Parks and recreation areas in compliance with the standards and criteria of Part 17, "Institutional and Recreational District," when approved by the Board of Supervisors in compliance with §1707 of Part 17.
- C. Agriculture. [Ord. 93-1]
- D. **Accessory Uses.** Accessory uses shall be permitted on the same lot with and customarily incidental to any permitted use, in compliance with §817, "Accessory Uses," of this Chapter. [Ord. 93-1]
- E. Elder cottages, as defined herein, are only permitted by special exception, subject to the regulations contained in §831 of this Chapter. [Ord. 93-1]

**§1103. INVENTORY, ANALYSIS AND OPTIONAL AND REQUIRED SKETCH PLANS.**

The initial formal application for any subdivision shall include an inventory and analysis of the site. The following site elements shall be inventoried and mapped in sufficient detail to allow evaluation of the plan relative to the intent of this district. Where a conflict occurs between these standards and those of the Township's Subdivision and Land Development Ordinance [Chapter 17], the stricter requirement shall prevail.

- A. **Physical Resources.** Identification of resources associated with the natural environment of the tract, including geology, topography, soils, hydrology and vegetation. These features shall be mapped at a scale of not less than 1 inch equals 100 feet, and shall be briefly described. The maps shall include:
  - (1) Topographic contours at 10 foot intervals, showing rock outcrops and slopes of more than 15%, in compliance with the Steep Slope Conservation District, Part 17, of this Chapter. Applicants are encouraged to use 2 foot contours drawn from aerial photographic sources because of their increased accuracy and practicality.
  - (2) Soil type locations and a table identifying soil characteristics relating to agricultural capability, seasonal high water table, depth to bedrock and suitability for onsite disposal systems, as per the [redacted] County Soil Survey.
  - (3) Hydrologic characteristics of the site, including surface water bodies, floodplains and hydric soils. If a wetlands survey is not provided initially, it shall be provided as part of the preliminary plan submission.
  - (5) Vegetation of the site, defining location and boundaries of woodland areas and vegetation associations in terms of species and size.
- B. **Land Use.** Current land use and land cover (cultivated areas, paved areas, pastures, etc.), all buildings and structures on the land, and all encumbrances, such as easements or covenants.
- C. **Visual Resources.** Scenic views onto the tract from surrounding roads and public areas, as well as view of scenic features from within the tract.
- D. **Cultural and Historic Resources.** Brief description of historic and cultural character of buildings, and structures, if applicable.
- E. **Context.** General outlines of buildings, land use and natural features such as water bodies or wooded areas, roads and property boundaries within 500 feet of the tract. This information may be presented on an aerial photograph at a scale of

not less than 1 inch equals 400 feet.

- F. Optional Sketch Plan. The applicant is strongly urged but not required to submit a sketch plan based on the inventory and analysis for any development in the land preservation district, in order to resolve design issues before investing in engineered preliminary plans.
- G. Required Sketch Plan. A sketch plan for ultimate development shall be submitted and approved prior to phasing of preliminary or final plans in accord with §1110, herein.

**§1104. NEIGHBORHOOD DESIGN STANDARDS.**

The following standards to apply to all residential development proposed under §1102(A)(1)(b), "Neighborhood Lotting," herein:

- A. All lots shall be grouped into neighborhoods which shall contain at least five, but not more than 25 lots, and are surrounded by open land.
- B. The maximum or minimum number of lots in a neighborhood may be increased or decreased, and neighborhoods may be assembled into larger groupings with the approval of the Board of Supervisors. However, the applicant must demonstrate that such an alternative plan is more appropriate for the tract in question, and will meet both the general intent and design standards of this Chapter, rather than being intended solely for economic savings.
- C. Neighborhoods are defined by the outer perimeter of contiguous lotted areas or abutting roads and may contain lots, roads and neighborhood open space.
- D. A plan may contain one or more neighborhoods.
- E. The outer boundaries of each neighborhood shall meet the neighborhood setback requirements specified in §1107(3), herein.
- F. Neighborhoods shall be located on areas of the tract which are relatively free of sensitive environmental features. At a minimum, neighborhoods shall not encroach upon:
  - (1) Floodplain or wetlands.
  - (2) Lands designated for open space in the Township Comprehensive Plan, Open Space and Recreation Plan or Official Map.
  - (3) Steep slopes, as regulated by the Steel Slope Conservation District, Part 18 of this Chapter.

## ZONING

- G. Disturbance to woodlands, hedgerow, mature trees or other significant vegetation shall be minimized.
- H. Prime farmland soils, and large tracts of contiguous land, suitable for agricultural use, shall be preserved when the Board of Supervisors determines this to be a priority for a tract of land or area of the Township.
- I. Neighborhoods shall be defined and separated by open land in order to provide direct access to open space and privacy to individual yard areas. Neighborhoods may be separated by roads if the road right-of-way is designed as a parkway and meets the setback requirements in §1107(3), herein.
- J. Views of neighborhoods and developed areas of estate lots from exterior roads shall be minimized by the use of changes in topography, existing vegetation or additional landscaping. [Ord. 93-1]
- K. All lots in a neighborhood shall take access from interior roads, rather than roads exterior to the tract.
- L. All lots in a neighborhood shall face neighborhood open space or other open land (directly or across a road) to either the front or the rear for a distance of no less than 30 feet.
- M. Neighborhood Open Space Standards. A neighborhood with ten or more residential lots must provide neighborhood open space which shall:
  - (1) Count as part of the minimum 75% open land requirement.
  - (2) Be provided at the rate of 1,000 square feet per lot in the neighborhood it serves.
  - (3) Be central to the neighborhood it serves.
  - (4) Provide a minimum of 100 feet of road frontage in the neighborhood it serves.
  - (5) Be permitted to contain stormwater detention basins or parking areas, but these shall not be included in the required 1,000 square feet per lot.
  - (6) Take the form of a "parklet," landscaped island or "village green."
    - (a) Parklet.
      - 1) Road frontage on one side, other open land on at least one side.
      - 2) Should contain walking, sitting, tot-lot and lawn areas and other elements to create a visual and social focal point for the neighborhood.

(b) Landscaped Island.

- 1) Surrounded by roads.
- 2) May be used as a media divider between two one-way cartways; minimum width 35 feet.
- 3) May be used in the center of an enlarged turnaround area of a cul-de-sac road.
- 4) May be used as a visual focal point and/or landscaped divider.

(c) Village Green. A parklet located within an landscaped island.

N. Neighborhood Recreation Area Standards. Each neighborhood with five or more residential lots shall be provided with a neighborhood recreation area in compliance with the following standards:

- (1) Neighborhood recreation areas shall be provided at the rate of 4,000 square feet per lot, with a minimum of 40,000 square feet per neighborhood, suitable for active noncommercial recreation use adjacent to the neighborhood.
- (2) Neighborhood recreation areas shall be improved by the developer of the subdivision and shall be maintained by the subdivision's homeowners association.
- (3) These areas shall count as part of the minimum required 75% open land, and shall be provided in addition to the neighborhood open space.

[Ord. 93-1]

**§1105. OPEN LAND STANDARDS.**

Under the neighborhood standards, 75% of each tract is required to be set aside as protected open land and shall meet the following standards:

A. The following uses are permitted in open land areas:

- (1) Conservation of open land in its natural state (for example, woodland, fallow field or managed meadow).
- (2) Agricultural uses, including raising of crops or livestock, and farm buildings.

## ZONING

- (3) Neighborhood open space as specified in §1104(M), herein.
  - (4) Passive noncommercial recreation including, but not limited to, trails, picnic areas, community gardens and lawn areas:
  - (5) Active noncommercial recreation areas intended to serve one or more neighborhoods, such as playfields, playgrounds and courts, meeting the setback requirements in §1107(C), herein.
  - (6) Water supply and sewage disposal systems for neighborhoods, the entire development, or for individual estate lots when located entire within the lot being served.
  - (7) Pasture for recreation horses (at a rate not exceed one horse per 2 acres).
  - (8) Easements for drainage, access, sewer or water lines or other public purposes.
  - (9) Stormwater management facilities for the proposed development, or for a larger area in compliance with a watershed stormwater management plan (adopted in accord with Act 167, the Stormwater Management Act of 1978).
  - (10) Parking areas of ten or fewer spaces where necessary to serve active recreation facilities.
  - (11) Above-ground utility and road rights-of-way, except that their land areas shall not count toward the required minimum 75% total open land requirement.
  - (12) Estate lots, in compliance with §1107(B), herein. [Ord. 93-1]
- B. Open land areas shall be located and designed to:
- (1) Protect site features identified in the inventory and analysis as having particular value, in compliance with the intent of this Chapter.
  - (2) Comply conceptual with the recommendations of the Township's Open Space Plan and/or Comprehensive Plan, where specified.
  - (3) Maximize common boundaries with open land on adjacent tracts as shown in the comprehensive plan or as otherwise required by the Board of Supervisors in the interest of good planning and design.
- C. Safe and convenient pedestrian and maintenance access shall be provided to open land areas that are not used for agricultural purposes.
- (1) Each neighborhood shall provide one centrally located access point per 25 lots, a minimum of one lot wide.

- (2) Access to open land used for agriculture may be appropriately restricted for public safety and to prevent interference with agricultural operations.
- (3) Public access to estate lots is not required.

D. The following are prohibited in open land areas:

- (1) Use of motor vehicles except within approved driveways and parking areas. Maintenance, law enforcement, emergency and farm vehicles are permitted, as needed.
- (2) Cutting of healthy trees, regrading, topsoil removal, altering, diverting or modifying water courses or bodies, except in compliance with a land management plan for the tract in question, conforming to customary and accepted standards of forestry, erosion control and engineering.

E. Natural features shall generally be maintained in their natural condition, but may be modified to improve their appearance, functioning, or overall condition, as recommended by experts in the particular area being modified. Permitted modifications may include:

- (1) Reforestation.
- (2) Woodland management.
- (3) Meadow management.
- (4) Buffer area landscaping.
- (5) Streambank protection.
- (6) Wetlands management.

(Ord. 91-3, 11/21/1991, §1104; as amended by Ord. 93-1, 7/8/1993, §7)

**§1106. OWNERSHIP AND MAINTENANCE OF COMMON FACILITIES AND OPEN LAND.**

1. Ownership and maintenance of common facilities and open land shall be provided for in accordance with the regulations in §809 of this Chapter. In addition, all open land shall be permanently restricted from future subdivision and development that is inconsistent with the standards of §1105, "Open Land Standards," herein, and further restricted by use of open land easements among at least three parties consisting of Upper Frederick Township, the subdivision's homeowners association, and one or more conservation and open space oriented organizations such as land trusts and conservancies including, but not limited to, the following: the \_\_\_\_\_, the \_\_\_\_\_, the \_\_\_\_\_ and the \_\_\_\_\_.

ZONING

[Ord. 93-1]

- 2. In accord with §809 of this Chapter, the following methods of ownership may be used, either individually or in combination:
  - A. Fee simple dedication to the Township, although the Township need not accept the offer of dedication.
  - B. Condominium association.
  - C. Homeowners association.
  - D. Easements for Township or County open space purposes.
  - E. Transfer to a private conservation organization, including various forms of conservation easements.
  - F. Deed restrictions and/or easements on estate lots.
  - G. Other methods acceptable to the Board of Supervisors.

[Ord. 93-1]

- 3. Maintenance. Unless otherwise agreed to by the Board of Supervisors, the cost and responsibility of maintaining common facilities and open land shall be in compliance with §809 of this Chapter. If the facilities are not properly maintained, the Township may assume responsibility of maintenance and assess costs as stipulated in §809 of this Chapter.

(Ord. 91-3, 11/21/1991, §1105; as amended by Ord. 93-1, 7/8/1993, §8)

§1107. DENSITY AND DIMENSIONAL STANDARDS.

All development and use of land within the R-80 Land Preservation District, except rural lotting, shall comply with the applicable requirements of this Section.

- A. Single-Family Detached Dwellings. Single-family detached dwellings in compliance with §1102(A)(1):

	<u>Conventional</u>	<u>Neighborhood</u>
(1) Minimum Tract Size	---	10 ac
(2) Minimum Common Open Space Land (% of gross tract acreage)	---	75%

ZONING

[Ord. 93-1]

- 2. In accord with §809 of this Chapter, the following methods of ownership may be used, either individually or in combination:
  - A. Fee simple dedication to the Township, although the Township need not accept the offer of dedication.
  - B. Condominium association.
  - C. Homeowners association.
  - D. Easements for Township or County open space purposes.
  - E. Transfer to a private conservation organization, including various forms of conservation easements.
  - F. Deed restrictions and/or easements on estate lots.
  - G. Other methods acceptable to the Board of Supervisors.

[Ord. 93-1]

- 3. Maintenance. Unless otherwise agreed to by the Board of Supervisors, the cost and responsibility of maintaining common facilities and open land shall be in compliance with §809 of this Chapter. If the facilities are not properly maintained, the Township may assume responsibility of maintenance and assess costs as stipulated in §809 of this Chapter.

(Ord. 91-3, 11/21/1991, §1105; as amended by Ord. 93-1, 7/8/1993, §8)

§1107. DENSITY AND DIMENSIONAL STANDARDS.

All development and use of land within the R-80 Land Preservation District, except rural lotting, shall comply with the applicable requirements of this Section.

- A. Single-Family Detached Dwellings. Single-family detached dwellings in compliance with §1102(A)(1):

	<u>Conventional</u>	<u>Neighborhood</u>
(1) Minimum Tract Size	---	10 ac
(2) Minimum Common Open Space Land (% of gross tract acreage)	---	75%

	<u>Conventional</u>	<u>Neighborhood</u>
(3) Maximum Density (Based on gross tract acreage)	1 du/2ac	1 du/2ac
(4) Minimum Lot Size	80,000 sq. ft.	16,000 sf (see §1107(A)(13), below)
(5) Maximum Lot Size	--	2 acres
(6) Minimum Lot Width	200 ft.	90 ft.
(7) Minimum Front Yard	200 ft.	25 ft.
(8) Minimum Side Yard	40 ft. each	25 ft. each
(9) Minimum Rear Yard	60 ft.	25 ft.
(10) Maximum Building Coverage (% of lot area)	5%	15%
(11) For conventional lotting, the installation of sidewalks along roads external to the site may be waived by the Board of Supervisors when the applicant provides an easement 50 feet wide along the street's ultimate right-of-way for trail, path or walkway use.		
(12) If central sewers and water are available, tracts of less than 10 acres may be developed in strict compliance with the "neighborhood" standards of this district, including small lots taking access from a new, internal road, and providing large setbacks from tract boundaries and ultimate right-of-way.		
(13) The minimum required lot size of 16,000 square feet may be reduced to 12,000 square feet by special exception where site design would be unduly restricted by one or more of the following:		
(a) Excessive site coverage by:		
1) Steep slopes as defined in Part 18 of this Chapter.		
2) Floodplain, wetlands or bodies of water.		
3) Bouldery terrain or rock outcroppings, including areas classified by the Soil Survey of ... County as limited by stones and shallow depth to bedrock.		
4) Woodlands.		
(b) Desire to retain most of the site in agriculture.		
(c) Unusual shape or dimensions of a tract that restrict the layout of lots.		

- (d) Constraints imposed by preneighborhood and/or estate lots.
- (e) Constraints imposed by existing residential or agricultural buildings.

B. Estate Lot Standards. When estate lots are proposed, as permitted under §1105(A)(12), herein, the following standards shall apply:

(1) Estate Lot Dimensional Standards.

- (a) Minimum Lot Size. Four acres.
- (b) Maximum Lot Size. Seven acres.
- (c) Minimum Lot Width. Two hundred feet.
- (d) Minimum Building Setback From All Lot Boundaries: Fifty feet (applies to principal and accessory buildings).
- (e) Maximum Building Coverage. Five percent of estate lot areas (applies to principal and accessory buildings).

(2) Developed Area/Open Land.

- (a) The maximum area of an estate lot that may be developed to include one dwelling, accessory structures, paved areas, lawns and other residentially landscaped areas and similar improvements shall be 50% of the estate lot area, and shall not count toward the 75% open land requirements.
- (b) The remaining estate lot area (50%) shall be retained in its natural state or be used for agriculture, reforestation, managed meadow or other open land uses permitted under §1105(A), herein, and may be counted toward the minimum 75% open land requirement of §1107(A)(2).

(3) Number of Estate Lots Permitted.

- (a) For tracts of less than 60 acres, one estate lot is permitted.
- (b) For larger tracts, the following maximums apply:
  - 1) Sixty or More Acres. Two estate lots.
  - 2) Ninety or More Acres. Three estate lots.
  - 3) One Hundred Twenty or More Acres. Four estate lots.
  - 4) For each additional increment of 30 acres, add one estate lot.

- (4) The dwelling on an estate lot shall be counted toward the maximum density permitted under the ultimate development plan for the tract.
- (5) The lot shall be restricted by permanent deed restrictions and open land easements against further subdivision and development or use inconsistent with the open land standards of §1105, herein.
- (6) Ultimate Development.
  - (a) Estate lots shall be permitted only as a part of an ultimate development plan, or as a phase of an ultimate development plan, which is drawn in compliance with the neighborhood design standards found in §1104, herein.
  - (b) Dwellings and the developed areas of estate lots shall not encroach upon floodplains, wetlands or steep slopes.

C. Neighborhood Setbacks. The outer boundaries of all neighborhoods shall meet the following setbacks. The boundary is defined as the outer edge of lots abutting open land, or of roads adjacent to the fronts of those lots.

- (1) From external road ultimate rights-of-way as defined by the Township 200 feet
- (2) From all other tract boundaries 100 feet
- (3) From cropland or pasture land 100 feet
- (4) From buildings or barnyards housing livestock 300 feet
- (5) From all other residential neighborhoods and from estate lot property line 100 feet
- (6) From wetlands, floodplains or watercourses 25 feet
- (7) From active recreation areas such as courts or playing fields (not including tot-lots) 150 feet
- (8) All setback areas along external roads, including areas on estate lots, shall be landscaped according to the standards of the Subdivision and Land Development Ordinance [Chapter 22] in order to preserve scenic views and integrate the neighborhood into the surrounding landscape. Suggested methods compatible with rural character included deciduous reforestation, hedgerows and/or naturalistic plantings and land forms.
- (9) Setback standards may be reduced by the Board of Supervisors under the

following circumstances:

- (a) Setbacks from external roads may be reduced to a minimum of 100 feet if the applicant can demonstrate, to the satisfaction of the Board of Supervisors, that existing vegetation and/or topography form an effective visual buffer along these roads, or where natural features seriously constrain strict compliance with the 200 foot requirement, and additional landscaped buffering will be provided to reduce the visual impacts, acceptable to the Board of Supervisors.
- (b) All other setbacks may be reduced to half of the requirements specified above if the applicant can demonstrate, to the satisfaction of the Board of Supervisors, that reduced setbacks improve the plan's compliance with the neighborhood design standards in §1104, herein, the intent of this Chapter, and other goals of the comprehensive plan.

**D. Application of Neighborhood Setbacks to Other Lotting.**

- (1) The neighborhood setbacks of §1107(C)(1), (2) and (5) shall also apply to the entire lot area of preneighborhood lots and estate lots so that ultimate development of the tract shall be completely surrounded by a band of common open land suitable for buffer, recreation and/or trail purposes.
- (2) An exception to subsection (1), above, may be made for an estate lot intended to contain an existing farmstead, if a minimum 50 foot open land easement is provided along the estate lot boundaries in the areas that would otherwise comprise the required neighborhood setbacks.

**§1108. SEWAGE AND WATER FACILITIES.**

**1. Water Supply.**

- A. Dwellings on lots of 40,000 square feet or more may be served by individual onlot wells.
- B. All other dwellings shall be served by centralized water supply facilities.

**2. Sewage Disposal.**

- A. Dwellings on lots of less than 80,000 square feet shall be served by centralized, common or shared sewage disposal systems.
- B. When common or shared sewage disposal systems use a portion of the open land area, easements shall be required, as appropriate.

3. All sewage disposal shall conform to the Townships Official Sewage Facilities Plan (Act 537), as amended, and may include the following alternatives:
  - A. Public sewers where available.
  - B. Individual onlot systems, employing subsurface disposal or spray irrigation on open land.
  - C. Centralized, community or shared systems employing subsurface disposal or spray irrigation on open land or stream discharge.

**§1109. CONDITIONAL USE STANDARDS AND CRITERIA FOR CONVENTIONAL LOTTING.**

In order to use conventional lotting on tracts of 10 acres or more for single-family detached dwellings with no common open land, in compliance with §1102(A)(1)(a)(2), herein, the applicant must demonstrate to the satisfaction of the Board of Supervisors, conformance with the following standards and criteria: [Ord. 93-1]

- A. The tract in question is unsuitable for neighborhood development due to factors such as the size or shape of the tract or the location of natural features.
- B. Where the property is wholly or partially in agricultural use, that the property is not feasible for continued or future agricultural use due to its physical characteristics. Existing features such as soil conditions, rock outcroppings, wooded areas, the tract's shape or size, past farming activities, and suitability for efficient use of farm machinery shall be considered.
- C. The proposed development will not have a disruptive effect on the existing topography, floodplains, wetlands, mature woodlands or other natural features on the site.
- D. A complete environmental and visual inventory of the site has been submitted, as specified in §1103, herein.
- E. The proposed development shall be consistent with good design principles and land development practices. Specifically, it shall be designed to minimize view of dwellings from exterior roads and to avoid "stripping out" of lots along these roads. Minimum building setback lines from the external road ultimate right-of-way and other tract boundaries shall be as required in §1107(C)(1) and (2), herein.
- F. The tract in question can be developed in a manner consistent with community goals as expressed in the Comprehensive Plan/Open Space Plan.

**§1110. PHASING OF ULTIMATE DEVELOPMENT.**

When an ultimate development plan for a tract has been approved as a sketch plan, and has been made a part of a binding subdivision and land development agreement between the applicant and the Township, then the preliminary and final plans may be implemented in phases in compliance with the following:

- A. Phases shall be logically delineated along defined limits including tract, neighborhood and open land area boundaries, estate lot lines and ultimate right-of-way lines of streets internal and external to the development.
- B. A phase may contain one or more of the following in logical combinations:
  - (1) Neighborhood.
  - (2) Estate lot.
  - (3) Open land area.
  - (4) Road right-of-way.
- C. An ultimate development plan may be phased in a variety of ways depending on the goals of the owner/subdivider including:
  - (1) All estate lots or all neighborhood lots, with required open land.
  - (2) A mix of estate lots and neighborhood lots, with required open land.
  - (3) One or more estate lots and/or neighborhoods, with the remaining land functioning as a large residual parcel, such as may be retained as farmland, although the ultimate development plan may show additional lotting of the residual parcel.
  - (4) Other combinations that may be approved by the Board of Supervisors, upon recommendation of the Township Planning Commission.
- D. Every lot proposed in the ultimate development plan shall be subject to the overall legal agreements regarding all the elements of the ultimate development plan including, but not limited to:
  - (1) Maximum number of lots, lot and road layout and open land areas.
  - (2) Membership, rights and responsibilities regarding a homeowner's association or other similar entity.
  - (3) Water supply and sewage disposal.

- (4) Future phases, including phased construction of neighborhoods in accordance with the approved ultimate plan.

**§1111. PRENEIGHBORHOOD LOTTING STANDARDS AND CRITERIA.**

Preneighborhood lotting permits creation of a limited number of new building lots prior to submission of ultimate development plans under the neighborhood design standards, without compromising the beneficial aspects of this district to preserve rural character and invaluable natural features. Therefore, preneighborhood lotting shall be permitted on tracts of 10 acres or more in compliance with the process, standards and criteria of this Section. The applicant shall do the following:

- A. Determine the number of new building lots permitted from the following table.

Total Gross Tract Acres	New Building Lots Permitted
10 to 14.9	1
15 to 24.9	2
25 to 34.9	3
35 or more	4

- (1) One existing dwelling may remain on the residual tract area, in addition to creating new building lots.
  - (2) Not more than four new building lots shall be permitted in any case because five new lots constitutes a neighborhood, as defined herein, which should be designed in compliance with the neighborhood design standards, herein.
- B. Prepare an inventory and analysis as required by §1103, herein, and submit a sketch plan for subdivision of preneighborhood lots in compliance with the standards of Township's Subdivision and Land Development Ordinance [Chapter 22]. Following agreement on the sketch plan concept, preliminary plans should be submitted.
    - (1) Minimum Lot Size. Fifty thousand square feet.
    - (2) Maximum Lot Size. Eighty thousand square feet.
    - (3) Minimum Lot Width. One hundred fifty feet (may be measured as width or depth).
    - (4) Minimum Building Setback From All Lot Boundaries. Fifty feet.

[Ord. 93-1]

- C. Locate the lots in a manner that will not interfere with ultimate development under the neighborhood design standards, herein. The applicant is advised that the use of preneighborhood lots may limit ultimate development of the tract to fewer total lots than would be possible without the use of preneighborhood lots.  
[Ord. 93-1]
- D. Provide only one vehicular access to the new lots which shall be either:
  - (1) Suitable and reserved for future use as access to the ultimate development.
  - (2) Replaced by revised access internal to the ultimate development when available.
- E. Ensure that onlot water supply and sewage disposal can be provided for each lot.
- F. Sign written agreements with the Township and deed restrict the preneighborhood lots and residual parcel to the effect that:
  - (1) The original tract area prior to preneighborhood lotting shall be used as the basis for ultimate development under the neighborhood design standards, herein.
  - (2) Preneighborhood lots shall be included in the total number of lots permitted under ultimate development.
  - (3) The approval of one or more preneighborhood lots has been exercised as a one time option, and that any further subdivision shall comply with §1102(A)(1)(b), "Neighborhood Lotting," which includes preparation of an ultimate development plan and preservation of at least 75% of the entire original tract as open land.
  - (4) These arrangements and deed restrictions shall be noted or referenced on the recorded plan for preneighborhood lotting and the written agreements shall be referenced on the deeds for preneighborhood lots, the residual parcel and all future lotting of the original tract.
  - (5) These lots may be required to connect into community systems when provided under neighborhood lotting.

[Ord. 93-1]

§1112. RURAL LOTTING STANDARDS.

Rural lotting permits limited subdivision of large tracts into small tracts for the purposes listed in §1102(B), herein, and future subdivision under preneighborhood lotting standards, listed in §1102(A), herein, and shall comply with the following standards:

- A. The applicant shall prepare an inventory and analysis as required by §103, herein, and is encouraged to submit a sketch plan for subdivision of rural lots in compliance with the Township's Subdivision and Land Development Ordinance [Chapter 22] and the standards herein. Following agreement on the sketch plan concept, preliminary plans should be submitted.
- B. Each rural lot shall be appropriately configured and contain suitable land areas for future subdivision under the neighborhood lotting and design standards, herein, and comply with the following standards.
  - (1) Every lot resulting from a rural lotting subdivision shall provide a minimum gross acreage of 30 acres, a minimum width of 500 feet for the full depth of the lot and a minimum depth of 500 feet for the full width of the lot.
  - (2) Setbacks, Location of Buildings and Other Improvements:
    - (a) Neighborhood setbacks required by §1107(C)(1) and (2), shall be provided along the entire perimeter of a rural lot.
    - (b) Building setbacks shall be 50 feet from the neighborhood setbacks, toward the interior of the tract, for principal and accessory buildings.
    - (c) The applicant is advised that the location of buildings and other improvements on a rural lot should consider their future impacts on ultimate development of the parcel.

[Ord. 93-1]

- (3) If a rural lot cannot meet these standards, it shall be permanently deed restricted against future subdivision because of its severe constraints.



## **Concluding Statement and Endorsement**

All of the above data and Plan Recommendations for the Two Rivers Area Watershed Conservation Plan has been formally and publicly reviewed. The following public endorsement of this data and Plan Recommendations is endorsed, as per the following resolution by the Two Rivers Area Council of Governments. The public at large is hereto advised that all these findings and Plan Recommendations shall serve as this area's primary guide and basis for all future initiatives to conserve, protect and manage the following resources within the Two Rivers Area:

- Geologic and Soil Conservation Features
- Forest Cover and its Affiliated Habitat Area(s) and Affiliated Open Space/Scenic Areas
- Karst/Sinkhole Geology and Groundwater System(s)
- Open Space and Recreational Resources
- Agricultural Economic Retention and Lands Conservation
- Basic Organizational/Intermunicipal Framework

For here and into the future, the following basic resolution to initiate and effect this cooperative is placed before the public.

## **Addenda #1**

### **Commentary by the Bushkill Stream Conservancy**

During the course of the conduction of the Two Rivers Area- River Conservation Plan, the Bushkill Stream Conservancy submitted the following Goals and Recommendations. These Goals and Recommendations are supplied in this study as an addenda. Respectfully, a careful reading of the Two Rivers Area-River Conservation Plan should reveal to the reader that many of these points are taken into consideration within this plan, although the wording is not precisely the same. In conclusion, other points brought up by the Bushkill Stream Conservancy are to be directly addressed more appropriately during the conduction of the Two Rivers Area Greenway Plan, to begin in the year 2001.

# ***Bushkill Creek Watershed Management Plan Goals and Recommendations***

*The Bushkill Stream Conservancy has compiled the following recommendations for the Bushkill Creek Watershed which were submitted by its partner organizations for inclusion in the formal watershed plan currently being developed under the DCNR River's Conservation Grant received by the Northampton County Council of Governments (COG) in 1995. The Conservancy looks forward to working with COG in the coordination and implementation of the following goals, objectives and recommendations:*

## ***Goal 1. Land Preservation and Conservation***

### **Objective 1. Preserve of Existing Greenways in the Bushkill Creek Corridor**

**Recommendation:** Working with Bushkill Township, develop and implement a greenway plan for the upper portion of the Watershed which will include specific land use and land acquisition strategies to protect/preserve the significant natural and historical resources within the Township.

### **Objective 2. Enhance and Establish Riparian Buffers.**

**Recommendation:** Working with Watershed municipalities, encourage the inclusion of riparian buffer zone requirements in the review process for all proposed development plans.

### **Objective 3. Preserve Remaining Woodland, Farmland and Open Space**

**Recommendation:** Assist Watershed municipalities in the establishment of conservation easement programs for the preservation of woodlands and open space within the Watershed.

**Recommendation:** Working with the Northampton County Conservation District, promote and implement identified farmland preservation projects within the Watershed.

**Objective 4. Preserve Existing Watershed Wetlands.**

**Recommendation:** Develop and implement a plan for the preservation of those significant wetlands in the upper portion of the Watershed which have been identified by the *Natural Area Inventory* completed by the Nature Conservancy and the Lehigh Valley Joint Planning Commission

**Objective 5. Preserve Identified Watershed Natural Areas of Regional and Statewide Significance.**

**Recommendation:** Incorporate the natural areas of regional and statewide significance identified by the *Natural Areas Inventory* completed by the Nature Conservancy and the Lehigh Valley Joint Planning Commission into greenway preservation/conservation planning efforts for the upper Bushkill Creek Watershed

**Objective 6. Establish and Maintain an Accurate Watershed Mapping and Inventory Management System**

**Recommendation:** Apply for and acquire a grant for Arcview software from DCNR's Rivers Conservation program.

**Recommendation:** Acquire an up-to-date GIS disc from the Lehigh Valley Joint Planning Commission for use during the implementation of the Bushkill Creek Watershed Management Plan.

**Recommendation:** Working with the Lehigh Valley Joint Planning Commission, create accurate digital mapping of Bushkill Creek Watershed. existing and potential environmental problems and of significant Watershed natural and historical resources. Layers of mapping information will include: existing and potential environmental problems, significant natural and historical resources, existing land use, zoning, soils, geology, wetlands, floodplains, sinkholes, proposed development, proposed and existing park and recreation areas, wellhead protection areas, existing open space/greenways, etc.

**Recommendation:** Create a database of current riparian landowners of the Bushkill Creek Watershed.

## ***Goal 2. Protection and Enhancement of the Stream Environment***

### **Objective 1. Improve Municipal Land Use Planning and Ordinances**

**Recommendation:** Working with all Watershed municipalities, incorporate a formal Watershed impact assessment as part of the review process for all proposed development.

**Recommendation:** Work closely with Bushkill Township in its current efforts to update its Comprehensive Plan and subsequent review and revision of its zoning ordinances to insure adequate protection of open space, greenways and stream habitat in the upper Bushkill Creek Watershed.

**Recommendation:** Fill vacant Bushkill Stream Conservancy Board vacancies with representatives from Bushkill, Plainfield and Moore Townships, and the Northampton County Federation of Sportsmen.

**Recommendation:** Working with Bushkill and Plainfield Townships, determine and mitigate potential negative impact on the Bushkill Creek and the landscape of the Boulton portion of the Jacobsburg National Historic district of commercial development spurred by the planned extension of RT. 33 to Interstate 78.

### **Objective 2. Implement Stream Rehabilitation and Fish Habitat Improvement Projects**

**Recommendation:** Develop plan for identification of specific sites on the Upper Bushkill Creek Watershed in need of stream habitat improvement measures.

**Recommendation:** Develop plan for identification of specific sites on the Little Bushkill Creek Watershed in need of stream habitat improvement measures.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion and re-establish fish habitat above and below Uhler Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install boulders for fish habitat at Equipto, Inc. pool.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at springhouse below Bushkill Street (Tatamy) bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion>

**Recommendation:** Move boulders at both pipeline crossings above Newlin's Mill Road to minimize debris collection. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Newlin's Mill Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion above Stocker Mill Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Schoeneck Creek. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion, remove heavy siltation and re-establish fish habitat above dam at Penn Pump and Lions Park. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion, remove heavy siltation and re-establish fish habitat above Bushkill Park Road bridge. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install in-flow deflectors and rip-rap at "Meadow" section of Special Regulations Area (SRA). Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at proposed Lafayette/Bushkill Drive Overlook. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Easton Cemetery bridge (Bushkill Drive). Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Install deflectors and rip-rap to correct excessive erosion at Union Fuel (Bushkill Drive). Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

### **Objective 3. Remove Stream Obstructions**

**Recommendation:** Removal of Stocker dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant trees/shrubs to minimize future erosion.

**Recommendation:** Removal of Penn Pump dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of Binney & Smith dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of Elementis/Minerals Technologies dam to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of dam at Scott Auto Service (Easton) to decrease siltation and erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

**Recommendation:** Removal of 7<sup>th</sup> Street dam (Easton) to decrease siltation and erosion.

**Recommendation:** Removal of 3<sup>rd</sup> Street dam (Easton) to decrease siltation and erosion. Install deflectors and rip-rap to correct excessive erosion. Install other boulders at this area for fish habitat. Plant shrubs/trees to minimize future erosion.

### **Objective 4. Lessen Impact of Point Source Pollution**

**Recommendation:** Working with DEP and Einfalts salvage yard, determine and mitigate stream pollution potential from site recycling activities.

**Recommendation:** Working with DEP and the current owner of the pressure treated lumber operation near Stockertown, determine and mitigate stream pollution potential from pressure treating operation.

**Recommendation:** Working with DEP, ESSROC and Hercules cement Companies, develop and implement a plan for the use of constructed wetlands to reduce sedimentation load on the Schoeneck Creek.

### **Objective 5. Lessen Impact of Non-Point Pollution**

**Recommendation:** Working with DEP, PDA, NRCS, Penn State Cooperative Extension Service, and the Northampton County Conservation District, promote and encourage the use of Best Conservation Management Practices by farmers to conserve and protect the quality and quantity of the soil and water in the Bushkill Creek Watershed. These agencies, along with other participating partners, will continue to develop and support programs which will economically and technically assist the farmers of Northampton County to protect and conserve their land and water resources.

**Recommendation:** (Add here specific recommendation for upper Bushkill Watershed BMP's included in Growing Greener grant application)

**Recommendation:** Working with DEP, PennDOT, the Northampton County Conservation District, and local municipalities, study, monitor and correct run-off pollution effects on water quality from agricultural, residential and roadside application of herbicides.

**Recommendation:** Working with DEP and the Northampton County Conservation District, study, monitor and correct run-off pollution effects on water quality of agricultural and residential application of fertilizer.

**Recommendation:** Working with PennDOT and local municipalities, study, monitor and stop roadside oil application in the upper reaches of the Bushkill Creek Watershed.

### **Objective 6. Prevent Groundwater Pollution**

**Recommendation:** Working with DEP, the Northampton County Conservation District, and local municipalities, install innovative alternative sewage treatment facilities for residential development in the upper Bushkill Creek Watershed.

**Recommendation:** Work directly with DEP and the current owner of the land fill operation on the Little Bushkill Creek to establish permanent monitoring of groundwater in this area.

**Recommendation:** Working with DEP and Einfalt's salvage yard, establish groundwater monitoring in the vicinity of the site's recycling activities.

**Recommendation:** Working with DEP and the owner of the pressure treated lumber operation near Stockertown, establish groundwater monitoring in the vicinity of the treatment plant.

**Recommendation:** Working with DEP and the Lehigh Valley Joint Planning Commission, determine and improve well head protection in the upper Bushkill Creek Watershed.

**Objective 7. Improve Erosion and Sedimentation Control Practices**

**Recommendation:** Plan and implement erosion control measures for the Palmer duck feeding area.

**Recommendation:** Plan and implement effective erosion control measures at the old Boulton Gun Factory dam site and at the main public stream access area in the Henry Woods area of Jacobsburg EE Center.

**Objective 8. Improve Stormwater Management Practices**

**Recommendation:** Working with the appropriate Watershed municipality, conduct a review of current stormwater management practices for existing developments to insure implementation of current BMP's.

**Objective 9. Implement Roadside Cleanup and Beautification Projects**

**Recommendation:** Working with PennDot's Adopt a Highway program and local service groups and organizations, promote and coordinate the cleanup and litter maintenance of all streamside roadways within the Watershed.

**Objective 10. Insure Adequate Stream Flow**

**Recommendation:** Working with ESSROC Cement Company, establish continued quarry pumping operations during times of low stream flow.

**Objective 11. Lessen Impact of Non-Native, Invasive Plant Species in Significant Watershed Natural Areas**

**Recommendation:** Joining efforts currently underway at Jacobsburg EE Center, direct volunteer efforts to non-native, invasive plant removal at Jacobsburg, Stocker Mill Road wetland, and other key Watershed natural areas.

**Recommendation:** Promote the use of native plants in all riparian improvement and land conservation projects within the Watershed.

**Objective 12. Improve Regulatory Protection of the Bushkill Creek and Its Tributaries**

**Recommendation:** Working with DEP and local conservation agencies, acquire "exceptional quality" designation for the Bushkill Creek and its tributaries.

***Goal 3. Water Quality Monitoring and Analysis***

**Objective 1. Improve Chemical and Biological Monitoring and Analysis of the Bushkill Creek and Its Tributaries.**

**Recommendation:** Working with Jacobsburg EE Center, Easton High School, and local colleges and universities, review and improve the effectiveness and coordination of current water quality monitoring efforts in the Watershed.

**Objective 2. Establish Effective Analysis, Management and Distribution of Water Quality Data**

**Recommendation:** Working with DEP and Jacobsburg EE Center, establish a viable system and responsibility for the analysis, management and distribution of Bushkill Creek water quality data. Establish a formal avenue for recommendations for action based on analysis of data.

**Objective 3. Establish a Groundwater Monitoring System within the Watershed**

**Recommendation:** Develop and implement a groundwater monitoring plan for landfill effluent in the Little Bushkill Creek sub-basin and other sites with the potential for significant groundwater pollution.

***Goal 4. Increase Environmental Awareness, Knowledge, Skills and Stewardship Commitment Among Those Living and Working in the Bushkill Creek Watershed In Order To Create the Action(s) Needed To Correct Current Ecological Problems and Prevent New Ones from Developing***

**Objective 1. To provide environmental, heritage, and cultural education opportunities for school groups, the general public, and local government and business leaders that will provide:**

- **An understanding that those who live and work in the Bushkill Creek Watershed are an inseparable part of its ecosystems and whatever humans do or do not do may alter the health of the Watershed.**
- **A basic knowledge of the natural laws which govern the environment of the Bushkill Creek Watershed; of the skills needed to solve its environmental problems; and recognition of each individual's responsibility to find solutions to the environmental problems of the Watershed.**
- **The development of a stewardship ethic that leads to the conservation of the Bushkill Creek Watershed's natural, historical, and cultural heritage, and to the correction and prevention of environmental degradation in the Watershed.**

**Recommendation:** Continue to support and expand the environmental and heritage education program services of DCNR's Jacobsburg Environmental Education Center within the Watershed. Specifically, the Bureau of State Parks' formal Watershed and Land Use education programs will be provided to secondary students and the implementation needs of this watershed plan will be integrated into their learning experience.

**Recommendation:** Focus Jacobsburg EE Center's program services on supporting the implementation needs of this plan. Watershed management-focused programs will be delivered to students of all ages, local business and governmental leaders, and to the general public.

**Recommendation:** Provide educational programming that will familiarize all members of the Bushkill Creek community with Best Management Practices (BMPs) for general stream care and stormwater management. This will be accomplished through educational programs and materials developed by the joint efforts of the Northampton County Conservation District and Jacobsburg EE Center.

**Recommendation:** Support the annual Bushkill Stream Festival in order to provide an enjoyable opportunity for the Bushkill Creek community to learn about this watershed management plan and what they can do to further efforts toward its implementation.

**Recommendation:** Document the entire length of the Bushkill Creek and its major tributaries using video, photos, and written descriptions of significant sites for use in planning and educational efforts.

**Recommendation:** Develop books, brochures, guides, videos, etc. that will be used to promote public awareness of the natural, recreational, and heritage resources of the Bushkill Creek Watershed and of the efforts underway for the implementation of this plan.

**Recommendation:** Create a web site that would house an up-to-date version of the Bushkill Creek Watershed Management Plan and progress being made in its implementation, upcoming projects/events, recreational opportunities, historic sites of interest, and pertinent water quality/environmental data/information.

**Recommendation:** Working with PennDOT, create a system of Watershed information signs/dispensers and interpretive signage/wayside exhibits at key locations such as stream crossings and recreational sites throughout the Watershed.

**Recommendation:** Establish environmental and BMP demonstration areas at key accessible locations in the Watershed such as Jacobsburg EE Center to be use for environmental education programming that addresses the importance of and techniques for maintaining riparian buffers, controlling erosion and sedimentation. In addition, these demonstration sites would target lawn/garden and wildlife habitat practices that could be used by Watershed homeowners to improve the health of the Bushkill Creek and its watershed.

**Recommendation:** Encourage heritage tourism for the Bushkill Creek Watershed by supporting planned development and staffing of a Delaware and Lehigh Canal National Heritage Corridor "landing" at the proposed visitor center at Jacobsburg EE Center. This landing will interpret the Bushkill "Reach" of the National Heritage Corridor including the important history of the Bushkill Creek and its mills, industries of the Slate Belt, the cement industry, and the heritage of the early Moravian community of Nazareth.

**Recommendation:** Establish an upper Bushkill Creek Watershed interpretive and recreational drive to promote awareness and enjoyment of this portion of the Bushkill Creek ecosystem.

**Recommendation:** Working with PennDOT and watershed municipalities, develop and post educational signage in critical sites along the Creek to increase public awareness of threats to the Bushkill. Signs will be posted at duck and geese feeding areas, in neighborhoods where runoff with fertilizers and chemicals flows directly into to stream, on culverts, at dumpsites, etc.

**Recommendation:** Working with the Northampton County Conservation District and Jacobsburg EE Center, develop an series of educational programs for Bushkill Creek Watershed farmers and large land owners that will increase awareness of this watershed management plan and knowledge and skills needed to effect beneficial land management/preservation practices.

**Recommendation:** Provide environmental education programming that focuses on the knowledge and skills needed to help the Bushkill Creek watershed community reduce the problems associated with non-native and invasive plant species.

**Recommendation:** Working with the Northampton County and Jacobsburg Historical Societies, promote the collection and preservation of historic writings, photographs, and paintings of the Bushkill Creek. Support the development of public heritage programming by these organizations that focuses on the important history of the Bushkill Creek in the development of this region and the nation.

**Recommendation:** Working with Northampton County Parks and Jacobsburg EE Center, support the implementation of water-quality-friendly park maintenance and development practices that will set an example for Watershed residents.

**Recommendation:** In cooperation with Trout Unlimited and key historical organizations, provide educational and interpretive programming on the heritage of trout fishing on the Bushkill, fish habitat improvement techniques, catch and release management practices, etc.

**Recommendation:** Working with Lafayette College, Lehigh University, and Muhlenberg College, and local citizen conservation groups such as Lehigh Valley Audubon and the Golden Eagle Bird Club, conduct needed research on the flora and fauna of the Bushkill Creek Watershed, i.e., mammal, bird, fish, native tree/shrub, and wildflower inventories,

**Recommendation:** Establish study and research areas in the upper Bushkill Creek Watershed in those natural areas of statewide significance identified by The Nature Conservancy and Lehigh Valley Planning Commission in their *Natural Areas Inventory* for Northampton County.

## ***Goal 5. Historical Resource Preservation and Heritage Tourism Development***

**Objective 1. Identify and preserve regionally and nationally significant historic sites and landscapes in the Bushkill Creek corridor.**

**Recommendation:** Support watershed heritage tourism and program development efforts of the Delaware and Lehigh National Heritage Corridor and the Jacobsburg National Historic District partnership (Jacobsburg EE Center and the Jacobsburg Historical Society).

**Recommendation:** Working with the Northampton County Historical and Genealogical and the Jacobsburg Historical Society, create and maintain a collection of historical documents, photographs, paintings, etc. of the Bushkill Creek and its Watershed.

**Recommendation:** Working with the Northampton County Historical and Genealogical Society and the Jacobsburg Historical Society, publish heritage

resource publications which focus on the important role that the Bushkill Creek played in the development of the Lehigh Valley and our Nation.

## **Goal 6 *Enhance and Increase Watershed Recreational Opportunities***

### **Objective 1. Implement Rails-to-Trails Conversion Projects**

**Recommendation:** Support existing and potential Watershed rails-to-trail projects: Easton to Stockertown/Stockertown to Jacobsburg/Jacobsburg to Wind Gap and Pen Argyl/Jacobsburg To Nazareth/Wind Gap to Walnutport.

### **Objective 2. Improve and Expand Watershed Recreational Facilities**

**Recommendation:** Working with state, county and local recreational agencies, form a Watershed Recreation Task Group to coordinate planning for and development and operation of recreational facilities within the Watershed.

### **Objective 3. Improve Stream Access and Viewing Areas**

**Recommendation:** Working with Binney and Smith and the City of Easton, complete the Bushkill Creek overlook projects in the Lower Bushkill Watershed.

**Recommendation:** Establish a scenic drive and self-guided brochure along the upper portion of the Watershed from: Douglasville Road to Clearfield Road to Hyers Mill Road to Bushkill Drive to Mountain Road, etc.

### **Objective 4. Maintain and Improve Watershed Hunting and Fishing Opportunities**

**Recommendation:** Working with the PA Game Commission, Trout Unlimited, and the Northampton County Federation of Sportsmen, inventory, preserve, and improve public hunting and fishing opportunities within the Watershed.

**Recommendation:** Working with the PA Game Commission, the Northampton County Federation of Sportsmen, Lehigh Valley Audubon, the Golden Eagle Bird Club, and area colleges and universities, inventory existing bird and mammal populations within the Watershed.