

MARTINS-JACOBY WATERSHED CONSERVATION PLAN



DECEMBER 2009

Prepared for:

**Martins-Jacoby
Watershed Association**

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1. EXECUTIVE SUMMARY

The Martins-Jacoby Watershed is located in the northeastern portion of Northampton County, Pennsylvania. The greater watershed area is approximately 102 square miles and is located entirely in Northampton County. The area contains a total of 153 stream miles with other numerous small, yet significant streams. Three entire townships and five boroughs along with a portion of two other townships are located within the watershed area.

The rich geology of the watershed which includes sandstone, slate, shale, and carbonates (limestone), determined the settling pattern of the watershed. The “Slate Belt” was responsible for the birth of the slate industry and the boroughs of Bangor, Pen Argyl, Roseto, and East Bangor. Meanwhile the limestone and shale regions attracted a population interested in agriculture. Beside agriculture, the Lower Mount Bethel Township and Martins Creek areas developed due to the cement industry (limestone) and gravel deposits which were left behind by the last glacier. Finally the town of Portland and village of Riverton

were tied to the Delaware River which was a main transportation route in the nineteenth century.

Population forecasts for the area show slow growth to moderate growth for the boroughs and Lower Mount Bethel Township while the rate of growth for the remaining townships will vary between 50 to 78 percent over the next twenty-five years. However, Forks Township to the south and the Poconos to the north, have had and are likely to continue greater development pressures. Currently agricultural lands and open space make up 17% to 45% of the total area of the boroughs and Forks Township while the remaining townships have 63% to 74% currently in agriculture or open space. Municipal governments should review their comprehensive plans and land development ordinances to prepare for the next development bubble. Also, the municipalities may want to consider adopting an open space plan and encouraging the agricultural community to participate in the preserved farmland program.



Oughoughton Creek.

K. Maxfield

Executive Summary

The future health of the watershed is dependent upon several factors. First, the watershed surveys that were completed as part of this study revealed a lack of riparian buffers in many areas of the watershed leaving streambanks subject to erosion. Also, the watershed area has several areas of steep slopes which are subject to severe erosion. The Lehigh Valley Planning Commission has developed model ordinances on riparian buffers, steep slopes, woodlands, wetlands, and other concerns. Storm water run-off is becoming an issue in many of the watershed areas and is a cause of accelerated erosion and a rash of complaints to local municipalities. The MJWA should maintain its partnership with Natural Resource Conservation Service (US Department of Agriculture) to promote conservation practices on participating farms. The MJWA and all interested parties should support the inclusion of Northampton County and surrounding six counties in the Conservation Reserve Enhancement Program (CREP) which pays farmers for implementing various conservation practices such as installation of riparian buffers. Lastly, unplanned development normally has a negative impact upon environmentally sensitive areas. Besides municipal ordinances, local governments and the Martins-Jacoby Watershed Association (MJWA) should promote educational programs on watershed issues to help all landowners and developers protect their property and hence the Martins-Jacoby Watershed.



Photos courtesy of MJWA.

Martins-Jacoby Watershed Association members work to clear a log jam (above) and stock fish (below).



2. INTRODUCTION



Allegheny Creek.

K. Maxfield

Project Goals

This Watershed Conservation Plan is the first crucial step toward implementing projects on the ground for natural, cultural, and recreational resource protection throughout the Martins-Jacoby Watershed, located in northeastern Northampton County, Pennsylvania. This Plan includes an inventory of existing natural, recreational, and cultural resources, analysis of the issues, concerns and threats to watershed resources, and specific recommendations that set forth priorities and actions leading to the development of a long-term, prioritized watershed management program. Products produced as part of this project, including extensive Geographic Information Systems mapping/database, prioritized list of watershed problem areas, water quality data, water monitoring program handbook, Martins-Jacoby Watershed Association (MJWA) website, informational brochure, and stream identification signage, will lead efforts by the MJWA and its partners in the successful implementation of this Watershed Conservation Plan.



Martins-Jacoby Watershed Association members.

J. Mauser

Project Team and Funding

The project team consisted of the Martins-Jacoby Watershed Association working in conjunction with the Northampton County Conservation District and Hanover Engineering. Primary project partners included Upper Mount Bethel Township, Washington Township, Plainfield Township, Forks Township, Lower Mount Bethel Township, and Forks of the Delaware Trout Unlimited Chapter.

The Pennsylvania Department of Environmental Protection and Pennsylvania Department of Conservation and Natural Resources Growing Greener Programs provided funding for the project. Additional funding was received from a private foundation

3. WATERSHED CHARACTERISTICS

General Description

The Martins-Jacoby Watershed is located in the northeastern portion of Northampton County, Pennsylvania, as shown in Figure 1. The greater Watershed area is approximately 102 square miles and is entirely within Northampton County. The project area includes all of the Upper Mt. Bethel, Lower Mt. Bethel, and Washington Townships and portions of Plainfield and Forks Townships. Also included are the the Boroughs of Bangor, East Bangor, Pen Argyl, Portland, and Roseto. The Watershed contains a total of 153 stream miles with numerous small, yet significant streams, including Martins Creek, Little Martins Creek, Jacoby Creek, Mud Run, Oughoughton Creek, Allegheny Creek, Brushy Meadow Creek, and Slateford Creek, all of which ultimately discharge to the Delaware River. The Watershed area, which extends from the Delaware Water Gap westward to the east side of Plainfield Township and southward into Forks Township contains a number of cultural, recreational, and ecological features including the Kittatinny Ridge, the Appalachian Trail, and numerous natural areas of statewide significance.

Physiography and Topography

As shown in Figure 2, the Watershed is located primarily within the Great Valley Section of the Ridge and Valley province. The Blue Mountain to the north of the Watershed lies in the Appalachian Mountain section of the Ridge and Valley Province and a small piece of the Watershed at the south end lies in the Reading Prong Section of the New England Province.

The elevation of the terrain within the Watershed ranges from about 168 feet along the Delaware River to nearly 1690 feet along the Kittatinny Ridge, or Blue Mountain, as shown in Figure 3 (page 9). The Blue Mountain bounds the Watershed to the north, paralleling the Northampton County boundary with Monroe County. The Delaware River makes up the eastern border from the Delaware Water Gap to the City of Easton. The Bushkill Creek Watershed, which is similar to the Martins-Jacoby Watershed in many respects, lies to the west and south.

The southerly face of Blue Mountain is extremely steep, generally rising 700 to 1,000 feet above the lower-lying and gently sloping foothills along its base. As a result of hydrostatic pressure from the steep slopes, the foothills area contains vast wetland areas, along with numerous vernal ponds. Additionally, small unnamed stream channels develop all throughout this area and quickly combine to collectively feed the larger, named perennial stream channels which cross the Watershed for several miles en route to the Delaware River.

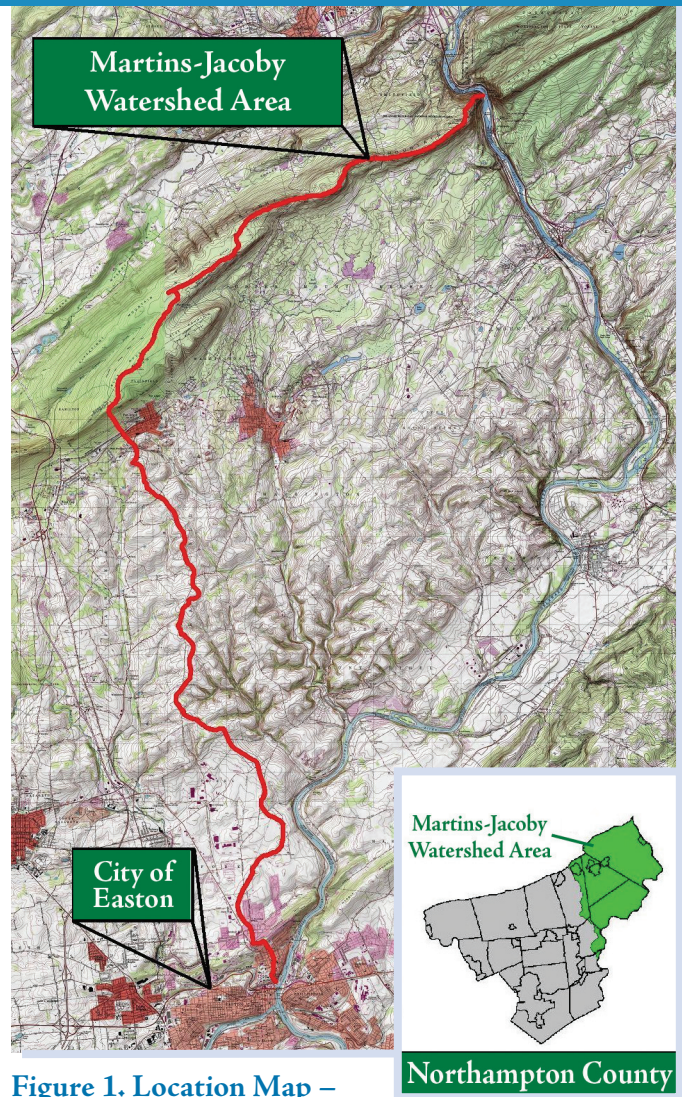


Figure 1. Location Map – Martins-Jacoby Watershed Northampton County, Pennsylvania

(Source: National Geographic Holdings, Inc., 2003)



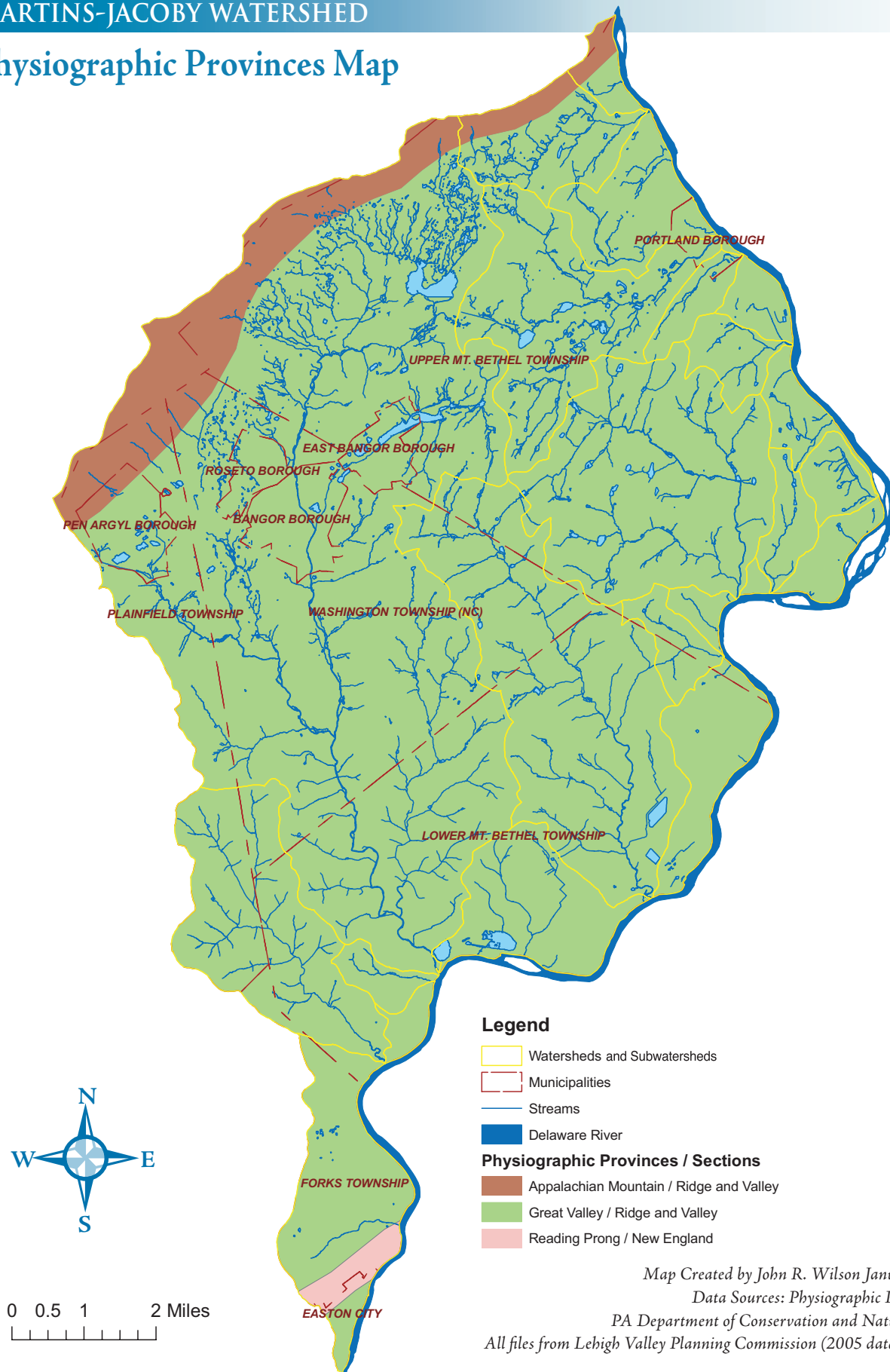
The Delaware River Valley.

K. Maxfield

FIGURE 2

MARTINS-JACOBY WATERSHED

Physiographic Provinces Map



Map Created by John R. Wilson January 20, 2008

Data Sources: Physiographic Provinces from

PA Department of Conservation and Natural Resources

All files from Lehigh Valley Planning Commission (2005 data CD Release)



The Oughoughton Creek.

K. Maxfield

Geology

The geology of the Watershed, which contains distinct carbonate and non-carbonate areas, plays an important role in the characteristics of soils and water chemistry throughout the Watershed. Therefore, the geology also has a direct connection with the diversity and assemblages of flora and fauna that exist throughout the region.

The major geologic components of the Watershed include sandstone, shale and carbonates. Figure 4 (page 10) shows a geologic map of the Martins-Jacoby Watershed. The Blue Mountain is composed of sandstone, a common ridge former. Just south of the Blue Mountain, the Martinsburg Formation, mainly composed of shale, slate, siltstone, and sandstone, makes up the majority of the Watershed area. The Upper Martinsburg Formation contains considerable, minable slate and over the years has been the site of dozens of slate quarries, with a few still in operation. Carbonates consisting of the Jacksonburg Limestone, the Epler Formation, the Allentown Dolomite, and the Leithsville Formation compose the southern portion of the Watershed. A small section of gneiss, a metamorphic rock, is also included in the southern portion of the Watershed.

Groundwater resources are variable throughout the Watershed and are dependant on geology. The shale, sandstone, and siltstone of the Martinsburg Formation permit rain water to pass quickly through the surficial soil and weathered rock but very slowly through the compact, fine-grained bedrock (*PA Geological Survey, 1973*). Water travels in a slow downward movement and tends to follow faults where present. The water from the

Martinsburg Formation is generally of good quality, however there are several places where the water has enough sulfur to make it undesirable (*PA Geological Survey, 1973*). Springs are more abundant in the Martinsburg Formation than in any other part of the County (*PA Geological Survey, 1973*).

In the carbonate regions of the Watershed, solution channels may be formed along joints and bedding planes in the bedrock making groundwater resources more plentiful than in the Martinsburg Formation. The groundwater in carbonate areas can be hard because of the mineral matter dissolved in the water as it passes through the soluble rock. The amount of mineral material in solution ranges depending on the distance the water has flowed, the length of time it has remained in contact with the rocks, and the relative solubility of the surrounding carbonates.

Geologic composition can also have a significant impact on water quality, especially on pH, temperature, and alkalinity of the water flowing through the rock and associated soils. Streams originating in the shale, sandstone, and siltstone geology which comprises the majority of the northern, headwater areas within the Martins-Jacoby Watershed generally have neutral to slightly acidic pH values. Streams forming in or flowing through the areas of carbonate geology in the middle and southern portions of the Watershed exhibit higher, more basic pH values. Some inclusions of carbonate geology are known to exist amongst the shale, sandstone, and siltstone in the northern portion of the Watershed, such as along the Jacoby Creek upstream from Mt. Bethel.

Soil Characteristics

Soils are closely connected with the character of the underlying rock, or parent material. Soil characteristics influence many of the activities that occur within the Martins-Jacoby Watershed. For instance, differing soil types allow different rates of infiltration and erosion, along with different engineering properties and capabilities for agricultural and other land uses. Slopes and locations of soil types are also significant factors for proper use and management. The data summarized below are from the soil survey staff of the Natural Resource Conservation Service (NRCS), 2008. Figure 5 (page 11) shows all of the soils throughout the Watershed.

The two major soil types in the Watershed are the Berks-Weikert and Swartswood Series, covering greater than 15 and 14 square miles, respectively. The Berks-Weikert Series is shallow to deep, well-drained soils that were largely formed on weathered shale and sandstone. The water capacity of these soils is generally low, and runoff is rapid to very rapid. Soils within this series are generally acidic, with low buffering capacity. The Swartswood Series consists of deep to very deep, well-drained and moderately-drained soils formed in till derived from gray and brown quartzite, conglomerate, and sandstone. Surface runoff is slow to rapid. Traditionally, both series have been extensively farmed.

The Manilus Series is the third most prevalent series in the Watershed, comprising approximately 10 square miles of the total watershed area. This series consists of moderately deep, well-drained to excessively-drained soils formed in channery till. These soils occupy nearly-level to steep bedrock-controlled landforms. The potential for surface runoff ranges from medium to very high.

The Conotton and Chippewa Series make up roughly 8 and 6 square miles of the Watershed, respectively. The Conotton Series consists of very deep, well-drained soils formed on Wisconsin Age glacial-stratified sand and gravel and on treads and risers on outwash plain and stream terraces, and on interfluvial and side-slopes on kames, eskers, and beach ridges. These soils are well-drained and the potential for surface runoff is negligible to medium. The Chippewa Series consists of very deep, poorly-drained and very poorly-drained soils formed in till deposits with dominantly sandstone, siltstone, and shale rock fragments. These soils are in upland depressions and are developed in till deposits dominantly comprised of sandstone, siltstone, and shale rock fragments. The internal drainage in these soils is very slow and the potential for surface runoff is very low and very high.

Steep Slopes

Slopes with grades of 15% to 25% are considered “steep.” Slopes with grades greater than 25% are “very steep.” Figure 6 (page 12) shows steep slope areas throughout the Watershed.

Steep slopes are vulnerable to damage resulting from site disruption, partially related to soil erosion. Erosion of steep slopes can be a serious problem as all soils are subject to movement as the slope of the landscape increases. If disturbed, these areas can yield heavy sediment loads into streams and wetland areas degrading water quality and disturbing aquatic habitat. Increased sedimentation also increases flood hazards by reducing the floodwater storage capacity of drainage ways.

Overall, the steepest slopes in the Watershed are along the Blue Mountain. There are also steep slopes along streams located in a band that runs southwest to north-east mostly lying in Lower Mt. Bethel Township and the southern-most portion of Upper Mt. Bethel Township, and Washington Township.



Looking down the steep slopes into the Mill Creek.

K. Maxfield



Bangor area.

K. Maxfield

Social/Economic Profile

According to the Lehigh Valley Planning Commission *Municipal Profiles Report* (May 2007), the population density in Northampton County is about 708 individuals per square mile, as of 2000. There are a total of 101,541 households, with 2.53 individuals per household. The median age is 38.5 years. For persons 25 years and over, 19.3% have no high school degree, 36.5% have graduated from high school, 23% have some college or associate degree, and 21.2% have a bachelor's or graduate degree. In terms of ancestry, 23.9% claim a German heritage, 12.2% are Italian, 10.9% are Irish, 6% are English, and 4.6% have Polish heritage. About 64% of the population works within the County, with the remaining population employed outside of the County. The major occupation for persons 16 years and over is management or professional (31.4%), followed by service occupations (14%); sales and office (27.1%); production, transportation, and material moving (18.1%); construction, extraction, and maintenance (9.2%); and farming, fishing, and forestry (0.2%).

The population change in Northampton County increased about 9% from 2000 through 2006 (Lehigh Valley Planning Commission, 2007). A table of population forecasts for all of the municipalities in the Watershed area is shown in Table 1. From 2005 to through 2030, the municipality with the highest predicted percent change is Plainfield Township at 78%, followed by Washington Township at 71%. The lowest percent change is predicted in the Borough of Roseto with 0% change, followed by Pen Argyl with 5%.

Table 1: Population Forecasts for Municipalities in the Martins-Jacoby Watershed

(Data Source: Lehigh Valley Planning Commission, 2007)

Municipality	Census 2005	Forecasted Population					% change predicted 2005 to 2030
		2010	2015	2020	2025	2030	
Bangor	5,305	5,350	5,398	5,458	5,528	5,655	7%
East Bangor	995	1,034	1,076	1,105	1,120	1,114	12%
Forks	12,853	13,973	15,181	16,522	17,871	19,962	55%
Lower Mount Bethel	3,312	3,426	3,548	3,683	3,819	3,988	20%
Pen Argyl	3,670	3,681	3,712	3,738	3,784	3,857	5%
Plainfield	6,055	6,855	7,705	8,694	9,654	10,752	78%
Portland	573	633	697	747	776	772	35%
Roseto	1,662	1,662	1,662	1,662	1,662	1,662	0%
Upper Mount Bethel	7,130	7,763	8,435	9,180	9,922	10,845	52%
Washington	4,702	5,347	6,032	6,755	7,411	8,027	71%

Table 2 lists the income status of all the municipalities in the Watershed area as of 1999, as well as that for Northampton County and Pennsylvania. The median household income shown is the mid-point in the range of household incomes in the municipality or area. Forks Township has the highest median household income, while Bangor has the lowest. The median family income listed is the mid-point in the range of family incomes in the municipality or area. Forks Township has the highest median family income in the Watershed area, while East Bangor is the lowest. Finally, the per capita income, which is shown in Table 3, is the mean income computed for every man, woman, and child in the municipality or area. Forks Township again has the highest per capita income, and Portland has the lowest.

Table 2: Income Status in 1999

(Data Source: Lehigh Valley Planning Commission, 1999)

Municipality	Median Household Income (\$)	Median Family Income (\$)
Bangor	36,382	44,954
East Bangor	36,429	42,386
Forks	66,055	70,587
Lower Mount Bethel	51,568	56,553
Pen Argyl	40,066	47,935
Plainfield	49,019	54,856
Portland	36,827	46,250
Roseto	39,812	45,833
Upper Mount Bethel	45,617	54,692
Washington	48,728	54,601
Northampton County	45,234	53,955
Pennsylvania	40,106	49,148

Table 3: Per Capita Income in 1999

(Data Source: Lehigh Valley Planning Commission, 1999)

Municipality	Per Capita Income
Bangor	17,742
East Bangor	20,056
Forks	26,180
Lower Mount Bethel	21,088
Pen Argyl	18,145
Plainfield	20,639
Portland	17,275
Roseto	17,419
Upper Mount Bethel	21,116
Washington	22,219
Northampton County	21,399
Pennsylvania	20,880

Page 9 Insert MAP 3

Page 10 Insert MAP 4

Page 11 Insert MAP 5

Page 12 Insert MAP 6

4. LAND RESOURCES

Current Land Use

Table 4 lists the current land use for each of the municipalities in the Watershed. In general, the boroughs have a higher percentage of land dedicated to residential, commercial, and industrial land use, as well as transportation, communication and utilities. This is to be expected given the population density in the boroughs. The townships generally have higher percentages of vacant and agricultural land uses, respectively to the boroughs. Figure 7 (page 23) is a map of the 15,896 land parcels located in the Watershed. Figure 8 (page 24) shows the land cover for the Watershed as last mapped in 2001. Figure 9 (page 25) shows the existing land uses within the Watershed. Figure 10 (page 26) shows all of the roadways in the Watershed.

Forest Land

Figure 11 (page 27) shows all of the woodlands in the Watershed, as of 2005. Based on this data, there are 36.6 square miles of forest in the Watershed. A description of the forest type and plant communities is given in Section 5.

With the exception of the forests along the Blue Mountain at the north end of the Watershed, the wooded areas are primarily fragmented. There is a tendency for narrow, connected woodlands to exist along many of the stream channels, although some streamside areas have been cleared or notably impacted and are no longer wooded. Only a small percentage of the wooded tracts located to the south of the Blue Mountain is in public ownership.

Table 4: Estimated Land Use – 2005

(Data Source: Lehigh Valley Planning Commission, 2005)

	Residential		Commercial		Industrial		Wholesale & Warehsg.		Trans., Comm. & Utilities		Public & Quasi-Public		Parks & Recreation		Agricultural & Open Space		Total
Municipality	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres
Bangor	356.1	36.7	33.9	3.5	27.0	2.8	14.7	1.5	132.2	13.6	32.0	3.3	61.3	6.3	312.2	32.2	969.4
East Bangor	212.6	38.9	86.2	15.8	14.7	2.7	0.0	0.0	38.3	7.0	2.3	0.4	99.2	18.2	92.9	17.0	546.2
Forks	2,149.8	27.3	205.1	2.6	324.9	4.1	9.6	0.1	782.4	9.9	367.2	4.7	456.2	5.8	3,580.6	45.5	7,875.8
Lower Mt. Bethel	1,921.0	12.2	41.1	0.3	833.4	5.3	0.0	0.0	974.6	6.2	19.7	0.1	234.8	1.5	11,735.2	74.5	15,759.8
Pen Argyl	228.7	25.4	10.4	1.2	261.3	29.0	0.0	0.0	141.3	15.7	44.0	4.9	25.1	2.8	189.5	21.0	900.3
Plainfield	3,318.7	21.2	175.5	1.1	309.6	2.0	15.8	0.1	1,133.4	7.2	165.8	1.1	633.0	4.0	9,936.9	63.3	15,688.7
Portland	96.3	26.0	6.2	1.7	39.2	10.6	0.0	0.0	70.8	19.1	4.5	1.2	16.0	4.3	137.6	37.1	370.6
Roseto	185.4	45.4	19.1	4.7	5.7	1.4	0.0	0.0	58.4	14.3	21.1	5.2	7.1	1.7	111.5	27.3	408.3
Upper Mt. Bethel	4,953.6	17.6	229.6	0.8	223.1	0.8	0.0	0.0	1,005.2	3.6	292.8	1.0	2,893.8	10.3	18,567.8	65.9	28,165.9
Washington	2,911.5	25.3	157.7	1.4	115.4	1.0	3.4	0.0	352.6	3.1	110.6	1.0	142.0	1.2	7,707.0	67.0	11,500.2



Farmland near Martin's Creek.

K. Maxfield

Agricultural Land

About 41% of the Watershed is currently in agricultural use. The preserved farms and land in agricultural security areas are shown in Figure 12 (page 28) .

The Lehigh Valley has a strong agricultural heritage. Agriculture within the Valley, including the Martins-Jacoby Watershed area, has been the backbone of the local economy and culture since the beginning of European settlement within the region. The earliest settlers arrived in region in the first decades of the 17th century and cleared the forests for agricultural purposes. To this day, farmers grow the same basic crops that have sustained the agricultural industry in the region for decades, including corn, barley, wheat, soybeans and hay along with a variety of vegetables for an ever-increasing metropolitan market. Animal operations, although less prominent than crop farming, are readily seen in many areas on a drive through the region's back roads. The majority of the crops grown in the Watershed are corn, wheat, soybeans, and hay.

Urban Areas

The major urban areas in the Watershed are in the Boroughs of Roseto, Pen Argyl, Portland, Bangor, and East Bangor. Other urban areas would include village areas which are part of Townships, as well as some higher density subdivisions built in more recent years. The total amount of developed land in the Watershed is roughly 12%, based on an analysis of aerial photos of the region.



J. Mauser

The Predmore Farm in Upper Mt. Bethel Township (above) and the PPL property along the banks of the Delaware River (below).



Special Natural Areas

The Pennsylvania Science Office of the Nature Conservancy put together a *Natural Areas Inventory* report for the Lehigh Valley in 2005. Areas identified as being critical for conservation are shown in Figure 13 (page 29). The report presents Lehigh and Northampton Counties' known outstanding natural features, including floral, faunal and geologic occurrences. There are several areas in the Martins-Jacoby Watershed of statewide significance identified in the report. In fact, the Watershed has 28 of the 44 sites of statewide significance in Northampton County. Sites of statewide significance support Species of Special Concern or exemplary natural communities. These sites may be some of the finest natural areas in the Commonwealth.

Descriptions of these areas of statewide significance are described in the *Natural Areas Inventory Report* and are summarized below and listed in order of importance, as determined by The Nature Conservancy. Sites are ranked from 1 to 5, with 1 indicating the highest priority for protection based on State or National significance and 5 indicating the lowest priority for protection. Ranks take into account potential threats, management needs and existing protection. Sites of similar rank are listed alphabetically by the United States Geological Survey (USGS) 7.5 minute quadrangle.

Mt Bethel Fens (County Rank 1) – Mt. Bethel Fens is a complex of at least 10 rare wetland communities, which are comprised of small calcareous fens and seeps (open meadow-like, permanently saturated wetlands fed by high pH groundwater), marshes and wooded swamps. Due to the combination of limestone and past glaciations, the fen habitat created here is very rare, both in Pennsylvania and globally. To date, there are 16 rare plants, rare animals and 2 rare mosses known to occur in the various fen communities. The Nature Conservancy has identified the Mt. Bethel Fens as one of its highest priorities for conservation in PA.

Bear Swamp (County Rank 2) – This site supports a fair to good quality example of a Circumneutral Broadleaf Swamp Natural Community. The swamp community occurs in two separate lobes along two separate tributaries of Martins Creek and occupies approximately 200 acres.

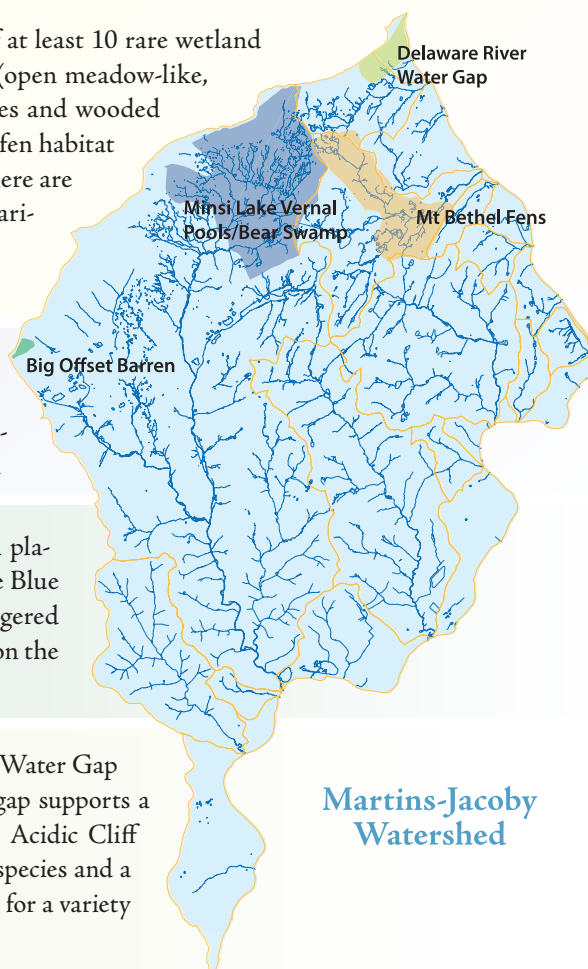
Big Offset Barren (County Rank 2) – This site is a broad forested plateau, which straddles the Northampton and Monroe county line on the Blue Mountain. It supports a fair to good quality population of a PA- Endangered plant species. Long-term survival of this species at this site may depend on the availability of forest gaps.

Delaware River Water Gap (County Rank 2) – The Delaware River Water Gap is one of the most striking natural features in Pennsylvania. The water gap supports a good quality example of the relatively common Northern Appalachian Acidic Cliff Natural Community. It also supports populations of a PA-Rare animal species and a PA- Endangered plant species. The cliff community also provides habitat for a variety of bird species.



J. Mauser

The Martins-Jacoby Watershed contains 28 of Northampton County's 44 sites of statewide significance as determined by The Nature Conservancy.



Martins-Jacoby Watershed

Minsi Lake Vernal Pools (County Rank 2) – This site supports a good quality example of an Ephemeral/Fluctuating Natural Pools Natural Community. It may be the largest concentration of vernal ponds known in Pennsylvania. The great variety of wetland microhabitats makes this area excellent breeding habitat for amphibians.

Mount Jack Limestone Outcrop (County Rank 2) – This site along the Delaware River supports a good quality example of a Calcareous Riverside Outcrop Natural Community and a fair quality example of a Northern Appalachian Shale Cliff Natural Community. Two Species of Special Concern are found at this site, including a PA-Endangered plant species and a good to excellent quality population of a Tentatively Undetermined plant species.

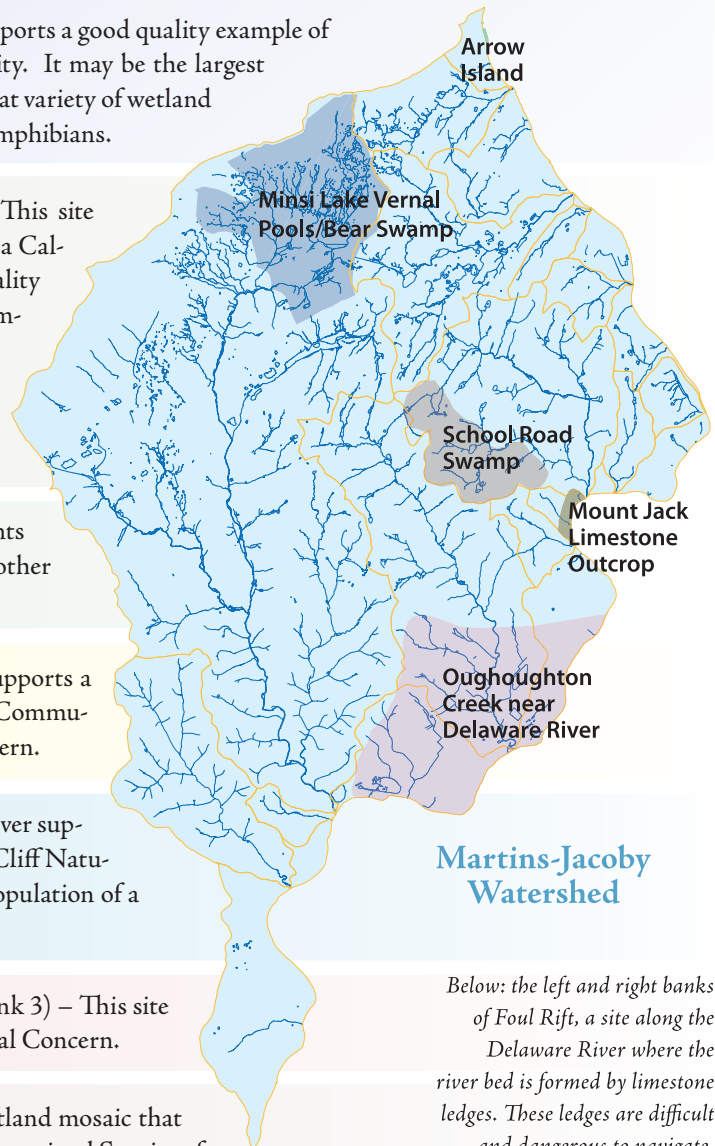
Arrow Island (County Rank 3) – This site supports two plants Species of Special Concern. One occurs on the island and the other in the Delaware River.

East Johnsonville Swamp (County Rank 3) – This site supports a fair quality example of an Acidic Broadleaf Swamp Natural Community. The site also supports two plant Species of Special Concern.

Foul Rift (County Rank 3) – This site along the Delaware River supports a good example of a Northern Appalachian Calcareous Cliff Natural Community. The outcrops support an excellent quality population of a PA-Rare plant species.

Oughoughton Creek near Delaware River (County Rank 3) – This site contains an unknown quality population of a Species of Special Concern.

School Road Swamp (County Rank 3) – This site is a wetland mosaic that includes areas both forested swamp and emergent marsh. Three animal Species of Special Concern have been observed at this site.



Below: the left and right banks of Foul Rift, a site along the Delaware River where the river bed is formed by limestone ledges. These ledges are difficult and dangerous to navigate.

J. Mauser





The Oughoughton Creek.

K. Maxfield

East Bangor Wetland Complex (County Rank 4) – This site is the largest contiguous wetland complex in Northampton County. It includes large expanses of forested swamp, shrub swamp, wet meadows, springs, and open water. The varieties of cover types are good habitat for a wide diversity of plants and animals. An animal Species of Special Concern has been observed using the habitat at this site.

Five Points Wetland (County Rank 4) – A fair to good population of a PA-Threatened plant species, occurs at this site.

Frost Hollow Overlook (County Rank 4) – A Species of Special Concern was found at this location. The type of habitat where this species was seen was rapids and pool; bottom sediments with silt, gravel, with some bedrock; bank type – gently sloping sandy silt, and large rocks.

Getters Island (County Rank 4) – This stretch of the Delaware River supports two animal Species of Special of Concern.

Getz Swamp (County Rank 4) – This site supports a fair example of a Calcareous Seepage Swamp Natural Community and supports three plant Species of Special Concern.

Lohman Wetlands (County Rank 4) – This site has both forested and non-forested area, both influenced by calcareous soils. This area supports a Basin Graminoid Fen and five Species of Special Concern.

Raesley Woods (County Rank 4) – This site supports a fair quality Calcareous Seepage Swamp Natural Community and a small population of PA-Endangered plants.

Angle Swamp (County Rank 5) – This site is a small shrub swamp with pockets of open marsh and clumps of trees. It supports a fair quality population of PA-Rare shrub species.

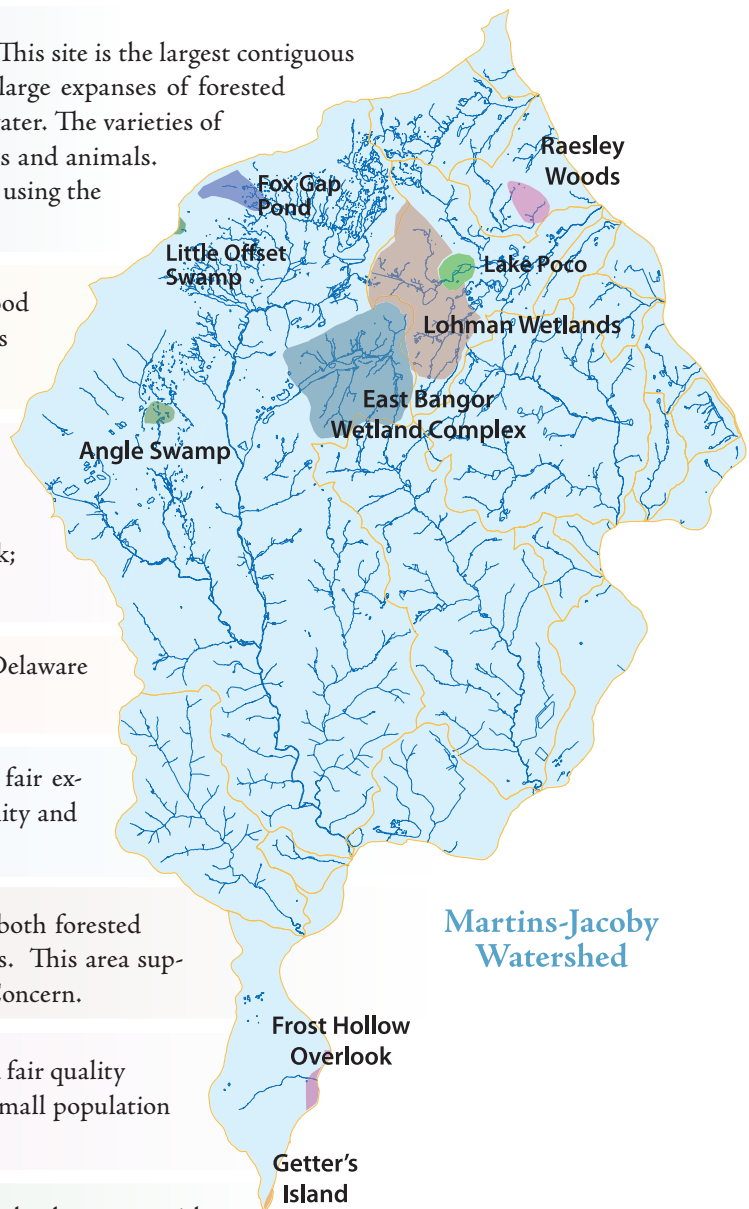
Delaware Shore near Keifer Island (County Rank 5) – A small population of a PA-Rare pant species, occurs in one of the larger openings of this scoured peninsula in the Delaware River.

Eastern Industries Quarries (County Rank 5) – A PA-Endangered species has been successfully reintroduced into the Delaware River Valley after being nearly extirpated in PA. It has been observed at this site.

Fox Gap Pond – This site is a small, shallow pond near the base of the Blue Mountain. The pond is surrounded by forest. The pond and forest is protected as a public watershed for drinking water. A delisted PA-Threatened aquatic plant species occurs along the edges of the pond.

Lake Poco (County Rank 5) – This site supports two plant Species of Special Concern, one of which is a PA-Endangered herb.

Little Offset Swamp (County Rank 5) – A fair population of a PA-Rare shrub species occupies the ecotone between the swamp and the surrounding xeric forest.





Slateford Creek Watershed on National Park property.

K. Maxfield

Lohman Swamp (County Rank 5) – This site supports a fair to good quality example of a Calcareous Seepage Swamp Natural Community. Although the site is relatively small and surrounded by roads, fields, and residences, it is a relatively mature, intact example of this natural community.

Martin's Creek Watershed (County Rank 5) – This site supports one animal and one plant Species of Special Concern.

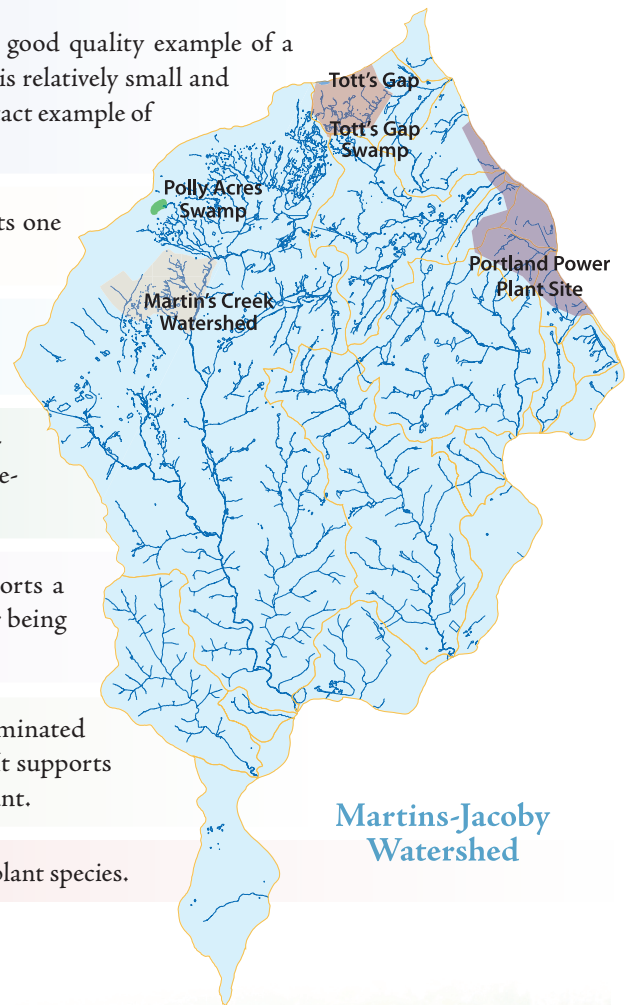
Oughoughton Creek Power House Site (County Rank 5) – This site supports one PA-endangered animal Species of Special Concern.

Polly Acres Swamp (County Rank 5) – This site is a 3-5 acre broad-leaf-conifer swamp. A good quality population of a PA-Rare shrub species occurs here.

Portland Power Plant Site (County Rank 5) – This site supports a PA-Endangered species, which has made a successful comeback after being nearly extirpated in PA.

Totts Gap (County Rank 5) – This site consists of several shrub dominated rocky summit outcrop areas located on the ridge east of Totts Gap. It supports poor to fair populations of a PA-Threatened plant and a PA-Rare plant.

Totts Gap Swamp (County Rank 5) – This site supports a PA-Rare plant species.



In addition, sites of local significance are identified in the report. These sites provide locally significant habitat and may be suitable for environmental education, parks or preserves; however, no Species of Special Concern or exemplary communities have been identified at these sites. Locally significant sites in the Martins-Jacoby Watershed are primarily found throughout the woodlands along the Blue Mountain. This locally significant natural area is the most extensive, relatively contiguous area of natural habitat within the Lehigh Valley. It is one of the major corridors for the movement of biota in eastern Pennsylvania. It includes extensive forestlands with streams, seeps, springs, wetlands, vernal pools, rock outcroppings, and boulder fields. It has long been recognized as one of the major East Coast flyways for migrating raptors.

Mining Areas

Figure 14 (page 30) shows all of the active mining areas in the Watershed. These include mines for fill material, limestone/Dolomite aggregate, sand & gravel, and slate. Locations of inactive mining are also shown. For many decades, slate mining, or quarrying, was a prevalent industry throughout the northern tier of the Watershed. Slate is still quarried at several, relatively small sites within the Watershed. Numerous slate quarry sites can also be observed scattered throughout the landscape, most of which were never reclaimed following closure of mining activities.



Ferns along the hillside at Slateford Creek.

K. Maxfield

Current and Future Land Use Decisions

Land use regulations throughout the Watershed are determined on a municipal level. Municipalities in Pennsylvania are not mandated by the Municipalities Planning Code to plan or zone within their boundaries. Counties, however, are required to adopt a Comprehensive Plan which addresses such issues to a limited extent, and to which municipalities must adhere. The Municipalities Planning Code gives considerable leeway to municipalities to shape their own planning and land use programs. Most provisions in the Municipalities Planning Code include procedures that guarantee public notice for surrounding affected landowners. This helps to increase citizen awareness and participation in local land use matters.

Land Use Tools

The array of land use tools available in Pennsylvania is described below. Table 5 lists each of the municipalities in the Watershed and the status of their current land use planning tools.

Comprehensive Plan –

A comprehensive plan is an overall policy guide for the physical development of a municipality or municipalities. The municipal planning code requires that a comprehensive plan consider the location, character, and timing of future development. The plan provides a blueprint for housing, transportation, community facilities and utilities for land use. The plan must be developed to guide a community through change in order for it to be effective. An adopted comprehensive plan is not the legal equivalent of a land use ordinance. A comprehensive plan can provide a

basis for zoning and other land use ordinances. Comprehensive plans depend on local ordinances and private actions to implement the plan recommendation.

Land use ordinances commonly include 1) Subdivision and Land Development (SALDO), and 2) Zoning. Land use ordinances are legislative actions exercised by the governing body of a municipality. Each of the above mentioned types of land use ordinances is briefly described below:

SALDO –

“Subdivision” refers to the creation of new lots or changes in property lines, while “land development” involves construction of public or private improvements to land. Subdivision and land development regulations offer municipalities a degree of protection against unwise, poorly planned growth. SALDO is the most commonly implemented land use ordinance in Pennsylvania.

Zoning –

Zoning is a tool a municipality may use to regulate land use and the location and intensity of development by major districts, such as residential, commercial, and industrial. Major districts may be further broken down into more specific uses such as High Density Residential, Rural Residential, Light Industrial, Heavy Industrial, etc. In basic terms, a zoning ordinance divides all land within a municipality into zones, or districts, and creates regulations that apply generally to the entire municipality, as well as to specific individual districts. Zoning should allow all feasible types of land uses and developments.

Table 5: Status of Municipal Planning and Zoning

Existing Planning & Zoning Tools	Municipality									
	Lower Mt Bethel	Upper Mt Bethel	Plainfield	Forks	Washington	Portland	Roseto	East Bangor	Bangor	Pen Argyl
Zoning	1971	2004	1983	2001	1997	1996	1990	2005	1967	2006
SALDO	1990	2003	1991	2003	1995	1973	1995	2009	1968	2007
Stormwater Mgt Plan	2007	2007	2007	2007	2007	2007	2007	2007	2007	2007
Sewage Plan ¹	1975*	1990	1999	1996	1966	2003	1987	1992	1987	1986
Comprehensive Plan	2007	2001	2008	1997*	2005	n/a	2005	2005	2005	2008
Recreation Plan	2007	2004	n/a	n/a	2008	n/a	n/a	n/a	n/a*	n/a
Open Space Plan	2007	2004**	2009	n/a	n/a	n/a	n/a	n/a	n/a	n/a

* update currently underway **amended 3/2009

1 – Pennsylvania Department of Environmental Protection, 2008



A forested slope along the Slateford Creek.

K. Maxfield

Page 23 Insert MAP 7

Page 24 Insert MAP 8

Page 25 Insert MAP 9

Page 26 Insert MAP 10

Page 27 Insert MAP 11

Page 28 Insert MAP 12

Page 29 Insert MAP 13

Page 30 Insert MAP 14

5. WATER RESOURCES

Surface Water

Streams

The Watershed contains a total of 153 stream miles with numerous small, yet significant streams, including Martins Creek, Little Martins Creek, Jacoby Creek, Mud Run, Oughoughton Creek, Allegheny Creek, Brushy Meadow Creek, Waltz Creek, Greenwalk Creek, and Slateford Creek, all of which ultimately discharge to the Delaware River. Table 6 lists the streams contributing to the Watershed and their associated stream miles. The elevation at both the mouth and source of the tributaries is listed in Table 7.

Table 6: Stream Length (Miles)

Stream	Main Branch	Tributaries	TOTAL
Allegheny	4.93	10.56	15.49
Oughoughton	7.29	11.32	18.61
Mud Run	4.80	7.57	12.37
Slateford	3.99	1.46	5.45
Jacoby	4.33	3.90	8.23
Delaware Tribs	12.61		12.61
Intermittent:	9.87		9.87
Martins Creek	12.51	34.99	47.50
East Branch Martins Creek	6.87		6.87
West Branch Martins Creek	2.97		2.97
Waltz	4.92		4.92
Greenwalk	2.50		2.50
Little Martins Creek	5.42		5.42
Total			152.81

Table 7: Elevation of Tributaries and Main Stem (feet above Mean Sea Level)

Stream	Mouth	Source
Mud Run	173	789
Martins Creek	182	1,690
Oughoughton Creek	201	835
Allegheny Creek	235	835
Jacoby Creek	262	864
Slateford Creek	297	1,452
Martins Jacoby Watershed	168	1,690

Recognizing the importance of water quality to the preservation of Pennsylvania's water supply and wildlife, the Pennsylvania Department of Environmental Protection established a Water Quality Standards program in 25 Pa. Code, Chapter 93, as required by the federal Clean Water Act. The standards are based on water use: 1) Designated Use – specified for each water body or segment whether or not the use is being attained, and 2) Existing Use – the use actually attained in the water body, whether or not the use is included in the water quality standards. All Commonwealth waters are protected for designated aquatic life use as well as a number of water supply and recreational uses as listed below:

♦ **EV (Exceptional Value)** – waters that constitute an outstanding national, state, regional or local resource, such as waters of national, state or county parks or forests, or waters that are used as a source of unfiltered potable water supply, or waters that have been characterized by the Pennsylvania Fish & Boat Commission as "Wilderness Trout Streams," and other waters with substantial recreational or ecological significance.

♦ **HQ (High Quality)** – a stream or watershed with exceptional quality waters and environmental features that require special protection.

♦ **CWF (Cold Water Fishes)** – maintenance and/or propagation of fish species and flora and fauna that are native to cold water habitats.

♦ **TSF (Trout Stocked Fishes)** – maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and flora and fauna that are native to warm water habitats.

♦ **MF (Migratory Fishes)** – passage, maintenance and propagation of fish that ascend to flowing waters to complete their life cycle.

♦ **WWF (Warm Water Fishes)** – maintenance and propagation of fish species and flora and fauna that are native to warm water habitats.

Water Resources

The Chapter 93 water quality designations for the streams in the Martins-Jacoby Watershed are shown in Figure 15 (page 38) and are listed in Table 8. There are over 100 miles of cold-water fisheries in the Watershed. Slateford Creek has an Exceptional Value designation, one of only two such streams in Northampton County. The Watershed also has 6.8 miles of streams designated as High Quality-Cold Water Fishes (parts of Martins Creek and Waltz Creek).

Table 8: Pennsylvania Code, Title 25, Chapter 93 Water Quality Designation

Stream	Code*	Miles of Stream
Allegheny Creek	CWF	14.38
Martins Creek	CWF	13.07
Martins Creek	TSF-MF	13.99
Martins Creek	HQ-CWF, MF	6.02
Martins Creek	TSF	8.39
Martins Creek	CWF, MF	0.92
East Branch Martins Creek	CWF	2.72
West Branch Martins Creek	CWF	2.32
Little Martins Creek	CWF	6.57
Brushy Meadow	TSF, MF	2.33
Brushy Meadow	CWF, MF	1.67
Waltz Creek	CWF, MF	2.21
Waltz Creek	HQ-CWF,	0.77
Greenwalk Creek	CWF, MF	3.95
Jacoby Creek	CWF, TSF	8.84
Slateford Creek	CWF	2.71
Slateford Creek	EV	2.48
Mud Run	CWF	12.23
Oughoughton Creek	CWF	17.83
Direct Drainage Area Streams	CWF	9.02
Delaware River Tributaries	CWF	10.65

* CWF – Cold Water Fishes, HQ-CWF – High Quality Cold Water Fishes, TSF – Trout Stocked Fishery, MF – Migratory Fishes
EV – Exceptional Value

Table 9: Sub-watershed Areas

Stream	Area (square miles)
Allegheny Creek	9.34
Oughoughton Creek	11.43
Mud Run	6.02
Martins Creek	44.69
Slateford Creek	2.76
Jacoby Creek	6.27
Delaware River Tributaries	17.11
Direct Drainage Areas (to Delaware River)	5.29



K. Maxfield

Un-assessed and Impaired Waters

Figure 16 (page 39) shows the waterways throughout the Martins-Jacoby Watershed which are either un-assessed by the Pennsylvania Department of Environmental Protection (PA DEP) for official water quality designation or which have been assessed and found to be impaired by any of several potential impacts. Section 305b of the Clean Water Act requires States to assess water quality and provide annual reporting to Congress. PA DEP utilizes designated funding to conduct stream assessments and water quality monitoring necessary to classify water quality under Chapter 93, Title 25 of the Pennsylvania Code. Section 303d of the Clean Water Act requires that States from “time to time” submit a list of waters for which effluent limits will not be sufficient to meet all State water quality standards. EPA has defined “time to time” to mean by April 1 of even numbered years. The failure to meet water quality standards may be due to an individual pollutant, multiple pollutants, “pollution,” or an unknown cause of impairment. The 303(d) listing process includes waters impaired by point sources and nonpoint sources of pollutants. States must also establish a priority ranking for the listed waters, taking into account the severity of pollution and uses.

Point source pollution problems within the Martins-Jacoby Watershed primarily include discharges from wastewater treatment plants (WWTPs) and discharges from other water-dependent operations such as greenhouses and agricultural operations. See Section 7 for further information regarding point source pollution within the Watershed.

Non-point source pollution (NPS) within the Martins-Jacoby Watershed primarily include nutrient and sediment pollution associated with stormwater runoff from agricultural and urban land uses, as well as from streambank and stream bed erosion caused by increased stormwater runoff from all land-uses. See Section 7 for further information regarding NPS pollution within the Watershed.

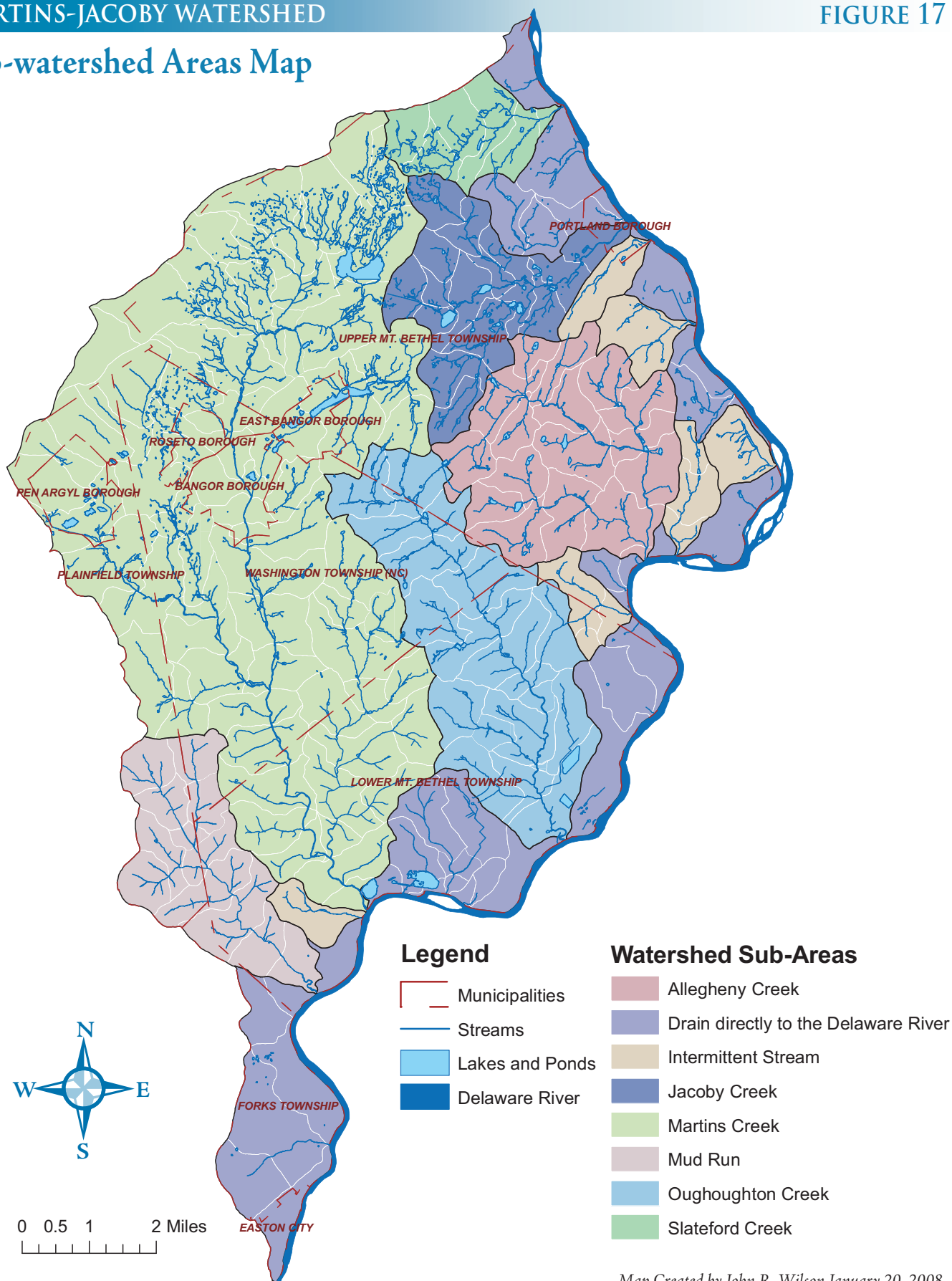
Sub-watersheds

The sub-watersheds are shown in Figure 17 (right). A table listing the sizes of the sub-watersheds is shown in Table 9. The Martins Creek sub-watershed comprises nearly half of the total area of the collective Martins-Jacoby Watershed.

FIGURE 17

MARTINS-JACOBY WATERSHED

Sub-watershed Areas Map



Map Created by John R. Wilson January 20, 2008

Data Sources: All files from Lehigh Valley Planning Commission (2005 data CD Release)

Lakes and Ponds

The Martins-Jacoby Watershed contains numerous lakes and ponds, as shown in Figure 18 (page 40). The lakes are relatively small, man-made impoundments and are found primarily in Upper Mount Bethel Township along headwater streams where plentiful clean water and advantageous topography were favorable. Minsi Lake, is the largest and most widely known, and is maintained by Northampton County as part of a park which provides open public use. Minsi Lake supports a high quality warm water fishery which may be accessed by electric motor boat only from two public launch areas. Brushy Meadow Lake also provides public recreation opportunities, but is primarily used by anglers for its warm water fishery. Brushy Meadow Lake is relatively shallow throughout, allowing dense aquatic plant growth to reach the lake surface throughout during the growing season. The high productivity in the lake supports warm water fish species such as largemouth bass, bluegills, and sunfish. The Watershed also supports countless on- and off-stream farm ponds which were built during that past two centuries to support livestock and other farming operations.



J. Mauser



Vernal Ponds

Vernal ponds are found in great numbers and densities throughout the remaining natural areas along the base of the Blue Mountain where hydrostatic pressure from the mountain slopes wells to the surface at the foothill slope-break during portions of the year. Depressions in the landscape fill temporarily and spring to life with delicate and unique organisms that rely on fish-free habitat including salamanders, frogs, and rare macroinvertebrates. During the growing season, these ponds dry-up due to generally lower rainfall amounts compounded by canopy (tree and shrub) interception and use by upslope and surrounding vegetation. Prior to the growing season, however, these vernal ponds provide critical breeding habitats for many amphibian and macroinvertebrate species. Current State and Federal regulations may protect some of these vernal ponds which meet either the characteristics of "wetlands" or "waters," as defined in respective regulations and guidance documents. Many vernal ponds, however, do not appear to meet the definition of either feature and therefore are not protected from impacts by land-use changes. Vernal ponds which have been identified, and in some cases studied, in the Watershed are shown in Figure 19 (page 41).



Minsi Lake (below), located in Upper Mount Bethel Township, is the largest lake within the Martins-Jacoby Watershed and supports a high quality warm water fishery which supports species like the largemouth bass (above).



K. Maxfield

Wetlands

Wetlands are areas that are inundated by surface or groundwater at a frequency and duration sufficient to support hydric soils and a prevalence of vegetation typically adapted for life in saturated soils. Wetland types within the Martins-Jacoby Watershed primarily include marshes, swamps, and fens (nutrient rich, organic accumulating systems). The highest concentrations of wetlands may be found in the northern most, or headwater, areas of the Watershed where hydrostatic pressure from the Blue Mountain reaches the surface at its base where more poorly drained shaley soils are found. Deeper and more well-drained limestone derived soils found throughout most of the lower Watershed support relatively limited wetland areas, with most being found in and along floodplains and valley bottoms. Closed depressions, or collapsed sinkholes, may also support wetland conditions when near the groundwater table or clogged with fines such as silt and clay which slow or prevent permeability of surface water inputs.

The wetlands and vernal ponds that have been identified in the Watershed are shown in Figure 19 (page 41). Hydric soils, which are soils that formed under saturated or inundated conditions and exhibit distinct conditions as such, have been mapped by the United States Department Agriculture, Natural Resource Conservation Service. Under natural conditions, wetlands are found in hydric soils, and therefore the location of mapped hydric soils throughout the landscape provides important information regarding the likely location of wetland areas. Hydric soils found throughout the Martins-Jacoby Watershed are shown in Figure 19. The wetland areas shown on Figure 19 were identified as part of the U.S. Fish & Wildlife Service, National Wetlands Inventory, a project which used aerial photography

and soils mapping to identify the larger wetlands throughout the landscape. This mapping does not include smaller wetlands which generally represent the majority of regulated wetlands which may only be identified in the field using accepted regulatory guidance. In addition, significant vernal ponds identified as part of the Seasonal Pool Registry conducted by the Western Pennsylvania Conservancy are shown on the map. Many other vernal ponds found throughout the Martins-Jacoby Watershed are also shown in Figure 19 (page 41), appearing as small, and in many cases isolated (non-connected on mapping) from nearby headwater streams originating along the base of the Blue Mountain Ridge. Other vernal ponds and seasonal pools may be observed in “closed depressions” in farmland areas throughout the limestone geology portion of the Watershed.

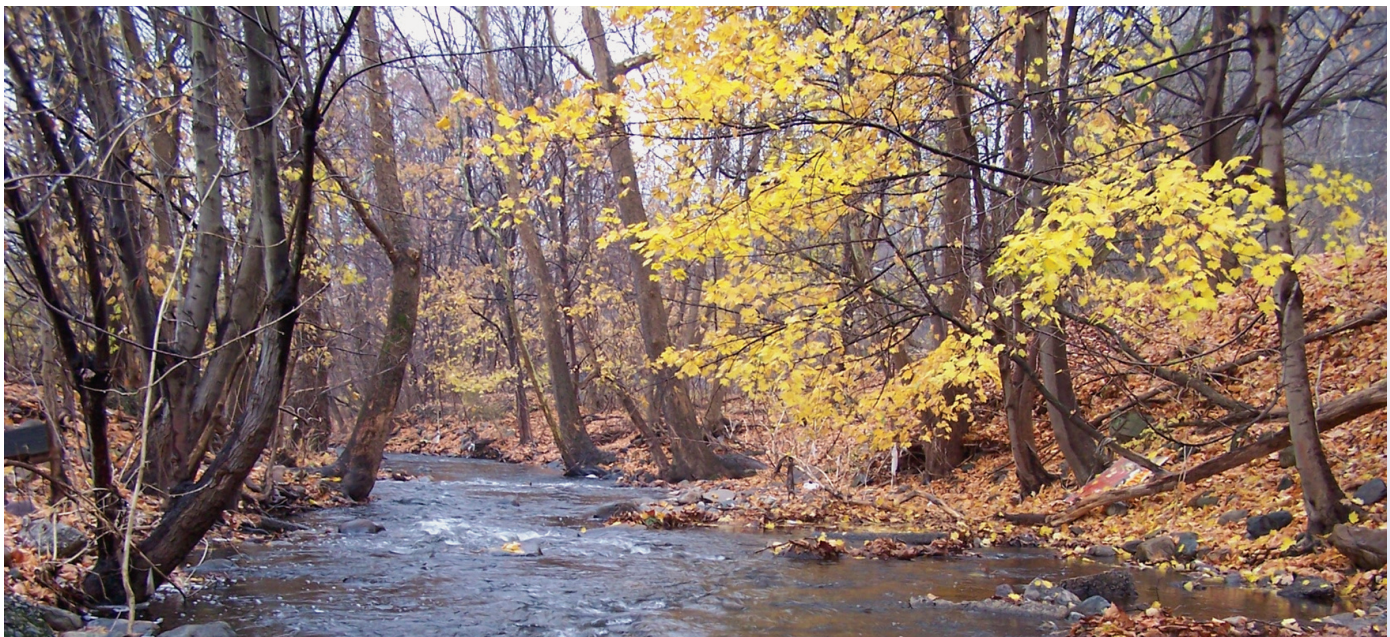
Wetlands are some of the most biologically diverse systems in the world and perform a variety of important physical and biological functions. Wetlands have important filtering capabilities for collected and “treating” surface water runoff before it reaches rivers and streams, helping to maintain clean streamflow, especially during periods of drought. Wetlands can also be a critical component of groundwater recharge where they are found in more permeable soils and are connected to the groundwater table. The largest concentration of wetlands in the Lehigh Valley is found in Upper Mt. Bethel Township (Lehigh Valley Planning Commission, 2007).

Floodplains

Floodplains are the low-lying areas adjacent to streams, rivers and other watercourses that are subject to periodic flooding during higher flow conditions. These areas store large amounts of surface water runoff, which can reduce flooding damage to downstream areas.

Regulatory protection of floodplains helps to reduce the threat to human life and property caused by periodic flooding. For regulatory purposes, a floodplain is defined as the area of land which is inundated by the 100-year flood, or streamflow elevation which is associated with the amount of rainfall associated with a storm event having an estimated ‘return period’ of once every 100 years. The Federal Emergency Management Agency (FEMA) identifies the 100-year flood as the flood elevation that has a one-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in any given time period. The 100-year flood is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management. The Pennsylvania Floodplain Management Act requires municipalities identified as being flood-prone to enact floodplain regulations, which, at a minimum, meet the requirements of the NFIP.

The floodplains found throughout the Martins-Jacoby Watershed are shown in Figure 20 (page 42).



Martins Creek.

J. Mauser

Riparian Buffers

A Geographic Information Systems (GIS) assessment of the status of the forested riparian buffers in the Watershed was conducted using aerial photographs from 2004 (see Figure 21). This analysis indicates that 37% of streams in the Watershed have no forested buffer on either side of the stream. About 16% of the streams have only one side of forested buffer. It is clear from this analysis that many of the forested riparian buffer areas along the stream corridor are not intact. It should be noted that this GIS analysis included only forested buffers. Grassy or shrubby buffers do exist in some locations, but were not included in the forested buffer analysis. There has been significant research documenting the importance of forested riparian buffers for stream health. The lack of forested riparian buffer along the stream corridor is a threat to the overall water quality of the Watershed.

The analysis of the riparian buffers in the Watershed indicates that forested buffers in the Watershed could and should be increased in order to preserve and enhance the water quality in the Watershed. Ideally, 50 to 100 feet of forested buffer on both sides of streams is recommended.

Fish are sensitive to sediment suspended in surrounding water; therefore, eroding streambank conditions also influenced fish population and assemblages. Steep, high banks with little vegetative cover have a greater chance of erosion during storms than lower banks with dense vegetation. Banks consisting of finer sediment are more erodible than banks that consist of cobbles and boulders. Streambank erosion also may influence the amount of oxygen available in flowing and still waters, especially when the eroded materials contain higher organic

contents which consume oxygen through chemical and biological processes. Fish with high oxygen demands, especially trout species, typically thrive in cooler waters with little to no erosion and with fairly high oxygen concentrations. Fish with lower oxygen demands can live in warmer waters where lower oxygen concentrations are common.

Surface Water Quality

Figure 22 (page 44) shows all of the surface water monitoring stations throughout the Watershed which are monitored by the Martins-Jacoby Watershed Association. Parameters monitored by the Association include pH, water temperature, dissolved oxygen, conductivity, specific conductance, ammonia, nitrate plus nitrite, total Kjeldahl nitrogen, total phosphorus, and total suspended solids. Data collected for the 2007 study period are provided in Appendix A.

Surface Water Supply

The Martins-Jacoby Watershed has an abundance of high quality surface water, especially throughout the northern tier of the Watershed along the base of the Blue Mountain Ridge. Currently, however, there are only three (3) permitted surface water withdrawals for relatively small business operations, including a quarry, greenhouse, and farm. Figure 23 (page 45) shows all of the gauging stations monitored by the United States Geological Service throughout the Watershed and Figure 25 (page 47) shows all of the permitted surface water (and groundwater) withdrawals in the Watershed that exceed 10,000 gal/day.

Groundwater

Groundwater in the Martins-Jacoby Watershed is an important resource in many respects. The primary source of high quality, clean drinking water throughout most of the Watershed area is from individual on-lot residential wells. There are also several community wells found throughout the Watershed, as well as a large-scale commercial drinking water withdrawal by Nestle in Washington Township.

In the northern portion of the Watershed, groundwater also provides the source for high quality cold waters to local fish hatcheries, countless farm ponds, and other water dependent businesses. Where groundwater intersects with the land surface, it supports the Exceptional Value wetlands, vernal ponds, and headwater streams which sustain plant and wildlife communities, many of which support species listed as Species of Special Concern in Pennsylvania.

Throughout most of the southern portion of the Watershed where topography is generally more level and dominated by limestone geology, groundwater is respectively deeper below the surface and is primarily valued for residential use from on-lot wells.

The “State Water Plan” update recommends that local government land use planning use ordinances that consider impacts on water quantity and quality and address the cumulative impacts to a watershed. Municipalities have the power to adopt ordinances to facilitate access to adequate water necessary for peace, health and safety, including consideration of the hydrologic connection between ground and surface water, and the impact of withdrawal of groundwater on surface water flow.

Groundwater Quality

Under natural conditions, groundwater quality is primarily affected by the local geology. Areas comprised of shale, slate, sandstone, and igneous rock throughout the region generally contain lower dissolved minerals, while areas comprised of limestone and dolomite, or carbonate geology, generally contain higher dissolved mineral content, also known as “hard water” or water with high “hardness.”

Pollution of groundwater resources by human activities must always be a serious concern, considering the difficulty and cost associated with remediation, as well as the level of dependency and costs associated with alternative sources such as public water supply. The residency time of groundwater in aquifers is generally hundreds to thousands of years, making remediation difficult and sometimes impossible. Primary pollution threats include acute contamination episodes such as spills and unintended or unauthorized discharges, as well as chronic problems such as leaking underground (and above ground) storage tanks, landfill leachate, improper disposal of waste oil, dry deposition from air pollution, misuse of pesticides and fertilizers, illicit discharges, and various non-point source pollution problems.

Groundwater Supply

Figure 24 (page 46) shows all of the groundwater extraction wells registered within the Watershed and Figure 25 (page 47) shows all of the groundwater (and surface water) withdrawals in the Watershed that exceed 10,000 gal/day and are regulated under State and Federal permits. Currently, there are 32 groundwater withdrawals within the Watershed area which exceed 10,000 gal/day. Typical residential wells are not expected to exceed 10,000 gal/day, and therefore are not regulated like larger commercial withdrawals under State and Federal permits. Most older residential wells were not catalogued for location or characteristics. Newer residential wells are supposed to be catalogued with the Pennsylvania Department of Environmental Protection, including information provided by drillers such as location, depth to water bearing zones, production (gal/min), drilling method, etc.



T. Maxfield

The historic Women's Christian Temperance Union's water fountain (right) in Weona Park in Pen Argyl says, "Nature's own beverage for Man and Beast." W.C.T.U. members began erecting the public fountains across the United States after their 1874 convention so that men could get a drink of water without entering saloons.

Page 38 Insert MAP 15

Page 39 Insert MAP 16

*Page 40 Insert MAP 18
(note Map 17 is in the
publication on page 33
and is not a big, separate
map)*

Page 41 Insert MAP 19

Page 42 Insert MAP 20

Page 43 Insert MAP 21

Page 44 Insert MAP 22

Page 45 Insert MAP 23

Page 46 Insert MAP 24

Page 47 Insert MAP 25

6. ECOLOGICAL RESOURCES

The Martins-Jacoby Watershed contains a wealth of ecological resources which are supported by the high quality waterways, remaining riparian corridors, and large tracts of undeveloped lands found throughout much of the northern tier of the Watershed. Grasslands and other natural areas found throughout the eastern, central, and southern portions of the Watershed are also important habitat areas for many terrestrial and avian species. Upper Mount Bethel Township contains the highest density of natural areas with the highest conservation values found throughout the Lehigh Valley (Lehigh and Northampton Counties).

Flora

Forest and Plant Communities

The majority of the forest area in the Watershed can be described as a mixed oak forest. It lies south of the Blue Mountain in the valley and most of the rolling hills where the soil is generally fertile and fairly deep. The forest is made up primarily of three dominant oaks, black, red, and white. Other trees in the forest include basswood, white ash, American beech, black cherry, slippery elm, black gum, Eastern hemlock, shagbark hickory, Norway maple, white pine, tulip tree, and black walnut. On the lower reaches of bottomlands, floodplains, and wetland area, the oaks are replaced by water loving trees such as sycamore, silver maple, and willows. The Blue Mountain area, where soil is generally shallow and sterile, will tend to have pitch pine, chestnut, oak, sassafras and red maple dominating the forest. The composition of the forest will vary with history, prior land use, soil type, competition, and other factors.

The understory of the mixed oak forest includes dogwood, shadbush, hornbeam, hop hornbeam, and sassafras, as well as spicebush, American witch-hazel, and many spring wildflowers. The understory of the Blue Mountain Ridge area generally consists of heaths, blueberry, mountain laurels, and a few wildflowers. Floodplains and other wet area will have an understory consisting of native vines, jewelweed and nettles.

There are a few hemlock ravines in the Watershed that consist mostly of hemlock mixed with some white pine and other deciduous trees, with little understory. The soil in these ravines is acidic due to the needles of the dominant vegetation. These areas are generally located on cool stream ravines on north-facing slopes.

Threatened and Endangered Species

Table 10 lists all of the threatened and endangered plant species in the Watershed. Table 11 lists all of the natural plant communities of concern for conservation. There are nine different natural plant communities of concern and 104 plant species of concern for conservation.



Jewelweed along the Jacoby Creek.

K. Maxfield



A lush green understory of Mountain Laurel near Slateford Creek in the Blue Mountain region.

K. Maxfield

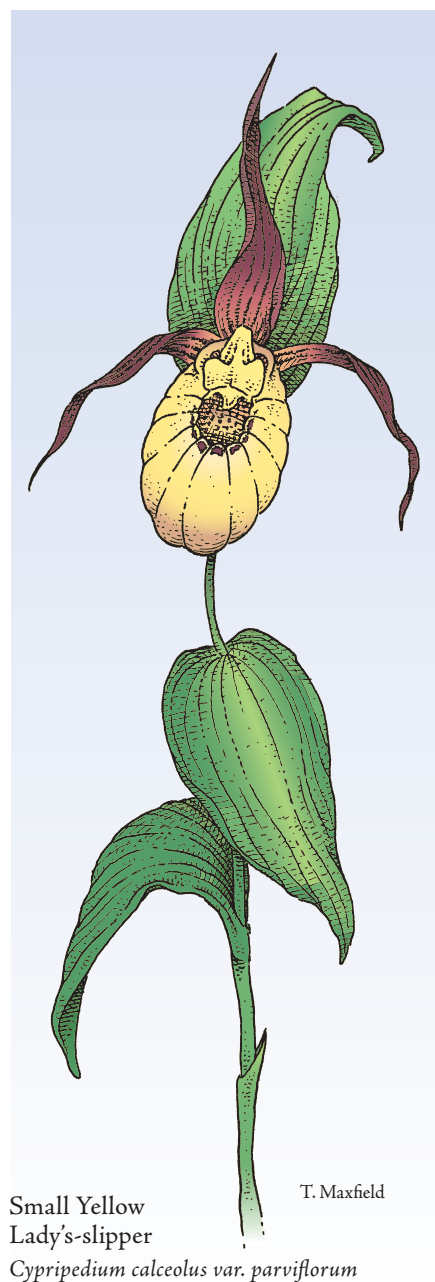
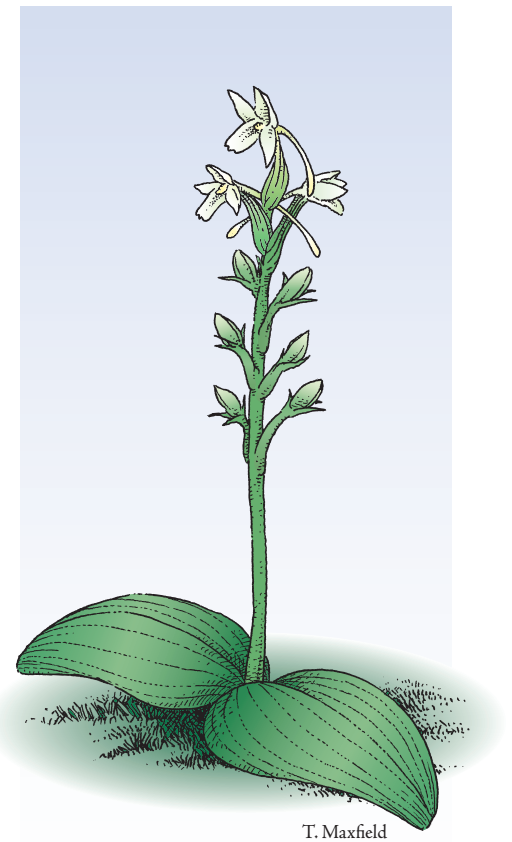


Table 10: Plant Species of Conservation Concern in the Martins-Jacoby Watershed

Scientific Name	Common Name	Global Rank	State Rank	State Protection Status	Proposed State Status
<i>Conioselinum chinense</i>	Hemlock-parsley	G5	S1	PE	PE
<i>Ilex glabra</i>	Ink-berry	G5	SX	PX	PX
<i>Ilex opaca</i>	American Holly	G5	S2	PT	PT
<i>Symphotrichum ericoides</i>	White Heath Aster	G5	S3	TU	TU
<i>Bidens discoidea</i>	Small Beggar-ticks	G5	S3	N	PR
<i>Hieracium kalmii</i>	Canada Hawkweed	G5	S3	N	TU
<i>Megalodonta beckii</i>	Beck's Water-marigold	G4G5	S1	PE	PE
<i>Solidago rigida</i>	Hard-leaved Goldenrod	G5	S1	TU	PE
<i>Polymnia uvedalia</i>	Leaf-cup	G4G5	SNR	N	PT
<i>Cacalia muehlenbergii</i>	Great Indian-plantain	G4	S1	N	PE
<i>Arabis hirsuta</i>	Western Hairy Rock-cress	G5	S1	TU	PE
<i>Opuntia humifusa</i>	Prickly-pear Cactus	G5	S3	PR	PR
<i>Lobelia kalmii</i>	Brook Lobelia	G5	S1	PE	PE
<i>Stellaria borealis</i>	Mountain Starwort	G5	S1S2	N	TU
<i>Chenopodium capitatum</i>	Strawberry Goosefoot	G5	SH	TU	TU
<i>Helianthemum bicknellii</i>	Bicknell's Hoary Rockrose	G5	S2	PE	PE
<i>Cuscuta cephalanthi</i>	Button-bush Dodder	G5	SU	TU	TU
<i>Cuscuta coryli</i>	Hazel Dodder	G5	SU	TU	TU
<i>Cuscuta campestris</i>	Dodder	G5T5	S2	N	TU
<i>Gaultheria hispidula</i>	Creeping Snowberry	G5	S3	PR	PR
<i>Leiophyllum buxifolium</i>	Sand-myrtle	G4	SX	PX	PX
<i>Leucothoe racemosa</i>	Swamp Dog-hobble	G5	S2S3	TU	PT
<i>Desmodium laevigatum</i>	Smooth Tick-trefoil	G5	SU	N	TU
<i>Desmodium nuttallii</i>	Nuttalls' Tick-trefoil	G5	S2	TU	TU
<i>Desmodium obtusum</i>	Stiff Tick-trefoil	G4G5	SU	N	TU
<i>Desmodium viridiflorum</i>	Velvety Tick-trefoil	G5?	SU	N	TU
<i>Lathyrus palustris</i>	Vetchling	G5	S1	TU	PE
<i>Lathyrus venosus</i>	Veiny Pea	G5	S2	N	TU
<i>Phaseolus polystachios</i>	Wild Kidney Bean	G5	S1S2	N	TU
<i>Stylosanthes biflora</i>	Pencilflower	G5	S2	TU	PE
<i>Senna marilandica</i>	Wild Senna	G5	S1	TU	PE
<i>Dicentra eximia</i>	Wild Bleeding-hearts	G4	S1	PE	PE
<i>Pycnanthemum torrei</i>	Torrey's Mountain-mint	G2	SU	PE	PE
<i>Pycnanthemum verticillatum</i> var. <i>pilosum</i>	Hairy Mountain-mint	G5T5	SU	TU	PX
<i>Myrica gale</i>	Sweet-gale	G5	S2	PT	PT

**Table 10: Plant Species of Conservation Concern
in the Martins-Jacoby Watershed (continued)**

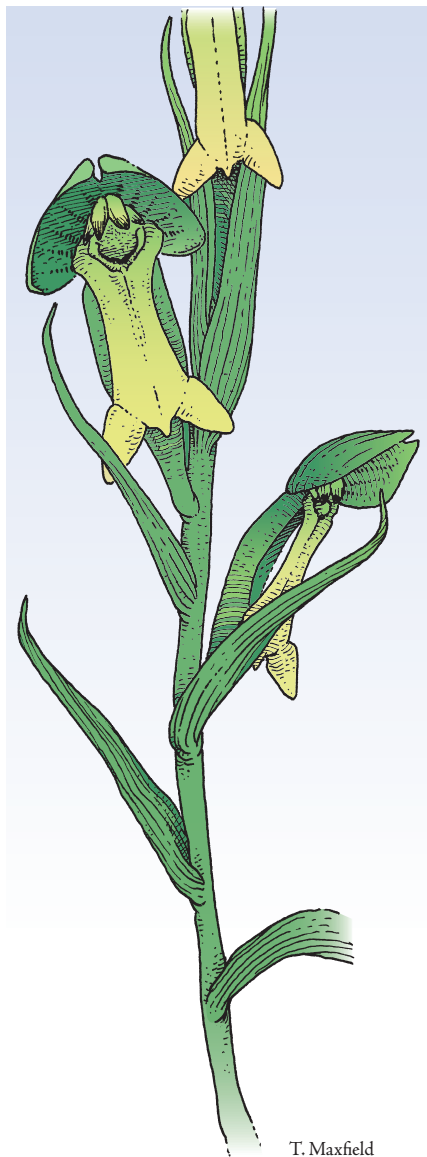
Scientific Name	Common Name	Global Rank	State Rank	State Protection Status	Proposed State Status
<i>Nuphar microphylla</i>	Yellow Cowlily	G5T4T5	S1	TU	PE
<i>Epilobium strictum</i>	Downy Willow-herb	G5?	S3	PE	PR
<i>Phlox pilosa</i>	Downy Phlox	G5	S1S2	TU	PE
<i>Lysimachia hybrida</i>	Lance-leaf Loosestrife	G5	S1	N	PT
<i>Pyrola chlorantha</i>	Green-Flowered Wintergreen	G5	S1	N	TU
<i>Ranunculus fascicularis</i>	Tufted Buttercup	G5	S1S2	PE	PE
<i>Ranunculus flabellaris</i>	Yellow Water-crowfoot	G5	S2	N	PT
<i>Ranunculus flammula</i>	Lesser Spearwort	G5	SH	TU	PX
<i>Trollius laxus</i>	Spreading Globeflower	G4T3	S1	PE	PE
<i>Filipendula rubra</i>	Queen-of-the-prairie	G4G5	S1S2	TU	TU
<i>Prunus pumila</i> var. <i>depressa</i>	Sand Cherry	G5T5	S1		PE
<i>Prunus pumila</i> var. <i>susquehanae</i>	Sand Cherry	G5T4	S2		PT
<i>Rosa virginiana</i>	Virginia Rose	G5	S1	TU	TU
<i>Potentilla fruticosa</i>	Shrubby Cinquefoil	G5	S1	PE	PE
<i>Salix candida</i>	Hoary Willow	G5	S1	PT	PE
<i>Salix petiolaris</i>	Meadow Willow	G5	S4	TU	WATCH
<i>Salix serissima</i>	Autumn Willow	G4	S2	PT	PT
<i>Parnassia glauca</i>	Carolina Grass-of-parnassus	G5	S2	PE	PE
<i>Castilleja coccinea</i>	Scarlet Indian-paintbrush	G5	S2	TU	PT
<i>Gratiola aurea</i>	Golden Hedge-hyssop	G5	S1	TU	PE
<i>Pedicularis lanceolata</i>	Swamp Lousewort	G5	S1S2	N	PE
<i>Juniperus communis</i>	Common Juniper	G5	S2	N	TU
<i>Alisma triviale</i>	Northern Water-plantain	G5	S1	PE	PE
<i>Carex adusta</i>	Crowded Sedge	G5	SX	PX	PX
<i>Carex alata</i>	Broad-winged Sedge	G5	S2	PT	PT
<i>Carex bicknellii</i>	Bicknell's Sedge	G5	S1	PE	PE
<i>Carex eburnea</i>	Ebony Sedge	G5	S1	PE	PE
<i>Carex flava</i>	Yellow Sedge	G5	S2	PT	PT
<i>Carex lasiocarpa</i>	Slender Sedge	G5	S3	PR	PR
<i>Carex longii</i>	Long's Sedge	G5	SU	TU	TU
<i>Carex polymorpha</i>	Variable Sedge	G3	S2	PE	PT
<i>Carex prairea</i>	Prairie Sedge	G5?	S2	PT	PT
<i>Carex shortiana</i>	Sedge	G5	S3	N	PR



Hooker's Orchid
Platanthera hookeri



LBJ Wildflower Center - Wosowski
Swamp Lousewort
Pedicularis lanceolata



T. Maxfield

Long-bracted Green Orchid
Coeloglossum viride



LBJ Wildflower Center - Wosowski

Netted Chainfern
Woodwardia areolata

Table 10: Plant Species of Conservation Concern
in the Martins-Jacoby Watershed (continued)

Scientific Name	Common Name	Global Rank	State Rank	State Protection Status	Proposed State Status
<i>Carex sprengelii</i>	Sedge	G5?	S3	N	PR
<i>Carex sterilis</i>	Sterile Sedge	G4	S1	PT	PE
<i>Carex tetanica</i>	A Sedge	G4G5	S2	PT	PT
<i>Cyperus dianthus</i>	Umbrella Flatsedge	G5	S2	PE	PE
<i>Eleocharis intermedia</i>	Matted Spike-rush	G5	S2	PT	PT
<i>Eleocharis compressa</i>	Flat-stemmed Spike-rush	G4	S1	PE	PE
<i>Eriophorum gracile</i>	Slender Cotton-grass	G5	S1	PE	PE
<i>Eriophorum tenellum</i>	Rough Cotton-grass	G5	S1	PE	PE
<i>Eriophorum viridicarinatum</i>	Thin-leaved Cotton-grass	G5	S2	PT	PT
<i>Rhynchospora capillacea</i>	Capillary Beaked-rush	G4	S1	PE	PE
<i>Scleria verticillata</i>	Whorled Nutrush	G5	S1	PE	PE
<i>Juncus arcticus</i> var. <i>littoralis</i>	Baltic Rush	G5T5	S2	PT	PT
<i>Juncus biflorus</i>	Grass-leaved Rush	G5	S2	TU	PT
<i>Lemna perpusilla</i>	Minute Duckweed	G5	SU	N	TU
<i>Lemna valdiviana</i>	Pale Duckweed	G5	SH	PX	PX
<i>Melanthium virginicum</i>	Virginia Bunchflower	G5	SU	N	TU
<i>Arethusa bulbosa</i>	Swamp-pink	G4	S1	PE	PE
<i>Coeloglossum viride</i>	Long-bracted Green Orchid	G5	SH	TU	TU
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Small Yellow Lady's-slipper	G5	S1	PE	PE
<i>Cypripedium reginae</i>	Showy Lady's-slipper	G4	S2	PT	PT
<i>Malaxis bayardii</i>	Bayard's Malaxis	G1G2	S1	PR	PE
<i>Platanthera hookeri</i>	Hooker's Orchid	G4	S1	TU	PE
<i>Spiranthes lucida</i>	Shining Ladies'-tresses	G5	S3	N	TU
<i>Aristida longespica</i> var. <i>geniculata</i>	Spiked Needlegrass	G5T5?	SU	TU	WATCH
<i>Aristida purpurascens</i>	Arrow-feathered Three Awned	G5	S2	PT	PT
<i>Bouteloua curtipendula</i>	Tall Gramma	G5	S2	PT	PT
<i>Bromus kalmii</i>	Brome Grass	G5	S3	N	TU
<i>Panicum boreale</i>	Panic-grass	G5	SU	TU	TU
<i>Panicum scoparium</i>	Velvety Panic-grass	G5	S1	PE	PE
<i>Echinochloa walteri</i>	Walter's Barnyard-grass	G5	S1	PE	PE
<i>Panicum flexile</i>	Wiry Witchgrass	G5	S2S3	TU	TU
<i>Potamogeton praelongus</i>	White-stemmed Pondweed	G5	S1	PX	PE
<i>Woodwardia areolata</i>	Netted Chainfern	G5	S2	N	PT

**Table 10: Plant Species of Conservation Concern
in the Martins-Jacoby Watershed (...continued)**

Scientific Name	Common Name	Global Rank	State Rank	State Protection Status	Proposed State Status
<i>Dryopteris celsa</i>	Log Fern	G4	S1	N	PE
<i>Dryopteris clintoniana</i>	Clinton's Wood Fern	G5	S2	N	PT
<i>Equisetum x ferrissii</i>	Scouring-rush	GNA	S1	N	PE

Notes:

GNA - Not applicable. A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

G4 - Globally uncommon but not rare, and usually widespread.

G5 - Globally common, typically widespread and abundant.

G#G# - A numeric range rank (e.g. G2G3) is used to indicate the range of uncertainty in the status of a species or community. A G2G3 rank would indicate that there is a roughly equal chance of G2 or G3 and other ranks are much less likely. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).

T - The status of subspecies or varieties are indicated by a "T-rank" following the species' global rank.

SX - Species is believed to be extirpated from the state.

SH - Species occurred historically in the state (with expectation that it may be rediscovered).

S1 - Critically Imperiled - Critically imperiled in the state because of extreme rarity or because of some factors making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres.

S2 - Imperiled in the state because of rarity or because of some factors making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals or acres.

S3 - Vulnerable - Vulnerable in the state either because rare and uncommon, or found only in a restricted range or because of other factors making it vulnerable to extirpation, Typically 21 to 100 occurrences.

S-4 - Uncommon but not rare, and usually widespread in the state. Usually more than 100 occurrences.

SU - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

S#S# - A numeric rank (e.g. S2S3) is used to indicate the range of uncertainty about the exact status of the species.

PE - Plant species which are in danger of extinction throughout most of the natural range within PA, if critical habitat is not maintained to if the species is greatly exploited by man.

PT - Plant species which may become endangered throughout most or all of their natural range within PA, if critical is not maintained to prevent their future decline, or if species is greatly exploited by man.

PR - Plant species which are uncommon within this Commonwealth. All species of the native wild plants classified as Disjunct, Endemic, Limit of Range and Restricted are included within the Pennsylvania Rare classification.

PX - Plant species extirpated in Pennsylvania

PV - Vulnerable plant species which are in danger of population decline within PA because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.

TU - Tentatively undetermined. The plant species are believed to be in danger of population decline, but cannot be confirmed.

N - No current legal status exists.



LBJ Wildflower Center - Wosowski

Bicknell's Sedge
Carex bicknellii



LBJ Wildflower Center - Wosowski

Scouring-rush
Equisetum x ferrissii

**Table 11: Natural Communities of Conservation Concern
in the Martins-Jacoby Watershed**

(Source: Pennsylvania Heritage Program)

Common Name	Global Rank	State Rank
Ephemeral/fluctuating Natural Pool	GNR	S3
Acidic Broadleaf Swamp	G5	S3
Circumneutral Broadleaf Swamp	GNR	S2S3
Calcareous Seepage Swamp	GNR	S1
Basin Graminoid-forb Fen	GNR	S1
Northern Appalachian Calcareous Cliff Community	GNR	S2
Northern Appalachian Acidic Cliff Community	G5	S5
Northern Appalachian Shale Cliff Community	GNR	S2
Calcareous Riverside Outcrop Community	GNR	S1

Notes:

GNR - Unranked. Global rank not yet assessed.

G5 - Globally common, typically widespread and abundant.

S1 - Critically Imperiled - Critically imperiled in the state because of extreme rarity or because of some factors making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres.

S2 - Imperiled in the state because of rarity or because of some factors making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals or acres.

S3 - Vulnerable - Vulnerable in the state either because rare and uncommon, or found only in a restricted range or because of other factors making it vulnerable to extirpation, Typically 21 to 100 occurrences.

S-5 - Secure. Demonstrably widespread, abundant, and secure in the state, and essentially in-eradicable under present conditions.

S#S# - A numeric rank (e.g. S2S3) is used for indicate the range of uncertainty about the exact status of the species.



Pool at Slateford Creek.

K. Maxfield

Invasive and Exotic Species

An invasive species is defined as a species that is 1) non-native to the ecosystem and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112, 1999). An invasive plant displays rapid growth and spread, allowing it to establish over large areas.

Invasion by exotic species has been identified second only to habitat loss as a threat to biodiversity. In addition, introduction of these species is perhaps the most permanent and unrecoverable blow to native biodiversity and ecosystem processes. Once these species are well established it is sometimes impossible to remove them. When removal is possible, it comes at a high cost financially and ecologically.

A list of some of the most common invasive plants in the Watershed area is provided in Table 12. Those invasive plants identified as noxious weeds are noted as such in Table 12. A noxious weed is a legal designation used specifically for plant species that have been determined to be major pests of agricultural ecosystems and are subject, by law, to certain restrictions. The U.S. Department of Agriculture regulates noxious weeds and defines them as plants that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation the natural resources of the United States, the public health, or the environment. Plants can also be designated as “noxious weeds” by states and counties, usually through “noxious weed boards.” Pennsylvania has such a “board” and a list of noxious weeds for PA at the Pa Department of Agriculture. Many noxious weeds are designated as such for their impacts to agriculture, but also threaten natural areas where they may thrive and displace native species and associated habitats.



Japanese knotweed.

K. Maxfield

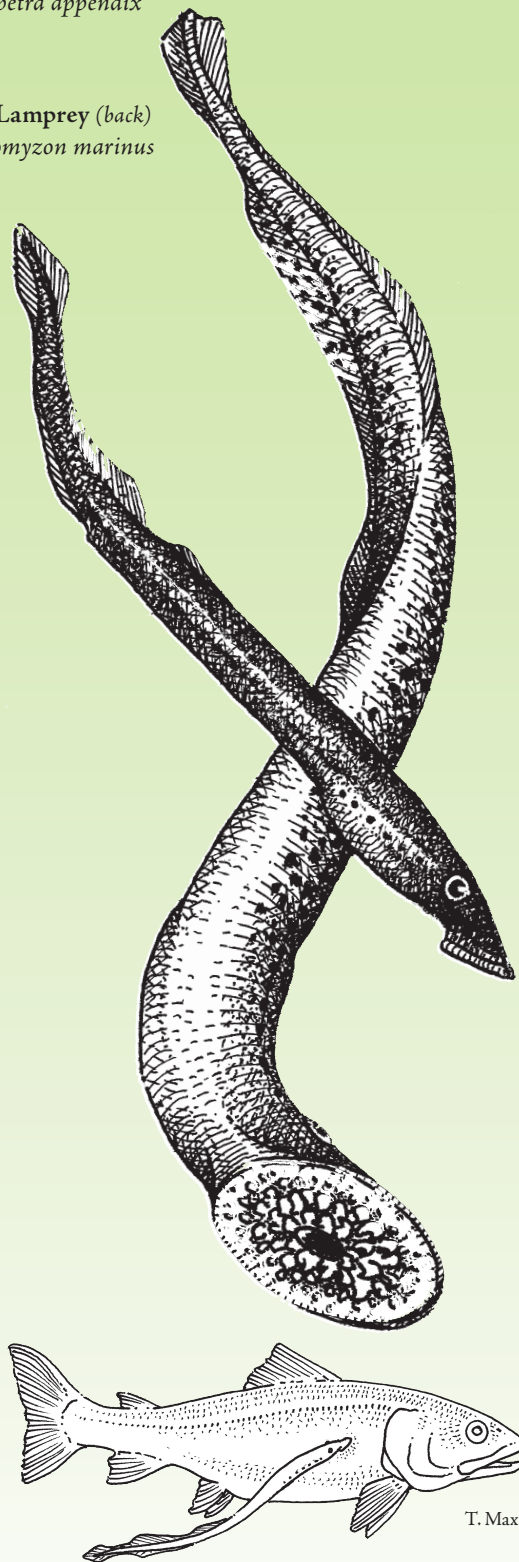
Table 12: Common Invasive Weeds in the Martins-Jacoby Watershed

Scientific Name	Common Name	Notes
<i>Alliaria petiolata</i>	Garlic-mustard	Spreads aggressively in woodlands by seed
<i>Hesperis matronalis</i>	Dame's rocket	Escaped garden plant, naturalized along roadways; spreads by seed
<i>Lythrum salicaria</i> , <i>L. virgatum</i>	Purple loosestrife	Garden escapee; PA noxious weed.
<i>Pastinaca sativa</i>	Wild parsnip	Found commonly along roadsides; widespread and abundant; spreads by seed
<i>Polygonum (Falopia) cusidatum</i>	Japanese knotweed	Difficult to control; spreads by roots and seeds
<i>Ranunculus ficaria</i>	Lesser celandine	Spreads by roots and shoots; can be very aggressive in wetlands
<i>Microstegium vimineum</i>	Japanese stilt grass	Spreads through woodlands by seed
<i>Berberis thunbergii</i>	Japanese barberry	Escaped from cultivation; spread by birds
<i>Elaeagnus umbellata</i>	Autumn olive	Escaped from plantings; spreads by birds
<i>Acer platatnoides</i>	Norway maple	Commonly planted and escaped; wind spreads prolific seeds
<i>Ailanthus altissima</i>	Tree-of-heaven	Wind spreads prolific seeds
<i>Phragmites australis</i>	Common reed	Spreads by roots and shoots; can be very aggressive in wetlands
<i>Rosa multiflora</i>	Multiflora rose	Spreads by roots, shoots, and seeds; PA noxious weed
<i>Cirsium vulgare</i>	Bull Thistle	Spreads aggressively by seeds; PA noxious weed
<i>Sorghum halepense</i>	Johnsongrass	Spreads by seeds and rhizomes; PA noxious weed
<i>Datura stramonium</i>	Jimsonweed	Spreads by seeds; PA noxious weed
<i>Cirsium nutans</i>	Nodding thistle	Spreads aggressively by seeds; PA noxious weed
<i>Cirsium arvense</i>	Canada thistle	Spreads aggressively by seeds; PA noxious weed
<i>Polygonum perfoliatum</i>	Mile-a-minute	Spreads aggressively by seeds; PA noxious weed

American Brook Lamprey (front)

Lampetra appendix

Sea Lamprey (back)

Petromyzon marinus

Lampreys have a toothed, round sucking mouth. The sea lamprey is a parasite that attaches to its prey, bores into the skin and sucks out blood and bodily fluids. As parasites, they scar and often kill the fish they are feeding on. The American brook lampreys are a non-parasitic, filter-feeding aquatic species that survives on very small plant and animal life.

Fauna

Animal Communities

Animal communities can be broken down into vertebrates (fish, birds, mammals, amphibians, reptiles) and invertebrates (insects). The invertebrate population in the Watershed is large and varied and will not be discussed in detail. Instead this section will focus on the vertebrate populations.

A list of the fish in the Watershed is shown in Table 13. There are over 25 kinds of fish in the Watershed, which make up a robust fishery.

Table 13: Fish of the Martins-Jacoby Watershed

(Data Source: Pennsylvania Fish and Boat Commission Fisheries database and personal correspondence with the Martins-Jacoby Watershed Association)

Common Name	Scientific Name	Status
American eel	<i>Anguilla rostrata</i>	N
brook trout**	<i>Salvelinus fontinalis</i>	N
brown trout**	<i>Salmo trutta</i>	I
longnose dace	<i>Rhinichthys cataractae</i>	N
blacknose dace	<i>Rhinichthys atratulus</i>	N
rainbow trout***	<i>Oncorhynchus mykiss</i>	I
white sucker	<i>Catostomus commersoni</i>	N
black crappie	<i>Pomoxis nigromaculatus</i>	N, I
bluegill	<i>Lepomis macrochirus</i>	N
common shiner	<i>Luxilus cornutus</i>	N
creek chub	<i>Semotilus atromaculatus</i>	N
largemouth bass	<i>Micropterus salmoides</i>	N, I
smallmouth bass	<i>Micropterus dolomieu</i>	N, I
cutlip minnow	<i>Exoglossum maxillingua</i>	N
fallfish	<i>Semotilus corporalis</i>	N
chain pickerel	<i>Esox niger</i>	N
brown bullhead	<i>Ameiurus nebulosus</i>	N
golden shiner	<i>Notemigonus crysoleucas</i>	N, I
redbreast sunfish	<i>Lepomis auritus</i>	N
American brook lamprey	<i>Lampetra appendix</i>	N
rock bass	<i>Ambloplites rupestris</i>	N, I
walleye	<i>Stizostedion vitreum vitreum</i>	N, I
pumpkinseed sunfish	<i>Lepomis gibbosus</i>	N
redfin pickerel	<i>Esox americanus americanus</i>	N
tessellated darter	<i>Etheostoma olmstedii</i>	N
sea lamprey	<i>Petromyzon marinus</i>	N

Notes:

* N - No special status; I - Introduced to non-native drainage

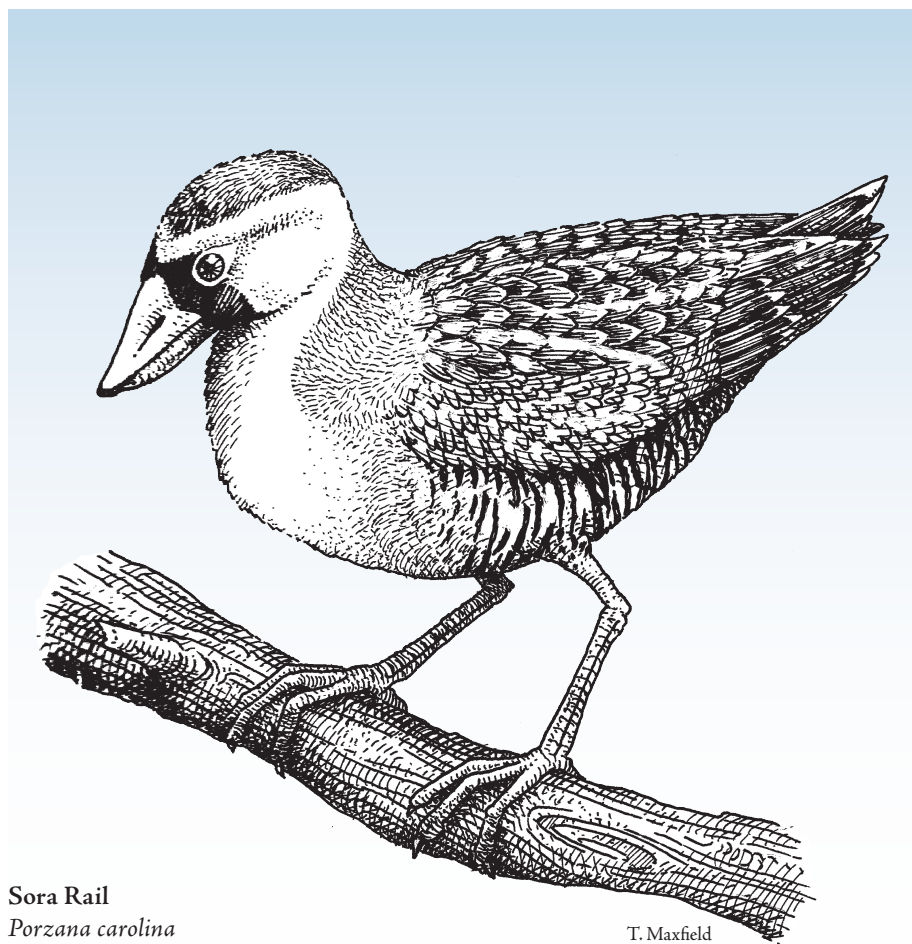
** Wild and Stocked (all other fish types are wild, unless otherwise noted)

***Stocked fish

A list of birds of conservation concern in the Watershed is shown in Table 14. Minsi Lake is a popular birding area in the Watershed. This area is an excellent site for waterfowl sightings during migration. Other local birding information can be obtained from the booklet "Birds of the Lehigh Valley and Vicinity" (2002) or the "Atlas of Breeding Birds in Pennsylvania" (1992), which is currently being updated. A listing of all currently known bird species sited in the Martins-Jacoby Watershed area is available from the watershed association upon request.

**Table 14: Avian Species of Conservation Concern
in the Martins-Jacoby Watershed**
(Source: Pennsylvania Natural Heritage Program)

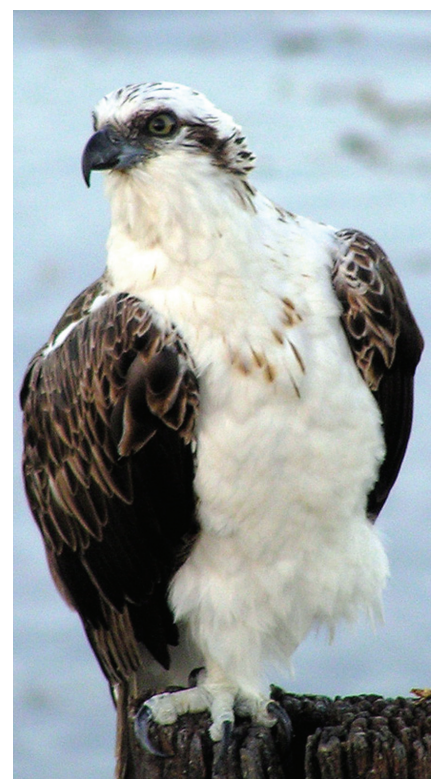
Scientific Name	Common Name	Global Rank	State Rank	State Protection Status	Proposed State Status	Federal Status
<i>Pandion haliaetus</i>	Osprey	G5	S2B	PT	PT	LT
<i>Rallus limicola</i>	Virginia Rail	G5	S3B			
<i>Porzana carolina</i>	Sora	G5	S3B		CR	



Sora Rail
Porzana carolina

T. Maxfield

The secretive Sora Rail is often heard but not seen. It is small and has one of the most unusual calls of any marsh bird that is often described as a whinny that descends. The Soras are the most abundant and widely spread of the North American rails and they migrate each fall and spring between breeding and wintering wetlands. They prefer areas with denser emergent vegetation. Their main food source is wetland plant seeds and aquatic invertebrates. Other names used to refer to the Sora are Soree, Meadow Chicken, Carolina Rail and Ortolan.



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Osprey
Pandion haliaetus

Notes for Table 14:

G5 - Globally common, typically widespread and abundant.

S2 - Imperiled in the state because of rarity or because of some factors making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals or acres.

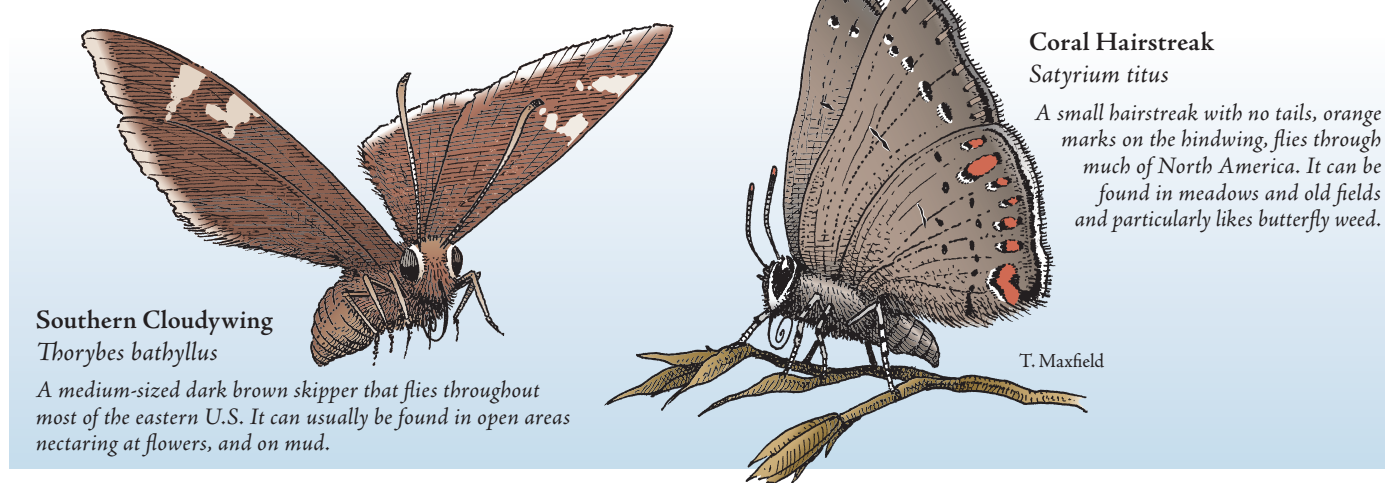
S3 - Vulnerable - Vulnerable in the state either because rare and uncommon, or found only in a restricted range or because of other factors making it vulnerable to extirpation, Typically 21 to 100 occurrences.

B - Breeding. Basic rank refers to the breeding population in the state.

PT - Plant species which may become endangered throughout most or all of their natural range within PA, if critical is not maintained to prevent their future decline, or if species is greatly exploited by man.

CR - Candidate rare. Species which exist only in one of a few restricted geographic areas or habitats within PA, or they occur in low numbers over a relatively broad area of PA.

LT - Any species which is likely to become an endangered species with the foreseeable future throughout a significant portion of its range.



There are many reptiles, amphibians, and mammals in the Watershed, too numerous to list here. Some of the more common reptiles include the common snapping turtle, wood turtles, Eastern box turtle, Eastern painted turtle, Northern water snake, Eastern garter snake, Northern ring neck snake, Northern black racer, black rat snake, and Eastern milk snake.

Common amphibians include the American toad, Eastern gray tree frog, Northern spring peeper, Northern leopard frog, pickerel frog, wood frog, green frog, bull frog, spotted salamander, red-spotted newt, Northern dusky salamander, eastern red-backed salamander, slimy salamander, four-toes salamander, Northern spring salamander, Northern red salamander, and Northern two-lined salamander.

Mammals more commonly observed in the Watershed area include opossum, Eastern mole, little brown bat, big brown bat, raccoon, mink, striped skunk, red fox, woodchuck, Eastern chipmunk, Eastern gray squirrel, house mouse, Norway rat, Eastern cottontail, white-tailed deer.

Threatened and Endangered Species

Tables 15 and 16 list all of the threatened and endangered invertebrates and vertebrates in the Watershed, respectively. There are ten invertebrate species of conservation concern and nine vertebrate species of conservation concern.

Scientific Name	Common Name	Global Rank	State Rank	State Protection Status	Proposed State Status	Federal Status
<i>Nicrophorus americanus</i>	American Burying Beetle	G2G3	SH			LE
<i>Coleophora leucochrysell</i>	Chestnut Case-bearer Moth	GU	SX			
<i>Thorybes bathyllus</i>	Southern Cloudywing	G5	S3S4			
<i>Poanes massasoit</i>	Mulberry Wing	G4	S3			
<i>Euphyes conspicuus</i>	Black Dash	G4	S3			
<i>Satyrium titus</i>	Coral Hairstreak	G5	S3S4			
<i>Satyroides eurydice</i>	Eyed Brown	G4	S1S3			
<i>Datana ranaeceph</i>	A Hand-maid Moth	G3G4	S1			
<i>Anodonta implicata</i>	Alewife Floater	G5	SNR		CU	
<i>Lampsilis cariosa</i>	Yellow Lampmussel	G3G4	S3S4		CU	

Notes:

G4 - Globally uncommon but not rare, and usually widespread.

G5 - Globally common, typically widespread and abundant.

SX - Species is believed to be extirpated from the state.

SH - Species occurred historically in the state (with expectation that it may be rediscovered).

S1 - Critically Imperiled - Critically imperiled in the state because of extreme rarity or because of some factors making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres.

S3 - Vulnerable - Vulnerable in the state either because rare and uncommon, or found only in a restricted range or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences.

S-4 - Uncommon but not rare, and usually widespread in the state. Usually more than 100 occurrences.

S#S# - A numeric rank (e.g. S2S3) is used to indicate the range of uncertainty about the exact status of the species.

CU - Condition Undetermined. Species for which there is insufficient data available to provide an adequate basis for their assignment to other classes or categories.

LE - A species which is endangered of extinction throughout all or a significant portion of its range.

**Table 16: Vertebrate Species of Conservation Concern
in the Martins-Jacoby Watershed**
(Source: Pennsylvania Natural Heritage Program)

Scientific Name	Common Name	Global Rank	State Rank	State Protection Status	Proposed State Status	Federal Status
<i>Pandion haliaetus</i>	Osprey	G5	S2B	PT	PT	LT
<i>Rallus limicola</i>	Virginia Rail	G5	S3B			
<i>Porzana carolina</i>	Sora	G5	S3B		CR	
<i>Notropis chalybaeus</i>	Ironcolor Shiner	G4	S1	PE	PE	
<i>Myotis septentrionalis</i>	Northern Myotis	G4	S3B,S3N		CR	
<i>Neotoma magister</i>	Allegheny Woodrat	G3G4	S3	PT	PT	LT
<i>Carphophis amoenus</i>	Worm Snake	G5	S3			
<i>Heterodon platirhinos</i>	Eastern Hognose Snake	G5	S3			
<i>Crotalus horridus</i>	Timber Rattlesnake	G4	S3S4	PC	CA	

Notes:

G3 - Vulnerable globally either because very rare and local throughout its range, found only in a restricted range.

G4 - Globally uncommon but not rare, and usually widespread.

G5 - Globally common, typically widespread and abundant.

S1 - Critically Imperiled - Critically imperiled in the state because of extreme rarity or because of some factors making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres.

S2 - Imperiled in the state because of rarity or because of some factors making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals or acres.

S3 - Vulnerable - Vulnerable in the state either because rare and uncommon, or found only in a restricted range or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences.

S-4 - Uncommon but not rare, and usually widespread in the state. Usually more than 100 occurrences.

B - Breeding. Basic rank refers to the breeding population in the state.

N - Non-breeding. Basic rank refers to the non-breeding population of the state.

S#S# - A numeric rank (e.g. S2S3) is used to indicate the range of uncertainty about the exact status of the species.

PE - Plant species which are in danger of extinction throughout most of the natural range within PA, if critical habitat is not maintained to if the species is greatly exploited by man.

PT - Plant species which may become endangered throughout most or all of their natural range within PA, if critical is not maintained to prevent their future decline, or if species is greatly exploited by man.

PC - Animals could become endangered or threatened in the future.

CA - Candidate at risk. Species that are although relatively abundant now are particularly vulnerable to certain types of exploitation or environmental modification.

CR - Candidate rare. Species which exist only in one of a few restricted geographic areas or habitats within PA, or they occur in low numbers over a relatively broad area of PA.

LT - Any species which is likely to become an endangered species with the foreseeable future throughout a significant portion of its range.

Exotic Species

Exotic or non-native faunal species in the Watershed are widespread. The introduced fish species in the Watershed are shown in Table 13. Introduced fish species can have a negative impact on the native fish populations due to competition for food, predation on native fish, and degradation of habitat. There are few exotic amphibians and reptiles due to the temperate climate in the Watershed.

Five exotic bird species regularly nest in Pennsylvania. Three of these are abundant and include the pigeon, European starling, and house sparrow. The remaining exotics are mute swan and ring-necked pheasant. Starlings and house sparrows may be the most harmful exotic bird species to native species because they compete with native birds for nesting cavities and prey on eggs and nestlings. Mute swans are territorial and tend not to over-populate in any given area. Additionally, they are thought to deter Canada geese which commonly cause nutrient and turbidity impacts to waterways. Ring-necked pheasants, which once were very prevalent throughout the Lehigh Valley, have declined dramatically over the past two decades due to many factors, including habitat loss and changes in farming practices.



Mute Swan
Cygnus olor

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Wildlife Habitat

Wildlife habitat throughout the Watershed can best be described as a collection of fragmented forests, edges, and patches in a human-dominated landscape. Some ecologists speak of forest “islands” in a “sea” of mixed landscape terrain, demonstrate boundaries between communities and the resulting “edge effect”, and characterize the “remnant forest” as they described the region (Halma and Oplinger, 2001).

Before European colonization, much of the Watershed area was dominated by forest. Major changes in the Watershed occurred with the arrival of the colonists. The spurt in human population in the early part of the nineteenth century, coupled with industrial development, had a profound impact on the forests. The construction of canals, railroads, streets that crisscross the Watershed produced fragmentation of the forest and created edge habitats and variously sized patches of forest.

Several habitat patterns are characteristic of the Watershed area and most regions in which human activity has flourished for any duration. These include: 1) bottomland forest, along stream edges, 2) upland forest or higher elevations between stream valleys, 3) suburban canopy – such as older sections of cities and towns and older developments, and city and county parks, 4) suburban without canopy – newer developments, sometimes woodlots of varied age and size, 5) croplands and pasture lands with hedge and tree line, 6) industrial – light industrial parks with lawns, planted shrubs and trees, and 7) the varied vegetation edges formed as a result of the construction of highways and other road, railways, pipelines, and similar human-made corridors (Halma and Oplinger, 2001).

These habitat patterns dictate the types of plants and animals one will find in the Watershed. For example, plants found in abundance along the edge of a stream would not flourish in upland woodland. Similarly, birds that live in the interior of a large forest will not be found in a fragmented edge of a woodlot.

Greenway and Wildlife Corridors

Although fragmented woodlands dominate the Watershed, the forested corridor along the Blue Mountain does provide excellent habitat for plants and animals. The Blue Mountain is the best example in the Watershed of a greenway and wildlife corridor.

Many of the streams in the Watershed, especially in the northern and western portion of the Watershed area have forested riparian areas. These areas are not as wide as the forest areas in the Blue Mountain, but do provide narrow greenway and wildlife corridors.



Woodlands near Totts Gap Swamp.

K. Maxfield

7. RECREATIONAL AND CULTURAL RESOURCES

Outdoor Recreation

Recreational resources in the Watershed play an important role in the economy and culture of the area. As local and regional populations increase, the potential for passive and active recreation and the associated economic benefits provided by the natural and cultural resources found within the Martins-Jacoby Watershed will also increase.

Passive Recreational Areas

Figure 26 shows thirteen (13) passive recreational areas in the Watershed. These passive recreation areas include the Appalachian Trail Lands, the Delaware Water Gap National Recreation Areas, and several county- and municipal-owned parks. There are no State Parks or Gamelands in the Watershed area.

Active Recreational Areas

Figure 27 (page 65) shows fifty-two (52) active recreational areas within the Watershed, including ball fields, rod and gun clubs, picnic areas, tot lots, campgrounds, and many other active recreational areas and facilities.



Track and field at Bangor Memorial Park.

K. Maxfield



Martin's Creek ballfield.

K. Maxfield



K. Maxfield

Trails

There are a few trail systems in the Watershed. The most significant system is the Appalachian Trail, which runs along the ridge of the Blue Mountain. This section is part of the nationally significant Appalachian Trail that runs 2,175 miles along a footpath stretching from Maine to Georgia.

There are a few other small trail systems in the Watershed including one in Upper Mt. Bethel Township, a rail-trail in Forks Township, and a trail that is currently being constructed in Lower Mt. Bethel Township. PPL also has a small trail system near its Martins Creek plant that is open for public use.

Fishing and Boating

Given the number of stream miles in the Watershed and their location adjacent to the Delaware River, fishing and boating activities are prevalent. Areas in the Watershed accessible to fishing and boating are shown in Figures 26 and 27.

Most boating activity takes place of the Delaware River and commonly includes motorized boating. Non-motorized boating is also popular along the river and streams in the Watershed.

Table 13 provides a comprehensive list of fish in the Watershed area, excluding the Delaware River. Figure 28 (page 66) is a map of the wild trout reproduction in the Watershed. Waterways in the Watershed offer year-round opportunities for public fishing for several species of warm-water, cool water, and cold-water fish.

Other Recreational Opportunities

The Watershed has a wide range of other recreational including hunting, hiking, swimming, bicycling, as well as many others.

Cultural and Historical Resources

Long before the colonists arrived in the Watershed area, Native Americans called the Lenape lived in the region. Pennsylvania land was first purchased from the Lenape in 1638 (Halma and Oplinger, 2001). Native American notions about land ownership and property sale were vastly different from those of the colonists.

Immigration to Pennsylvania increased during the early years of the eighteenth century, with large numbers of German settlers making their way to the Lehigh Valley. As white settlers moved into the region, they initially used the trails made by the Native Americans. The banks of the Delaware served as a major corridor leading from the south, passing through the sites of Easton, Bangor, and Portland, progressing north through the Delaware Water Gap (Halma and Oplinger, 2001).

As more and more settlers arrived, the natives slowly moved out to the west and north to lands that had not yet been discovered by European immigrants. As they moved into this part of Pennsylvania, the settlers found a land of abundance, with shad in the rivers, tremendous quantities of trout in the smaller streams, and grouse, squirrel, rabbits and deer by the thousand in the forests.

Seventy-five percent of the inhabitants at the time of the Revolutionary War were listed on tax rolls as farmers ((Halma and Oplinger, 2001). Clearing land for planting crops was among the first tasks facing settlers in the Watershed. Agriculture in Northampton County has been a dominant part of daily life from the beginning of European settlement.

Things may have stayed pretty much the same in the 19th century if not for the anthracite coals discovered in the latter decades of the 18th century and the coming industrial age.

In the Watershed area, the cement industry had a large role in growth of the area near the end of the 19th century. The great cement era began in the 1890s as a result of the use of the rotary kiln processing techniques and a greater national demand for this building material. Cement production was confined to a "cement belt" several miles wide extending from Belvedere, NJ to Ormrod in Lehigh County.

Another important industry to the area has been slate mining. Until recently, most of the buildings in the Watershed area had slate roofs. Many still do. Slate has been produced for many other purposes as well. The slate industry prospered when building activity prevailed and suffered when slow economic times have limited building operations.

In recent times since the decline of the cement and slate industries, Watershed residents are mostly employed in non-agricultural jobs and many work outside of the Watershed area.

The National Register of Historic Places (NRHP) is the official list of historical and cultural resources worthy of preservation in the United States and is administered by the National Park Service. The NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historical and archeological resources. Places listed in the NRHP include districts, sites, building, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture.

The Watershed area has five important historical resources listed on the NRHP map, including:

- ♦ **Bridge in Bangor Borough:** Architecture/Engineering historic significance
- ♦ **County Bridge No. 36:** Architecture/Engineering historic significance
- ♦ **Real Estate Building:** Event, Architecture/Engineering historic significance
- ♦ **Weona Park Carousel:** Event, Architecture/Engineering historic significance
- ♦ **Williams Jacob Heller House:** Person and Engineering historic significance



K. Maxfield

The Real Estate Building in Bangor, now called the Century Building.



The Weona Park Carousel is one of five sites in the watershed that is listed on the National Register of Historic Places.

K. Maxfield



The beautiful natural areas of the Martins-Jacoby Watershed offer numerous opportunities for passive recreation.

K. Maxfield

Page 64 Insert MAP 26

Page 65 Insert MAP 27

Page 66 Insert MAP 28

8. WATERSHED POLLUTANT SOURCES

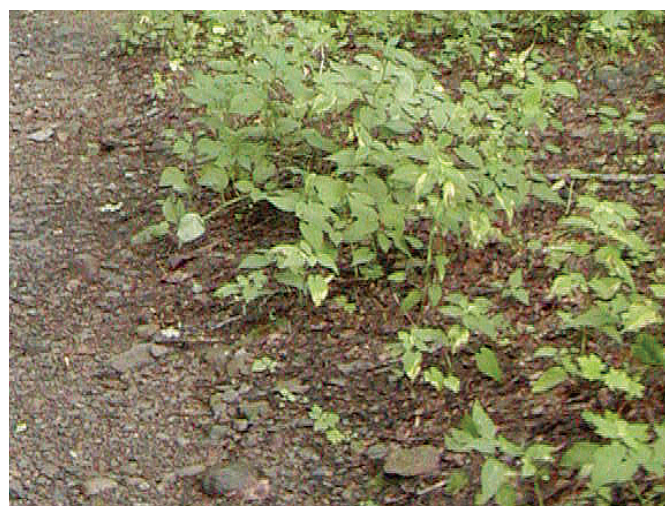
Point Source

Due to relatively good, suitable soils for on-lot septic systems throughout much of the Martins-Jacoby Watershed, centralized public and private wastewater treatment facilities have been confined largely to the more densely populated urban areas, along with a few areas of high-density development and institutional use. Figure 29 (page 69) shows the location of all existing sewer and water systems located throughout the Watershed.

Pen Argyl Sewage Treatment Plan (STP) provides service for Pen Argyl Borough and portions of Plainfield and Washington Townships. The Pen Argyl STP is a contact aeration trickling filter process, but is currently being upgraded to a sequential batch reactor secondary sewage treatment facility. The Bangor and East Bangor Borough STPs are both sequential batch reactor secondary sewage treatment facilities. The Easton STP is a primary clarification, final clarification, aerobic sludge digestion treatment facility. The new Portland STP which became operational during 2009 is a state-of-the-art membrane biological reactor, ultraviolet filtration, aerobic sludge digestion tertiary treatment facility. The smaller STPs at the Bangor School District, Evergreen Village, and Lutheran Brethren Conference Center are package treatment plants. Table 17 summarizes the service areas, point source burden (actual and permitted flows), and populations served for the STPs within the Martins-Jacoby Watershed.

Water quality monitoring conducted as part of this study during 2007 did not indicate any notable problems which may be caused by point source discharges into the streams within the Watershed.

In addition to WWTP discharges, there are several permitted industrial discharges located throughout the Watershed for water dependent businesses. Figure 30 (page 70) shows the location of all discharges with NPDES permits.



K. Maxfield

Soils within the watershed are generally suitable for on-lot septic systems.

Table 17: Sewage Treatment Plant Point Sources in the Martins-Jacoby Watershed

Sewage Treament Plant (STP)	Service Area ¹	Sewage Treatment Flows ² Actual ³ Permitted (millions of gallons per day)	
Bangor Borough STP	Bangor and Roseto Boroughs	1.800	1.600
Bangor School District STP	Upper Mount Bethel Township	0.009	0.023 ⁴
East Bangor STP	East Bangor Borough	0.092	0.100
Evergreen Village	Upper Mount Bethel Township	0.019	0.049 ⁴
Lutheran Brethren Conference Center	Upper Mount Bethel Township	0.019	0.049 ⁴
Pen Argyl STP	Pen Argyl Borough, Plainfield and Washington Townships	1.078	0.950
Portland Borough STP	Portland Borough and Upper Mount Bethel Township	not available new plant	0.105

1 – Portions of municipalities listed.

2 – Lehigh Valley Planning Commission, PA Department of Environmental Protection and municipal/authority records, 2009.

3 – Flows reflect maximum 3 consecutive month average flows based on DEP's reporting procedure.

4 – Actual and Permitted, Lehigh Valley Planning Commission, 2005

Note: All flows expressed in MGD (million gallons per day).

Non-Point Source

Thirty-one (31) non-point source pollution problem areas were identified throughout the Martins-Jacoby Watershed, as shown in Figure 31 (page 71). In general, the majority of the identified problem areas involved erosion, stormwater runoff, and inadequate stormwater erosion and sedimentation pollution controls. All identified nonpoint source pollution problem areas were compiled in tabular and map formats. A Geographic Information Systems (GIS) database with shape file (layer) was created which included the location of each problem area, photographs of each site, a recommended Best Management Practice (BMP) or retrofit to address the identified problem, and a cost estimate for each BMP. The table and copy of the GIS map are provided in Appendix B. The information provided as a result of these investigations can be used to seek funding to construct and implement specific BMPs to address the problems noted. A discussion of funding sources is provided in Section 10 of this Plan.

Several severe streambank erosion problem areas occurred prior to the initiation of this project following the flooding flows associated with Hurricane Ivan and two subsequent storm events in 2005 and 2006. Three of these areas were corrected using a combination of structural and bio- engineering methods. Several areas, however, remain which need to be restored or stabilized to prevent further erosion and associated nutrient and sediment impacts to downstream waters. The MJWA has been working with the Pennsylvania Department of Conservation and Natural Resources to obtain the necessary funding for the materials and labor for these project areas. The problem area is currently being corrected through design, permitting, and construction funds provided through Pennsylvania's Growing Greener Program. The MJWA is also working with the Northampton County Conservation District and the Natural Resource Conservation Service to install agricultural BMPs on farms with the Watershed.



Kyle Hoffman, intern with Hanover Engineering, takes some water samples.

J. Smith

Page 69 Insert MAP 29

Page 70 Insert MAP 30

Page 71 Insert MAP 31

9. WATERSHED MANAGEMENT RECOMMENDATIONS AND STRATEGIES



MJWA

Martins-Jacoby Watershed Association members work to clear a floodplain area from debris after a logjam obstructed creek flow.

The protection and management of the Martins-Jacoby Watershed can be outlined in four general management goals:

1. Control and manage growth and development,
2. Control and manage invasive species,
3. Control and reduce nonpoint source pollution, and,
4. Restore natural stream flows.

Specific strategies for accomplishing these management goals are outlined in the following sections. A Priority Action Plan for implementing the Martins-Jacoby Watershed Conservation Plan is provided in Section 10.

Control and Manage Growth and Development

The protection of the Martins-Jacoby Watershed depends primarily on the ability of the municipalities, and particularly the townships within the Watershed to restrict and guide the location, quantity, and types of new growth. This task is made exceedingly difficult when market conditions create a high demand for new development and housing, which in-turn inflates land prices and increases local taxes and drives landowners to sell natural lands and farmland for land development projects. While substantial amounts of both privately- and publicly-protected lands exist within the Watershed, vast amounts of privately held lands are available for development, many of which are larger farms and contain suitable soils for conventional on-lot septic systems. Growth management involves continual collaboration with key groups on a number of strategies including ordinance development, municipal planning, multi-municipal planning, land preservation, and outreach.

Municipal Ordinances

Strong, conservative municipal ordinances which are structured to conserve water, protect water quality, minimize consumption of undeveloped land, reduce sprawl and create sustainable growth and development are essential to the protection of surface and ground water, as well as preserving the quality of life offered throughout the region.

The zoning ordinance, subdivision and land development ordinance, and comprehensive plan are the three major documents that define and implement municipal land planning under the Pennsylvania Municipal Planning Code. The Martins-Jacoby Watershed Association should work with the Watershed municipalities to update and improve their ordinances and comprehensive plans to regulate development in a manner that protects and conserves water resources, as well as open space and general quality of life offered within the region.

The Martins-Jacoby Watershed should work with the various Watershed municipalities to ensure that their existing and future ordinances and plans are being implemented properly. Developing progressive and well-designed planning documents is futile if they are not well-implemented. Ordinance definitions must be clear, concise, and accurate for ordinances to be effective. All environmental regulation definitions should be checked and revised as necessary. Particular attention should be given to the definition of “wetlands” and “waters” as well as methodology for their delineation.

Watershed Management Recommendations and Strategies

A list of ordinance recommendations and deficiencies for each Township within the Watershed is provided in Appendix C.

There have been many recent developments which may directly or indirectly benefit water quality and environmental protection, and which are directly tied to municipal regulations and enforcement. Notable initiatives include:

Act 24 – Appalachian Trail Preservation

Act 24, which was signed by Governor Rendell in June, 2008, requires 58 Pennsylvania municipalities through which the Appalachian National Scenic Trail (AT) runs to use their zoning authority to preserve the AT and protect the natural, scenic, historic and aesthetic resources along the trail. Section 4 of that Act states that municipalities shall “take such action consistent with applicable law, as at least an interim measure, to preserve the natural, scenic, historic and aesthetic values of the trail and to conserve and maintain it as a public natural resource. Such action shall include the adoption, implementation and enforcement of zoning ordinances as the governing body deems necessary to preserve those values.” Upper Mount Bethel, Washington, and Plainfield Townships all contain privately held lands which abut the AT, and therefore are required to adopt or amend their zoning ordinances, accordingly, under Act 24 to include all reasonable protective measures meeting the intent of the Act.

Alternative Energy Sources

Generally poorer economic conditions and realization of the need for energy independence, has spurred the market for research and development and implementation of alternative energy sources. Many of the potential, viable sources being explored and used require municipalities to address dimensional and use issues through existing and new regulations. Solar and wind power generally require only dimensional considerations, while outdoor wood burning furnaces and geothermal energy systems require both dimensional and use considerations, including potential for environmental impacts. In general, environmental impacts associated with outdoor wood burning furnaces require stipulations on what may be used as fuel and on requirements for air pollution control. The primary concern for impacts from geothermal energy systems relates to groundwater pollution potential associated with chemicals used in the underground portions of most systems which may leak and cause groundwater pollution. The Watershed municipalities should address all alternative energy sources, accordingly, as amendments to their existing Zoning Ordinances or as “stand alone” ordinances.



J. Mauser

Over 100 people attended a “Bio-Fuels for Communities and Schools Conference” in August of 2009. Ten organizations, including the Martins-Jacoby Watershed Association, partnered to organize the conference.

Fuels to Schools and Beyond

The recent trend toward Energy Independence and the corresponding push toward development and use of alternative fuels appear to offer a prime opportunity for preserving farmland which might otherwise be converted for residential development. Warm Season Grasses may be grown in addition to or in place of traditional farm crops to provide a source for pelletized fuels which may be used for heating. The Fuels to Schools & Beyond program is a proven example of how grass-based pellets can be used for heating in place of fuel oil or electric heat from fossil-fuel based power plants. Grasslands also provide excellent habitat for many bird species and other wildlife which would benefit from such land management, and in fact offer critical habitat for some species like the barn owl. Current ordinances in many municipalities, however, do not technically allow for a grassland condition which is in conflict with the language contained in common Weed Ordinances. Therefore, municipalities, and primarily the townships where farms are generally found, should replace their Weed Ordinances with a combination of a Natural Landscaping Ordinance and a Noxious Weed Ordinance (also provided in Appendix C) which would allow actively managed herbaceous conditions but also require noxious plants to be removed or controlled to prevent their spread and damage to adjacent properties. These ordinances allow for mowing and landscaping, but encourage growth of native plants in back and side yards, particularly on sites near natural areas. Stormwater management is also inhibited by many Weed Ordinances. Natural vegetation, such as tall grasses, forbs, shrubs, and trees, provides habitat for wildlife, reduces stormwater runoff, buffers noise, and improves aesthetics. Many of these species are specified for use with currently accepted or required stormwater management BMPs.

Official Map

Article IV of the Municipalities Planning Code enables counties and municipalities to develop and adopt an Official Map, which is an effective planning tool for notifying all landowners of existing and proposed public lands and rights of way (e.g. surveyed locations of existing and proposed public streets, watercourses and public grounds, including widenings, extensions, diminution, openings or closings). An Official Map can be developed for an entire municipality or specific area, and may be a stand-alone ordinance or incorporated as part of an adopted Zoning Ordinance.

Article IV also contains a provision that allows municipalities to place environmentally sensitive and valuable areas on an official map. These designations help municipalities plan for recreational trails, as well as the protection of water resources, open space areas and other significant natural assets.

The municipalities within the Watershed should develop Official Maps which are protective of existing, valuable open spaces and which plan for recreational trails and associated facilities. At a minimum, the Official Maps should include existing riparian woodlands, as mapped by the Lehigh Valley Planning Commission, as lands designated for preservation.

Comprehensive Plan Development

Under the Municipalities Planning Code (MPC), four types of comprehensive plans are defined: municipal, multi-municipal, county and specific plan. A municipal plan covers a single municipality. A multi-municipal plan is developed and adopted by any number of contiguous municipalities and includes any joint municipal plan previously authorized by the MPC. A specific plan is a detailed plan for nonresidential development covered by a municipal or multi-municipal comprehensive plan.

The MPC defines a “County Comprehensive Plan” as “a land use and growth management plan prepared by the county planning commission and adopted by the county commissioners which establishes broad goals and criteria for municipalities to use in preparation of their comprehensive plan and land use regulation.” A multi-municipal plan is defined as “a plan developed by any number of contiguous municipalities, including a joint municipal plan as authorized by this act.” A “Specific Plan” is a means to expedite development approval by giving municipalities the authority to adopt a plan for the systematic implementation of a generally consistent comprehensive plan for any nonresidential area.

All comprehensive plans are subject to the following four common criteria: 1) contain basic plan elements set forth in Section 301(a); 2) contain a plan for the reliable supply of water, considering current and future water resources availability; 3) be reviewed every 10 years, and 4) “...identify those areas where growth and development will occur so that a full range of public

infrastructure, including sewer, water, highways, police and fire protection, public schools, parks open space and other services can be adequately planned and provided as needed to accommodate growth.”

MPC Section 301 (a) requires each municipal, multi-municipal, and county comprehensive plan to have nine elements. Collectively, these basic elements should present a composite vision of private and public development for the future based on a statement of community development goals and objectives. Each and every basic element is linked, interrelated, or connected. For example, resident population data equates to housing needs and demographics such as age cohorts can relate to housing types and educational needs, both present and future. There are a multitude of interrelationships among and between the required comprehensive plan elements.

A summary of the required plan elements derived from MPC sections 301 (a) follows:

- **A statement of community development goals and objectives** that chart the location, character and timing of future development.
- **A plan for land use** identifying the amount, intensity, character and timing of land use.
- **A plan to meet housing needs** of present residents and those families anticipated to live in the municipality as well as accommodating new housing in different dwelling types and at appropriate densities for households of all income levels.
- **A transportation plan.**
- **A community facilities plan.**
- **A statement of the interrelationships** among the various plan components which estimates the environmental, energy conservation, fiscal, economic development and social consequences on the municipality.
- **A discussion of short- and long-range plans** implementation strategies.
- **A statement indicating that existing and proposed development is compatible** with plans and development in contiguous municipalities. This statement should indicate that existing and proposed development is generally consistent with the objectives and plans of the county comprehensive plan.
- **A plan for the protection of natural and historic resources** to the extent the municipalities are not limited by other federal or state statutes, these resources include, wetlands, aquifer recharge zones, woodlands, steep slopes, prime agricultural land, flood plain, unique natural areas and historic sites.

(adapted from Governor’s Center for Local Government Services, 2001)

Watershed Management Recommendations and Strategies

In 2005, the Lehigh Valley Planning Commission (LVPC) completed the *Comprehensive Plan Lehigh Valley...2030* which focused strongly on:

- ♦ preservation of farmland
- ♦ preservation and protection of natural features
- ♦ redevelopment of old industrial sites including brownfields
- ♦ renewal and revitalization of the cities
- ♦ development of more parks and recreational facilities
- ♦ upgrade roads and intersections

All of the townships within the Watershed have Comprehensive Plans. Plainfield Township's plan is the oldest, dated 1983. Washington Township has the most recent plan, dated 2005, which was a multi-municipal plan that included the Boroughs of Bangor, East Bangor, and Roseto. Lower Mount Bethel Township is currently working on a revised plan, however, which should be completed during 2009. Upper Mount Bethel Township's most recent plan is dated 2001. Based on specifications for revisions included in the MPC, the Townships of Washington, Upper Mount Bethel, Plainfield, and Forks should all review and revise their Comprehensive Plans to ensure consistency with the *Comprehensive Plan Lehigh Valley...2030* which was completed in 2005. Lower Mount Bethel Township should craft their revised plan which is currently under development to be consistent with the *Comprehensive Plan Lehigh Valley...2030*.

Multi-municipal planning provides for efficient placement of land use activities, supporting infrastructure, and growth provisions across a significantly larger area of land than an individual municipality. Traditionally in Pennsylvania, planning has generally been completed on the municipal level, and State regulations require under the Municipalities Planning Code (MPC) that municipalities plan and provide for all types of residential housing. While an important concept, this provision does not generally provide adequately for sustainable growth and development throughout any given region, and may actually drive growth and development in an undesirable direction for many municipalities and regions. Therefore, the MPC has been amended in recent years to allow for regional, or multi-municipal, planning which still achieves the same goal of providing all types of residential housing and land-uses, but on a larger scale that results in greater sustainability and cooperation between participating municipalities.

Given the projected regional growth and development within the region encompassing the Martins-Jacoby Watershed, combined with the high potential for such growth and development, the local municipalities within the Watershed should engage in and successfully implement multi-municipal planning efforts.

Aside from the direct benefits of implementing multi-municipal planning, many funding sources which support municipal-based projects have been developed or amended to provide increased preference towards municipalities which have engaged in regional planning. Therefore, multi-municipal planning will improve the abilities for the municipalities in the Watershed to provide higher quality services and improved quality of life, while protecting against undesirable changes due to substandard growth and development.



K. Maxfield

Greenways Planning

The Martins-Jacoby Watershed is part of the area designated as the Lehigh Valley Greenways by the Department of Conservation and Natural Resources (DCNR). The Lehigh Valley Greenways is an initiative focused on resource protection and economic development within the Lehigh Valley area. A major component of this initiative is the development and implementation of Greenways Plans which are both natural resource and recreation based.

A Greenways Plan should be developed for the Martins-Jacoby Watershed to provide for recreation, transportation, and protection of water quality and wildlife habitat. A Greenways Plan is a document intended to serve as comprehensive plan for preserving the connectivity of the open spaces around the natural features and undeveloped lands. The general goal of a Greenway Plan is to concentrate new development in existing developed areas, and to restore and protect open space areas around the rivers, lakes, and ridges as interconnected, undeveloped "greenways." A Greenways Plan for the Martins-Jacoby Watershed would ideally connect the developed areas within the Watershed using off-road and roadside trails along stream corridors and abandoned rail beds, with off-shoots to parks, public natural areas, and other existing recreational facilities. Using this concept, headwater areas and riparian buffers will be preserved, recreational opportunities will be enhanced within the Watershed, sustainable growth patterns will be established, and watershed protection education opportunities among Watershed residents will be increased.

Open Space Acquisition and Preservation

Open Space acquisition and preservation within the Martins-Jacoby Watershed generally falls into two basic categories which require somewhat different implementation practices: farmland preservation and natural areas preservation. Open space may also include lands for active recreation. The primary differences between farmland and natural areas preservation are potential funding sources and mechanisms used for preservation. Farmland preservation is most commonly accomplished through purchase of conservation easements whereby the landowner maintains title to the property, but basically sells the development rights to the municipality and/or County so that the land must remain farmed or as undeveloped open space. Funding for farmland preservation most commonly comes from self-imposed Open Space Taxes levied by municipalities and from State Farmland Preservation Funds administered through the respective Counties with Farmland Preservation Programs. Natural areas preservation is also most commonly accomplished through purchase of conservation easements, but may also include fee-simple purchase of land by respective municipalities. Funding for natural areas preservation most commonly comes from self-imposed Open Space Taxes levied by municipalities and from the Pennsylvania Department of Conservation and Natural Resources, with lesser amounts from other sources such as private foundations and private donations. To the extent practicable, municipalities should partner with the County and State, specifically PA DCNR, along with other funding sources conservation easements and fee-simple purchases. Partnering not only helps to spread the costs by using different funding sources, but it also commonly results in stronger protection by having more 'holders' on conservation easements and on easements which should be placed on all properties purchased as fee-simple.

Open Space acquisition and protection involves working with private landowners to acquire or protect land through deed restrictions, conservation easements, and fee-simple purchase alternatives. Targeted open space acquisition is a powerful companion to protecting lands through municipal land planning. The Heritage Conservancy, The Nature Conservancy, and the Wildlands Conservancy have land holdings within the Watershed, and several of the municipalities have designated open space conservation lands. There are also numerous farms preserved through the County Farmland Preservation Program throughout the Watershed. Despite existing active land conservation effort, however, additional land acquisition is needed in several key areas, such as along riparian corridors, the base of the Blue Mountain, and along the Delaware River. Priority lands identified for preservation within the Martins-Jacoby Watershed are shown in Figure 32.

Upper Mount Bethel Township has an Open Space Program with a completed Open Space Plan and funding available through a 0.25% Earned Income Tax dedicated for open space preservation. The Township is currently beginning implementation of their Open Space Program.

Lower Mount Bethel Township is currently in the process of developing an Open Space Plan and already has their funding mechanism in place through a 0.25% Earned Income Tax dedicated for open space preservation. The Open Space Program will begin implementation procedures upon completion of their Open Space Plan, targeted for late 2009.

Washington Township does not yet have an Open Space Plan or funding mechanism, but is currently evaluating the concept. The Township should consider and implement an Open Space Program similarly to Upper and Lower Mount Bethel Townships.

Plainfield Township is currently in the process of developing an Open Space Plan and already has their funding mechanism in place through a 0.25% Earned Income Tax dedicated for open space preservation. The Open Space Program will begin implementation procedures upon completion of their Open Space Plan, targeted for 2009.

Forks Township does not have an Open Space Program. The Township relies on County and State funding to support any open space preservation and related recreational projects.

The Martins-Jacoby Watershed Association should continue working with land trusts and conservation organizations, municipalities, and County planners to establish and refine land acquisition and protection targets, develop relationships with key landowners and assist with the acquisition of additional lands in critical areas.



J. Mauser

Lower Mt. Bethel Supervisor, Charles Palmeri and Upper Mt. Bethel EAC member, Charles Cole, design a "green" development with "M&Ms" at a Growing Greener Workshop held in October of 2009. Participants represented Northampton County Council, Lower Mount Bethel Township, Plainfield Township, Slate Belt COG, Upper Mount Bethel Township, Washington Township, Northampton County Farmland Preservation, and DCNR.

With regard to the selection of specific parcels, the following targets should be considered:

- ♦ **Acquire lands that are particularly susceptible to development** because of market pressures, existing zoning, and land characteristics.
- ♦ **Focus on acquisition of large land parcels** rather than many small parcels.
- ♦ **Acquire land in headwater and riparian areas.**
- ♦ **Specific efforts should be directed to engaging the major landowners** in the Watershed in permanently protecting the land that falls within the greenways areas outlined in Greenways Plans (once developed and adopted).

Outreach to Developers

An important and often overlooked tool for managing development is to form collaborative relationships with developers that encourage the use of new technologies to improve storm-water management, reduce ecological disturbance, and protect natural landscape features. This collaborative approach invites developers to become active partners in the conservation of the essential features of the Watershed.

To facilitate this process, the Martins-Jacoby Watershed Association and the Township Environmental Advisory Councils (EACs) should periodically sponsor developers' roundtable sessions. The roundtable should be professionally facilitated to allow a dialogue between area developers, planners, natural resource professionals, and other stakeholders concerning ways that these groups can work collaboratively to achieve common and individual goals.

The MJWA should also create a developer certification program that would allow developers to undergo a voluntary training program in low-impact development techniques and a commitment to protect and respect critical natural resources. The certification program could provide marketing and branding appeal for developers looking to distinguish themselves among consumers and municipalities.

Land Protection - Public Education and Outreach

Public education and outreach is a key aspect of building broad support for land protection. The MJWA should continue to work to build public awareness and support for sustainable growth and development initiatives. The MJWA should undertake the following actions to advance this goal:

- ♦ **Coordinate with local realtors** to distribute educational "Welcome to the Watershed" materials to new home buyers and renters,
- ♦ **Post up-to-date education materials to the MJWA web site** to explain specific sustainable growth and development, as well as land conservation options,
- ♦ **Produce a "Landowner's Guide to Conservation in the Martins-Jacoby Watershed"** brochure or fact sheet and distribute to major landowners within the Watershed,
- ♦ **Produce a "Landowner's Guide to Land Preservation in the Martins-Jacoby Watershed"** brochure or fact sheet and distribute to major landowners within the Watershed.
- ♦ **Write articles** for local and regional newspapers, newsletters, township bulletins, websites and other mass media about the MJWA's efforts regarding sustainable growth and development, land preservation, and resource conservation.
- ♦ **Maximize media coverage for land acquisition and preservation activities** through the use of press releases and ground-breaking or ribbon-cutting ceremonies, and
- ♦ **Conduct surveys and key person interviews to determine the public's perceptions** about threats to the natural and scenic character of the Watershed, as well as the loss of open space and how it affects the local economy. The findings should be publicized in order to encourage public education and outreach efforts that advance open space preservation, growth management, and resource conservation efforts.



K. Maxfield

Wild & Scenic Designation

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection.

Rivers are classified as wild, scenic, or recreational.

- ♦ **Wild river areas** – Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- ♦ **Scenic river areas** – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- ♦ **Recreational river areas** – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Regardless of classification, each river in the National System is administered with the goal of protecting and enhancing the values that caused it to be designated. Designation neither prohibits development nor gives the federal government control over private property. Recreation, agricultural practices, residential development, and other uses may continue. Protection of the river is provided through voluntary stewardship by landowners and river users and through regulation and programs of federal, state, local, or tribal governments. In most cases not all land within boundaries is, or will be, publicly owned, and the Act limits how much land the federal government is allowed to acquire from willing sellers. Visitors to these rivers are cautioned to be aware of and respect private property rights.

The Act purposefully strives to balance dam and other construction at appropriate sections of rivers with permanent protection for some of the country's most outstanding free-flowing rivers. To accomplish this, it prohibits federal support for actions such as the construction of dams or other instream activities that would harm the river's free-flowing condition, water quality, or outstanding resource values. However, designation does not affect existing water rights or the existing jurisdiction of states and the federal government over waters as determined

by established principles of law. (Excerpt from National Wild and Scenic Rivers Internet Website, 2009)

The goals of the Lower Delaware Wild & Scenic River Management Plan include:

Goal 1: Water Quality – Protect existing water quality in the Delaware River and its tributaries from measurable degradation and improve water quality where practical.

Goal 2: Natural Resources – Preserve and protect the river's outstanding natural resources including rare and endangered plant and animal species, river islands, significant habitat, steep slopes, floodplains, wetlands and buffer areas.

Goal 3: Historic Resources – Preserve and protect the character of historic structures, districts, and sites including landscapes in the river corridor.

Goal 4: Recreation – Encourage recreational use of the river corridor that has low social & environmental impact and is compatible with public safety, the protection of private property, and preservation of natural and cultural qualities of the river corridor.

Goal 5: Development Impact – Identify ways for minimizing the adverse impact of development within the river corridor.

Goal 6: Open Space Preservation – Preserve open space as a means to maximize the health of the ecosystem, preserve scenic values, and minimize the impact of new development within the river corridor.

The Northern Regional Council of the Lower Delaware Wild & Scenic River Program was created to promote protection of the section of the Delaware River from Delaware Water Gap to the City of Easton. All municipalities within the direct drainage area to this section of the Delaware River in New Jersey and Pennsylvania may participate as partners in this Regional Council under resolution of their governing bodies. Municipalities involved in the Program are eligible to receive funding for the implementation of programs, projects, and studies which further the goals described in the Management Plan.

Currently, Upper Mount Bethel and Lower Mount Bethel Townships, as well as the Borough of Portland and the City of Easton have resolved to implement the Management Plan. Forks Township, which has important but limited frontage along the Delaware River just north of the City of Easton, as well as the remaining Watershed municipalities, have not entertained involvement in the Program. Although not in the Watershed, Williams Township which borders the City of Easton to the South has also resolved to implement the Management Plan.

The Martins-Jacoby Watershed Association should work with the remaining municipalities within the Watershed to become partners in the Program. The MJWA, as an appropriate 501c3, non-profit organization, should serve as the funding vehicle for long-term implementation by the partnering municipalities within the Watershed.

Coldwater Conservation Plan Development

The Martins-Jacoby Watershed Association should partner with the Watershed municipalities, Trout Unlimited, and other stakeholders in the planning and implementation of a Coldwater Conservation Plan for the Watershed. Coldwater Conservation Plans are focused on protection of existing coldwater streams, as well as their restoration, enhancement, and upgrade in water quality designation with the Pennsylvania Department of Environmental Protection. Most of the streams within the Martins-Jacoby Watershed are listed as Cold Water Fishes (CWF), with Slateford Creek being an exception listed as Exceptional Value (EV). Many of the streams listed as CWF likely qualify for either High Quality-Cold Water Fisheries (HQ-CWF) or as Exceptional Value (EV) designation under Chapter 93, Title 25 of the Pennsylvania Code. Headwater reaches of many streams likely qualify as EV, based on field observations, relatively unimpacted watersheds, and similar characteristics observed in other local watersheds along the base of the Blue Mountain. As such these streams or reaches of streams would be excellent candidates for the development and implementation of a Coldwater Conservation Plan.

The underlying intention of all Coldwater Conservation Plans is to protect coldwater trout fisheries. All of the named streams within the Martins-Jacoby Watershed, as well as some of those which are unnamed, are known to support reproducing populations of wild brown trout and native brook trout. The Coldwater Conservation Plan would better define which streams support which species, as well as recommend Best Management Practices for their management in terms of fish habitat, species separation, and other stream-specific factors. Program goals include:

- fostering a greater public understanding of watershed characteristics and how they affect coldwater ecosystems;
- identifying special areas of concern, such as areas with exceptional water quality with high potential for impacts;
- producing conservation plans that will lead to additional planning or implementation of projects that protect and enhance our coldwater ecosystems; and
- providing technical assistance and financial opportunities to organizations dedicated to protecting coldwater ecosystems.

Funding for Coldwater Conservation Plans is primarily provided through the Coldwater Heritage Partnership, a collaborative effort between the Pennsylvania Fish & Boat Commission, Pennsylvania Department of Conservation and Natural Resources, Western Pennsylvania Watershed Protection Program, and Pennsylvania Trout.



A brown trout from Martin's Creek.

J. Mauser



A brown trout from Waltz Creek.

J. Mauser



All of the named streams within the Martins-Jacoby Watershed are known to support reproducing populations of wild brown trout and native brook trout.

Control and Manage Invasive Species

Controlling and managing invasive species must be a priority management goal in the Martins-Jacoby Watershed. Invasive plants may be native or non-native species, but most commonly are non-native plants that have no natural enemies in their newly claimed environment. These invasive non-native species overtake and destroy natural native communities where they are introduced. Only about 10 percent of plants species introduced into new environments become invasive, but once these plants become established, they are difficult, if not impossible, to eliminate. Invasive species alter the natural ecology of an area by outcompeting and eliminating native species. Currently within the Martins-Jacoby Watershed, the most problematic invasive non-native plant species include purple loosestrife, Japanese knotweed, multiflora rose, tree-of-heaven, garlic-mustard, Japanese stiltgrass, bush honeysuckle, Japanese honeysuckle, Oriental bittersweet, Japanese barberry, and common reed. If left unchecked, these populations will dramatically and irreversibly impact thousands of acres of upland, wetland, and riparian habitats.

Invasive Species Educational Programs

Educational programs on invasive species are commonly offered throughout the region by many different groups and individuals. The MJWA should participate in these presentations and educational opportunities and should also offer such programs to local residents and landowners. The MJWA should develop a Powerpoint presentation and hold public seminars to educate the general public about invasive plant species, their respective impacts, and their management. The presentation should also be posted on the MJWA website, along with notes regarding plant morphology and treatment recommendations for viewing and download.

Eradication and Management

Eradication of problematic invasive plant species is often difficult, but may be possible for certain species and related conditions (e.g. densities, coverages, distance to water, etc.). In cases where problem species are resistant to treatment methods, are in close proximity to water, have higher densities and aerial coverages, and/or have other challenges for successful treatment, a management approach may be more appropriate as a goal rather than eradication. In all situations, and especially where problems are especially challenging, an Integrated Pest Management (IPM) approach is recommended. IPM involves the use of all applicable management strategies which are most appropriate for the management and/or eradication of a particular species.

Currently, there are no active invasive species management programs within the Martins-Jacoby Watershed. Development and



Japanese stiltgrass.

www.yorkcounty.gov/WISE/images

implementation of such a program are major recommendations of this Plan. Management efforts have been undertaken at some local preserves, such as the Mount Bethel Fens, where there is a special focus on maintaining native plant assemblages. Additionally, some citizens have implemented management and control practices on their own private property to eradicate unwanted invasive, exotic species.

The Nature Conservancy has developed an invasive plant management program which is geared toward educating and training citizens how to treat and management invasive plants. The MJWA should partner with The Nature Conservancy to provide formal education and training to local residents with programs offered at local preserves and the MJWA headquarters. Because most Watershed land is privately owned, enlisting respective landowners is an essential component of a comprehensive management strategy to control the introduction and spread of invasive and exotic plant species.

Monitoring Program

The MJWA should develop an invasive non-native species monitoring program that integrates Global Positioning Systems (GPS) locating of sites with their new Geographic Information Systems (GIS) database. Use of GPS and GIS technologies has proven to be a highly effective tool for mapping and monitoring invasive species. The GIS allows excellent mapping that is tied to data including species name, aerial coverage, density, suggested control methods, and photographs of the sites.

Monitoring is also recommended to gain long-term control, as most of the problematic species will require several growing seasons worth of treatment efforts to gain full eradication. Monitoring results should be included in the GIS database to allow for more efficient and effective cataloguing of efforts and successes.

Control and Reduce Nonpoint Source Pollution

Nonpoint source pollution (i.e. sediment and nutrient loading) from existing agricultural, residential, commercial, and industrial development within the Watershed is negatively impacting some of the waterbodies within the Martins-Jacoby Watershed. Nonpoint source Best Management Practices (BMPs) should be implemented to reduce existing nonpoint source pollution in the Watershed. These BMPs include:

- Stormwater management at residential, commercial, and industrial sites
- Management of agricultural runoff from farm fields and barnyards
- Road and trail maintenance to reduce erosion
- Site development erosion and sedimentation control
- Streambank and shoreline stabilization
- Riparian buffer restoration and protection
- Wastewater management
- Watershed education



J. Mauser

Collapsing streambanks can be a major contributor to nonpoint source pollution.

These measures should be implemented only at sites where significant, low-cost pollution reduction can be reliably achieved. The most effective BMPs are those that offer public participation and education opportunities. The specific nonpoint source problem areas discussed in Section 8 of this Plan should be targeted first. A Priority Action Plan for BMP implementation is provided in Section 10. Non-point source pollution problem areas identified as part of this watershed protection project are shown in Figure 31 (page 71) and listed in Appendix B. Sites identified as part of this study have been estimated to cost a total of \$1,462,610 to correct. The Martins-Jacoby Watershed contains many other sites and non-point source pollution problems which were not identified as part of this project, due to budgetary limitations. The Martins-Jacoby Watershed Conservation Plan should be updated, as needed, to include additional and new non-point source pollution problem areas which fit into the basic categories outlined in this Plan which are targeted for correction.

Stormwater Management

Stormwater runoff from forested, agricultural, and developed areas contains high concentrations of sediments, nutrients, and other pollutants. Development activities generally result in soil compaction and increased impervious surfaces, both of which decrease infiltration of stormwater into the ground. This leads to an increase in both the amount and velocity of stormwater runoff from developed sites, and causes higher rates of erosion. Historically, stormwater management was either ignored altogether or focused on reducing the frequency and severity of downstream flooding by reducing the post-development peak discharges from sites. This reduction was typically achieved by storing runoff water in large detention basins that offered little treatment. More recently, stormwater management has been redefined to include the removal of pollutants, thereby improving and protecting the quality of downstream waters. Increasing groundwater recharge by increasing stormwater infiltration is another important stormwater management goal. Innovative stormwater BMPs focus on stormwater infiltration to achieve flood control while removing pollutants and recharging groundwater.

Urban Stormwater

A significant amount of developed land exists in the Martins-Jacoby Watershed, especially in the southern part of the Watershed. Beginning in March 2003, as part of Phase II of the National Pollutant Discharge Elimination System (NPDES) storm water program the US EPA required both large and small municipal separate storm sewer systems (MS4s) to implement a storm water management program as a means to control polluted discharges from these MS4s. The NPDES Phase II regulation requires that each affected MS4 incorporate the following stormwater Minimum Control Measures (MCMs) into their normal operations to reduce nonpoint source pollutants from stormwater runoff:

- Public education and outreach
- Public participation and involvement
- Illicit discharge detection and elimination
- Construction site runoff control
- Post-construction runoff control
- Pollution prevention and good housekeeping

The installation of stormwater BMPs will help the MS4 municipalities within the Martins-Jacoby Watershed to comply with the new EPA Stormwater Phase II regulations. Recommendations for addressing minimum control measures can include such activities as public education programs, storm sewer stenciling, identification of potential BMP retrofit areas to improve stormwater quality, or an effective street sweeping program. During watershed investigations, several commercial establishments



K. Maxfield

The parking lot at the Lower Mt. Bethel Welcome Center was specifically designed and planted to capture and filter stormwater runoff from the lot.

were observed that had large parking lots. Such large impervious surfaces should be retrofitted with stormwater BMPs to reduce runoff and filter pollutants. The approximate cost to retrofit the existing identified urban stormwater problem areas in the Martins-Jacoby Watershed is \$16,000, as shown in Appendix B. Although this Plan only includes one site recommended for correction, stormwater management problems and deficiencies exist in countless numbers throughout the watershed, and therefore would be exhaustive to include in this Plan. Therefore, the Plan should be updated, annually, to include additional and new stormwater management problem areas which should be added to the priority list of non-point source pollution problems targeted for correction.

Structural and non-structural stormwater management controls should be encouraged for new development in the Martins-Jacoby Watershed. The following structural and non-structural management controls are designed to decrease runoff, erosion, and associated water quality problems: stormwater ordinances, retention basins, detention basins, bioretention systems, sand filters, infiltration trenches, constructed wetlands, grassed waterways, vegetated swales, and filter strips. In developed areas, stormwater management should primarily focus on urban stormwater controls such as sand filters, water quality inlets, bioretention systems, and infiltration structures. These stormwater controls do not require large areas of land for installation and treatment, and therefore can be integrated into many existing urban settings. In areas of future development or redevelopment, stormwater management controls such as infiltration basins, extended detention basins, constructed wetlands, and buffer strips should be constructed or implemented. These stormwater control measures typically require larger land areas for installation

and treatment, and therefore should be incorporated or designed as part of the land development planning process, and particularly for new development such as conversion from agricultural land-use to other uses.

If an existing commercial establishment changes ownership and the new owner needs municipal approvals, local ordinances should include provisions which require improving stormwater runoff quality from the site before approvals are granted. Stormwater quality treatment systems that may be applicable for redevelopment or change in use on existing properties include sand filters, peat filters, or bioretention systems. The purpose of these systems is to treat stormwater runoff from parking areas and roads. These systems are generally designed to treat the first 0.5 inches of stormwater runoff, which is commonly referred to as the “first flush.” An inexpensive way that commercial establishments can reduce runoff and improve stormwater quality is to cut breaks into their curbs, or remove the curbs altogether, allowing stormwater to run off the parking area as sheet flow and infiltrate into adjacent vegetated areas or grassed swales and other infiltration BMPs.

In addition to urban stormwater BMPs, opportunities to reduce stormwater in suburban and rural areas should be pursued. Watershed homeowners should be encouraged to direct roof runoff to “rain gardens,” “dry wells,” and/or rain barrels to reduce the amount of stormwater that would otherwise leave their properties and damage local waterways. Using rain barrels or cisterns gives the homeowner the advantage of stormwater re-use for watering gardens or lawns during dry periods. Homeowners should also be educated about the benefits of planting attractive rain gardens on their properties to increase infiltration and groundwater recharge, as well as creating aesthetically pleasing landscaping.

Stormwater Ordinances and Act 167 Stormwater Management Plans

The Pennsylvania Department of Environmental Protection mandated that all municipalities within the Martins-Jacoby Watershed adopt updated Act 167 Stormwater Management Plans by the summer of 2005. These plans help to control flooding caused by increased development and also help to improve water quality by requiring water quality Best Management Practices (BMPs) as part of stormwater management plans. The Lehigh Valley Planning Commission (LVPC) developed a model Act 167 Stormwater Management Plan, known as the Global Act 167 Stormwater Management Plan that meets the regulatory requirements of the Federal National Pollution Discharge Elimination Systems (NPDES) regulations and passed this new plan along for use by all municipalities within the Lehigh Valley, as well as other municipalities across the Commonwealth. The Global Act 167 Stormwater Management Plan uses the hydrologic study data and mapping for required release rates from the prior Act 167 plans, which for the Martins-Jacoby Watershed was completed in 1996. All of the municipalities within the Martins-Jacoby Watershed have since adopted and begun implementation of the Global Act 167 Stormwater Management Plan under ordinance. Figure 33 (page 99) shows the different sub-watershed areas with the Martins-Jacoby Watershed which have specific Act 167 Stormwater Management Plan.

All re-development and changes in use for existing developed sites which require other municipal approvals should require applicants to implement stormwater management plans and BMPs, to the extent practicable, to be consistent with the Global Act 167 Stormwater Management Plan.

All municipal Zoning Ordinances should include provisions whereby all rooftop drainage shall be directed into properly designed on-lot stormwater management BMPs such as rain gardens, dry wells, infiltration trenches, and other acceptable stormwater retention and infiltration BMPs. All new development, re-development, and changes in use should be subject to providing such on-lot treatment for stormwater from rooftops.



J. Mauser

A green roof (shortly after installation at the Lower Mt. Bethel Welcome Center) captures rainwater for vegetation planted on the roof. Today, the roof is truly "green" as the plant material thrives on the rooftop.

Agricultural Management

Nonpoint source pollution from agricultural runoff is a source of nutrient (phosphorus and nitrogen) and sediment loadings to the wetlands, ponds, lakes and streams. Pollutant loadings from agricultural land uses can be reduced by the implementation of both traditional and innovative agricultural BMPs.

According to the watershed investigations performed during this study, an estimated \$4,460 would be required to install agricultural BMPs at problem area sites within the Watershed. Limited access to private lands and farms during the field investigations in this study made it difficult to identify specific agricultural problem areas and BMP needs on private land. The Martins-Jacoby Watershed Association should work in partnership with the Northampton County Conservation District, Natural Resources Conservation Service (NRCS), Delaware Riverkeeper, and other conservation organizations to educate and encourage more farmers to adopt and implement updated Nutrient Management Plans, as well as to implement other applicable agricultural BMPs on their farms. The Martins-Jacoby Watershed contains many large and small agricultural operations which appear to have viable futures. Agricultural related non-point source pollution problems and deficiencies exist at many of the farms and new problems will be created over time. Therefore, the Plan should be updated, annually, to include additional and new agricultural non-point source pollution problem areas which should be added to the priority list of non-point source pollution problems targeted for correction.

Nutrient Management Plans and Conservation Management Plans are a high priority and should be developed for all farms within the Watershed. Such plans are especially important on farms that produce or receive manure, particularly livestock operations and Concentrated Animal Feeding Operations (CAFOs). Spreading, injecting, or incorporating manure on cropland is a significant source of nutrients to waterways, especially immediately prior to or during the growing season when aquatic plant, algae, and periphyton (attached algae) growth potential is the highest. Proper manure management, through the implementation of Nutrient Management Plans, is essential for improving water quality in areas with significant agricultural land use.

Agricultural BMPs should be implemented throughout the Martins-Jacoby Watershed. Each agricultural BMP targets a particular problem. A number of BMPs are designed to prevent erosion occurring on cultivated land. These BMPs include: contour strip-cropping, cover-cropping, and pasture and hayland management. Contour strip-cropping combines contour farming with field strip-cropping to reduce runoff and soil erosion while improving nutrient management and natural biological pest control. Contour farming involves plowing, planting, and cultivating along topographic contours; whereas, field strip-cropping involves

farming alternating strips of cultivated crops and grasses or legumes. Cover-cropping is the planting of grasses or legumes for seasonal protection against erosion. Pasture and hayland management refers to the establishment or re-establishment of native perennial forage plants. Pasture and hayland management can include reseeding areas that are 30 to 40 percent bare.

Integrated Pest Management (IPM) is a BMP designed to reduce pesticide use. With integrated pest management, a variety of pesticide alternatives are used including biological controls such as the introduction of natural enemies, habitat diversification, and the use of disease- and pest-resistant plants. Pesticide and fertilizer application, when necessary, are timed to coincide with specific weather patterns and conditions for optimum efficacy. Soil testing and plant analysis help prevent crop over-fertilization by allowing farmers to determine how much fertilizer is needed for successful crop production. Local Cooperative Extensions, such as the Penn State Cooperative Extension Service, can test soil and plant material for nitrogen and phosphorus to determine appropriate fertilizer application rates. Farmers within the Watershed should be made aware of this service and should be encouraged to contact the Cooperative Extension Service.

Manure management is another important agricultural BMP for protecting water quality. Manure management can include manure sampling, calibrating manure spreaders, and installing manure storage facilities. Manure sampling involves testing manure to determine nitrogen and phosphorus content. This information is important for developing nutrient management plans. Calibrating manure spreaders involves applying a measured amount of manure by determining the specific application rate of the manure spreader. Manure storage facilities are contained structures used to temporarily store manure between applications to crop fields to protect waterways from nutrient contamination. During the watershed investigations, several opportunities for manure storage facilities were found.

Livestock Management can prevent erosion and water quality degradation by maintaining adequate land-to-livestock ratios, maintaining productive forage, rotating grazing, locating feeders away from streams and lakes, limiting livestock access to streams using fencing, stabilized crossings, and planting riparian buffer strips. Watershed investigations included sites with streambank erosion where streamside fencing was not installed to keep livestock out of the stream.

Planting riparian buffers around streams is probably the most important BMP for protecting water quality in Watershed streams. Riparian buffers filter contaminated runoff and prevent nutrients and sediments from entering the water. However, in many cases, landowners may be unwilling or unable to create large riparian buffers or dedicate viable farmland for such BMPs. One other option is “critical area planting,” which involves planting native vegetation in areas prone to erosion. This BMP focuses on smaller but more critical areas to provide nutrient removal through uptake and filtration by planted vegetation.

The Conservation Reserve Enhancement Program (CREP) is a voluntary program that pays participants to plant hardwood trees or establish grass filter strips, riparian forest buffers, vegetation, and other conservation practices on environmentally sensitive land. Currently, the local NRCS office assists property owners in the watershed to gain enrollment in the CREP program. The Northampton County Conservation District should encourage more property owners to enroll in the CREP program and to install additional BMPs on their properties.



Predmore Farm, Upper Mt. Bethel, riparian buffer project.

J. Mauser

Road and Trail Maintenance

Roads commonly have negative impacts on the natural communities throughout watersheds. Roads change the hydrology of the Watershed by redirecting water from its otherwise natural flow patterns. Roads increase nonpoint source pollution by increasing the amount of impervious surfaces, thereby preventing infiltration of stormwater into the ground and creating increases in runoff water volumes and velocities. Roads also create an unnatural disturbance to soils and natural plant communities which then promotes the growth of invasive plant species which tend to quickly colonize such areas. Sediment washing from dirt and gravel roads is also a significant source of nonpoint source pollution in rural areas. Unless properly constructed and regularly maintained, dirt and gravel roads are generally one of the primary contributors of sediment pollution waterways in rural areas.

Traditional thinking in road maintenance has been to get water off of the roads and into low-lying areas such as wetlands and streams by the quickest and simplest means possible. The methods employed, however, result in unnecessary, excess nutrients and sediment entering these aquatic systems. Inadequate drainage structures such as undersized and improperly installed culverts can cause downstream erosion. Several instances of roadside erosion and sediments entering waterways via damaged or inadequate drainage structures were evident in the Martins-Jacoby Watershed during watershed investigations. All Watershed roads should be properly graded and the road edges well vegetated, with appropriate stormwater management BMPs installed.

Pennsylvania's Dirt and Gravel Road Pollution Prevention Program is a water pollution abatement program that offers local municipalities special funding and technical support to repair, manage and maintain their dirt and gravel roads in environmentally safe ways. The program is administered through County Conservation Districts and local Quality Assurance Boards. The relatively few dirt and gravel roads in the Watershed should be properly maintained so that sediment does not enter wetlands and waterways. The Northampton County Conservation District has already begun improving dirt and gravel roads within the Watershed through this program, and that work should be continued and expanded. The PA State Conservation Commission and Center for Dirt and Gravel Road Studies periodically hold Environmentally Sensitive Maintenance training courses, which include modules on drainage, road maintenance techniques, erosion prevention and sediment controls, bank stabilization, roadside vegetation management, and grant procedures. Municipal highway crew members that are responsible for maintenance of dirt and gravel roads in the Martins-Jacoby Watershed should be encouraged to attend the training courses.

Road and highway maintenance is important in this Watershed since many roads, including Routes 512, 611, 191, and the Martins Creek-Belvedere Highway, run along or cross over Watershed streams. Many smaller roads are within the direct drainage areas of these water bodies. A number of roadside erosion sites were documented during the watershed investigation studies for this project. These sites are listed in Appendix B, and should be repaired using methods such as grassed swales, rip-rap swales, bank stabilization, bioengineering techniques, level spreaders, infiltration trenches, and other methods. In general, roadside swales should be properly maintained and should always be immediately stabilized if disturbed. Properly sized and installed culverts at stream crossings, driveways, and roads are imperative, as well as are adequate roadside drainage structures. Emergency procedures should be established to handle accidental spills such as cargo fuel or other materials. The use of de-icers during winter months, such as application of calcium chloride and magnesium chloride, is necessary on occasion to ensure safe driving conditions. These chemicals should be used only when necessary and only in amounts required to provide effective results.

Road and trail maintenance should be accomplished by applying for funding to repair whole stretches of road, or sections of the Watershed through the Dirt and Gravel Road Pollution Prevention Program, the PA DEP Growing Greener Program, the PA DCNR Community Conservation Partnerships Program, or other potential funding sources. Municipalities may also elect to use road maintenance monies obtained through Liquid Fuels funds, if available.

Many of the same principles that apply to dirt and gravel road maintenance also apply to trail maintenance. Eroded soils and pet waste on and along trails can contribute significant amounts of nutrients and sediments to nearby surface waters. The trails within the Martins-Jacoby Watershed should be inspected and maintained regularly for erosion problems.

The Martins-Jacoby Watershed Association, along with other local interest groups, should maintain and improve trails throughout the Watershed in order to improve public access to water resources and encourage stewardship. Greater accessibility will likely foster increased interest in preserving and protecting the high quality and exceptional value waterways found throughout the Martins-Jacoby Watershed. Trail users should be educated via signage or information on trail maps about ways to protect trails from erosion. Trail improvement options include installing water bars or check dams, providing better trailside drainage structures, including boardwalks or bridges over wet areas or ephemeral streams, limiting trail access during certain times of the year, re-routing damaged trails, and covering trails with natural materials such as wood chips. American Trails, a non-profit organization working on behalf of all trail interests, has some excellent trail maintenance information on their website at <http://www.americantrails.org/resources/ManageMaintain/>.

Site Development Erosion and Sediment Pollution Control

Nonpoint source pollution from site development may be very significant during earthmoving and construction activities. The potential for soil erosion is very high until sites are stabilized with permanent vegetative cover, and is further heightened when soils are “highly erodible” or steeply sloped. Typically, large-scale development projects receive greater attention with respect to the installation and maintenance of proper erosion and sediment pollution controls. However, smaller construction projects such as single family residential sites, in many cases, lack proper erosion and sediment pollution controls. During the watershed evaluations conducted as part of this plan development project, an estimated \$23,000 worth of corrective measures using currently accepted site development Best Management Practices (BMPs) were observed at several sites throughout the Martins-Jacoby Watershed, as listed in Appendix B and shown on Figure 31.

Erosion and sediment pollution control plans are required for all earthmoving activities, large and small. Federal National Pollutant Discharge Elimination Systems (NPDES) Phase II Stormwater regulations require any project disturbing more than one acre of land to obtain an NPDES Permit. The Northampton County Conservation District reviews the erosion and sediment control plans for any construction projects that propose the disturbance of one or more acres of land to ensure their adequacy and subsequently enforce their proper implementation and maintenance. Smaller projects, which may not meet disturbance

thresholds and conditions which require a Federal NPDES permit, still require an adequate erosion and sediment control plan to be developed, implemented, and maintained during construction activities. Plans for smaller projects are generally not reviewed, but are still required by law and are enforceable to the same extent as for larger projects. Enforcement of the activities at smaller sites is more difficult due to the unsure timing of the actual earthmoving and the general lack of project information combined with limited enforcement staffing and resources.

The Northampton County Conservation District currently regulates and enforces erosion and sediment pollution control within the Martins-Jacoby Watershed. It is likely that the Conservation District will effectively enforce proper erosion and sediment pollution control for all large projects that require formal project review. The Conservation District should strive to inspect smaller projects to ensure proper installation and maintenance of erosion and sediment pollution controls. Local citizens, developers, and contractors should be made aware of the erosion and sediment pollution control regulations and general requirements. Watershed residents should be made aware that site development or any earthmoving activities that lack or have inadequate erosion and sediment pollution controls should be immediately reported to the Conservation District. Additionally, all municipalities should help with enforcement of implementation of erosion and sediment pollution control plans by using Building Permits and Certificates of Occupancy as leverage to require proper plan implementation and maintenance.



Watershed Association member John Mauser searches for macroinvertebrates, an indicator of water quality.

K. Maxfield

Streambank and Shoreline Stabilization

Streambank and shoreline erosion is one of the major sources of nonpoint source pollution in developed watersheds, including agricultural land-use. Certain nutrients, as well as many other “pollutants,” adhere to eroded soil particles and are transported to wetlands and waterways. This is particularly problematic when erosion sites are within “legacy sediments” which generally contain high nutrient concentrations. Legacy sediments are sediments and materials eroded from farmland and redeposited along streams since colonial times when conventional farming practices provided little or no nutrient management. During the watershed investigations conducted as part of this project, eroded streambanks and shorelines were observed along many streams and ponds, as shown in Figure 31 (page 71) and listed in Appendix B. It is likely that other areas of streambank and shoreline erosion exist along the tributaries and pond margins on private land that could not be inspected as part of this project. A more thorough evaluation of all streambanks in the Watershed should be performed to locate and determine the magnitude of all streambank erosion problem areas within the Watershed.

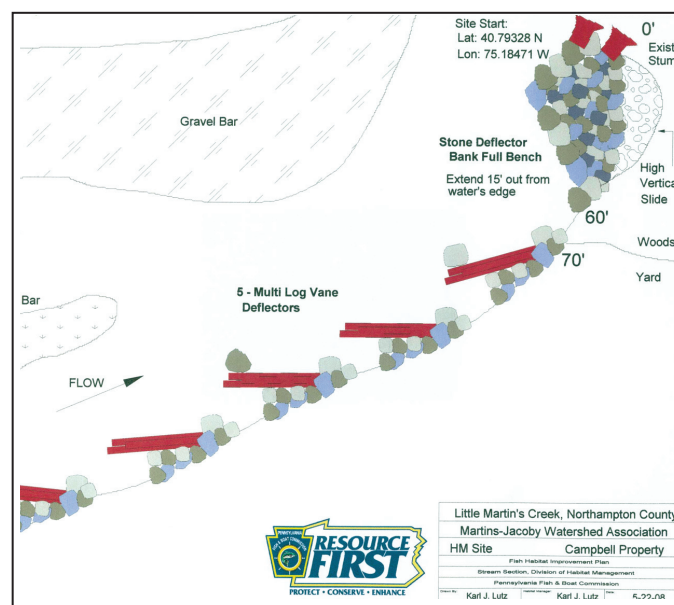
Restoration of eroding streambanks is a cost-effective way to significantly reduce sediment and nutrient loadings to Watershed streams. By using bioengineering (vegetative) or a combination of bioengineering and structural engineering streambank stabilization techniques, erosion problems can be corrected while stabilized streambanks can serve as a vegetative buffer and, in many cases, a restored riparian corridor offering recreation and wildlife habitat values. Well-vegetated riparian buffers along the streams reduce the quantities of sediments and nutrients that enter the streams via stormwater runoff.

A variety of methods are designed to stabilize eroding streambanks and reduce continued erosion and sediment pollution. Some methods reduce the amount and velocity of water in streams, others involve relatively high cost structural controls such as rip-rap and large stone, and still others involve relatively low-cost controls such as bioengineering using willow twigs, grasses, shrubs, and trees. Lower cost, bioengineering approaches should be used wherever practical to stabilize severely eroding streambank areas. Where warranted, structural stabilization elements should be included in project design to ensure long-term stabilization and to provide adequate protection against high streamflow velocities which bioengineering methods are not designed to withstand.

In addition to streambank and shoreline stabilization projects, the Martins-Jacoby Watershed Association should work in partnership with the Forks of the Delaware Trout Unlimited Chapter and the Pennsylvania Fish and Boat Commission to install fish habitat structures in strategic areas of the Watershed. Fish habitat structures can include boulders, logs, cribs, j-hook rock vanes, LUNKER structures, and others. Care must be taken when installing fish habitat structures, however, since

improper construction can actually cause damage to streambanks. Fish habitat structures should always be designed and sited by a professional.

Streambank and shoreline stabilization problems should receive a high priority for the implementation of watershed BMPs since sediments and nutrients are introduced directly into surface waters. Costs to install streambank and shoreline stabilization measures at various problem areas are presented in Appendix B. The total estimated cost to install all listed streambank and shoreline stabilization measures is \$722,850. Costs could be reduced by using volunteer labor for planting and construction. Many municipalities and local construction businesses may have the necessary equipment and expertise to provide low or no-cost earthmoving and other heavy site work required for such projects. It may be easiest to address streambank stabilization one stream reach at a time in order to spread-out costs over time.



The plan above, designed by Karl Lutz of the PA Fish and Boat Commission, uses logs and quarry stones to stabilize the bank and improve fish habitat to a section of Little Martin's Creek that was severely damaged by Hurricane Ivan in 2004. The photo above shows the logs being put on place before the quarry stones were added to help pin down the logs and further stabilize the bank.

Streambank Stabilization Project: the Savoia Property, Martins-Jacoby Watershed

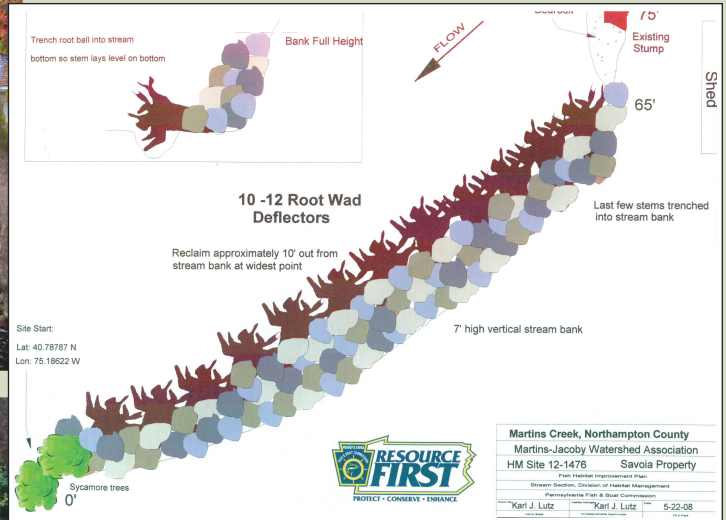
The Savoia project is being used as model for stream-side landowners on how to best control eroding steep slopes.

BEFORE:



THE PLAN:

Stabilize the collapsing streambank using tree root wads and quarry stone.



Watershed specialist, Rebecca Kennedy of the Lehigh County Conservation District, supervises as the bank is readied for the trees.

AFTER:



Once carefully backfilled with quarry stone and soil, the new, stable bank is ready for matting and riparian plantings.

The project was completed in October 2008.

Designed by Karl Lutz of the PA Fish and Boat Commission.

The tree root wads and quarry stone are placed in the stream in a smooth curve to direct the flow in the former stream bed. The object of this project is to provide fish habitat and at the same time to stabilize the stream bank avoiding erosion of the bank. Sediment is the biggest pollutant of Pennsylvania's streams.



Photos courtesy of the Martins-Jacoby Watershed Association.

Riparian Buffer Restoration and Protection

Adequately vegetated or buffered streams remove pollutants from stormwater runoff. In addition to pollutant removal, stream buffers reduce water temperature, maintain stream flow during dry seasons, stabilize streambanks, decrease erosion potential, provide valuable wildlife habitat, provide improved in-stream aquatic habitat, provide flood control, and enhance the natural landscape by providing visually appealing “green belts.” During the watershed investigations, several streams were identified that had inadequate riparian buffers, as shown in Figures 21 and 31. Riparian buffers should be enhanced wherever necessary in the Martins-Jacoby Watershed. The total cost to restore riparian buffers at the problem area sites identified during the watershed investigations is \$394,300. In addition, the streambank stabilization sites identified also need riparian buffer restoration, costs for which were figured to be part of recommended BMPs for those sites.

A permanent wooded buffer along all streambanks is the most desirable buffer to provide stable ground cover and shading of the stream channel. Warm season grasses should be planted to establish an effective temporary buffer until the more permanent shrubby and woody buffer can become established. A narrow strip of warm season grasses should be maintained between the wooded buffer and any tilled fields to provide maximum filtration for agricultural runoff.

In addition, for both existing and new development, the protection, development, and enhancement of stream buffers should be encouraged. A Riparian Buffer Ordinance or adequate amendments regarding riparian buffer protection in existing Zoning Ordinances should be adopted by all municipalities in the Martins-Jacoby Watershed. It is recommended that all municipalities within the Watershed consider and adopt standards for riparian buffer protection outlined in the *Riparian and Wetland Buffers – Guide/Model Regulations* publication released in July 2008 by the Lehigh Valley Planning Commission. A summary of the model ordinance is provided in Appendix C.



K. Maxfield

The heavily wooded riparian buffer (right) along the Slateford Creek in the northwestern part of the Martins-Jacoby Watershed serves many beneficial purposes in protecting the water quality of this Exceptional Value (EV) stream. The crayfish (above) found at this site is an indicator of the water quality.



Wastewater Management

Due to its rural nature, the wastewater management needs for the vast majority of the Martins-Jacoby Watershed are served by on-lot septic systems. On-lot problems exist primarily where conventional septic leach fields were installed in areas of seasonal high and normal high water tables, shallow bedrock, low permeability soils, and other soil conditions which do not allow consistent, adequate renovation of sewage effluent. In the Martins-Jacoby Watershed, residents and landowners should be educated about protecting their drinking water supplies from contamination associated with failing on-lot septic systems. Properly designed and installed on-lot systems may still offer the best overall means for treating small flows (effluent), controlling growth/development, and protecting the quality of surface waters. Decentralized wastewater systems should be considered whenever multiple on-lot systems are failing, or when existing centralized wastewater infrastructure must be upgraded or replaced. Decentralized wastewater recommendations should be included in municipal ordinances, comprehensive plans, and Act 537 Plan revisions. New stream discharges of treated effluent should be avoided whenever possible by using land application, and as required in the watersheds of Special Protection Waters which comprise the entire Martins-Jacoby Watershed.

On-Lot Wastewater Systems

On-lot septic systems become a nonpoint source pollution problem when improper installation, siting, or maintenance leads to system failure and leakage of sewage into surface or groundwater. The municipalities within the Martins-Jacoby Watershed should each develop and implement on-lot disposal system management programs. The programs should include pre-construction and construction guidelines to ensure properly designed and constructed on-site wastewater disposal systems. The program should also require standard pumping schedules and routine maintenance guidelines based on household size and septic tank size. Sewage Enforcement Officers (SEOs) would be in charge of implementing the program. A critical facet of the program should be a public education campaign in the form of seminars and brochures to educate Watershed residents, landowners, and municipal officials about proper installation and maintenance of on-lot septic systems.

The identification of malfunctioning septic systems is a priority and should be implemented by property owners and SEOs with the assistance and encouragement of the Martins-Jacoby Watershed Association. Pinpointing exactly which systems are actually causing significant impairment is a challenge that continues to plague many regulatory agencies, watershed organizations, and SEOs. **Some common options for identifying septic system problems include:**

- **Using mailed surveys** to ask residents about the age, condition, and maintenance of their septic systems,
- **Using direct visual inspection** where possible (from off property) to note obvious malfunctions necessary to drive further inquiry,
- **Using voluntary dye tests** to determine if specific septic systems are functioning properly,
- **Using GIS analysis** of soil type, building age, slope, and other “predictor variables” to predict likely areas that have septic malfunctions,
- **Conducting water testing** in local streams and at discharges intersecting property lines, and
- **Reviewing permits** for on-site treatment systems to identify potentially malfunctioning systems.

Using only one of these methods is usually insufficient to produce meaningful results. The MJWA may want to conduct a preliminary GIS analysis to jump-start this effort. The MJWA should develop a generic guidebook or brochure that explains the various assessment options and provides suggestions for how to conduct a multi-phased septic system assessment program. The brochure should identify methods for financing on-lot system repairs and replacements, and should also include the municipal SEOs’ contact information in case malfunctioning septic systems are suspected and need to be reported.

Decentralized Wastewater Systems

A decentralized wastewater system is defined by the United States Environmental Protection Agency (EPA) as “An onsite or cluster wastewater system that is used to treat and dispose of relatively small volumes of wastewater, generally from individual or groups of dwellings and businesses.” A centralized wastewater system uses gravity or pressure sewers to transport all of the wastewater in the area to one location for treatment and disposal, usually to a stream discharge.

As the need for upgrading larger wastewater treatment facilities is increasing and costs are rising, decentralized treatment options are becoming more and more attractive, especially in waterfront communities. In their report entitled “Response to Congress on Use of Decentralized Wastewater Treatment Systems,” the EPA indicated concern about the gap between wastewater needs and available Federal-State funding. The report indicated the need to identify and implement alternatives to costly centralized treatment and collection systems. The conclusion of the EPA report states that “adequately managed decentralized wastewater systems are a cost-effective and long-term option for meeting public health and water quality goals.”

Decentralized wastewater disposal consists of “clusters” of units served by a single, smaller treatment system. Wastewater from each cluster is transported to a smaller wastewater system for treatment and disposal. Decentralized wastewater systems can be used to break up larger service areas into smaller clusters. Instead of one centralized treatment facility, there are two or more smaller, decentralized wastewater treatment facilities serving the same area. The cluster treatment systems, being smaller due to the reduced wastewater flow, may allow land-based disposal of treated effluent by on-site systems such as sand mound, drip irrigation, or spray irrigation systems, rather than stream discharge which is generally required for larger centralized systems. Decentralized systems can also be small package treatment plants that discharge treated effluent directly to streams where permitted by the Pennsylvania Department of Environmental Protection.

There are several advantages to decentralized wastewater systems:

- 1. Decentralized systems usually do not promote uncontrolled growth** like centralized systems often do, primarily because they are designed for a specific flow and are not easily upgradable for proposed increases in flow.
- 2. Decentralized systems often are less expensive** to construct and operate. They reduce the length of sewers needed and do not extend into unpopulated areas.
- 3. Decentralized systems, consisting of a series of smaller wastewater flows, have a greater potential for on-site disposal.** Most centralized wastewater systems require a wastewater treatment plant with stream discharge because of the larger wastewater flows being treated.
- 4. If on-site treatment and disposal are feasible, decentralized systems with on-site soil disposal (of treated effluent) provide better treatment,** better meet EPA and DEP water quality anti-degradation requirements, recharge groundwater, and prevent the potential for stream impacts caused by acute and/or chronic malfunctions which commonly occur with stream discharges from centralized systems.

In existing communities located near sensitive environmental areas such as high quality streams, rivers, lakes, and wetlands, decentralized systems can offer distinct benefits. Waterfront communities often run into water quality problems when seasonal residences that were originally built on soils unsuitable for on-lot wastewater treatment begin to age and have septic system failures. In addition, waterfront homes are increasingly being converted to year-round residences whose original wastewater systems are insufficient to treat the increased usage. Since waterfront real estate is usually purchased at a premium, very little land and money may exist for the construction of a centralized treatment facility, so a series of smaller, decentralized systems may be the best option. Decentralized systems can be targeted toward clusters of homes with the most serious problems, and

not requiring costly and otherwise unnecessary connection of homes with newer, well-functioning septic systems, as is generally the case with centralized systems.

There are, however, several disadvantages to decentralized wastewater systems. They usually require more up-front soil testing to locate suitable disposal sites. They may also require slightly higher engineering design fees due to greater complexity of the systems and associated regulations. Although system maintenance of a decentralized system is typically lower than a larger centralized system, cumulative costs could be higher when many decentralized systems are required to meet larger needs for larger flow volumes.

Act 537 Plans

The municipalities in the Martins-Jacoby Watershed should develop or update their respective Act 537 Sewage Facilities Plans to ensure adequate wastewater planning for potential residential, commercial, and industrial development. All Act 537 Plans should contain an evaluation of wastewater needs. The Act 537 Plans should include a physical description of the municipal planning area, a description of current wastewater systems, an evaluation of wastewater treatment needs, an evaluation of alternatives, and recommended plans to address problem areas. The Pennsylvania DEP's Bureau of Water Quality administers the Act 537 program. The Act 537 program will provide fifty percent of the funding in order to complete a DEP approved wastewater facilities plan.

Upper Mount Bethel Township's existing Act 537 Plan was completed in the early 1990s and is currently being revised, with a needs assessment underway. Surveys of Township residents conducted over the years have indicated a desire to remain a rural community.

Lower Mount Bethel Township's existing Act 537 Plan was completed in 1975 and is currently undergoing a formal revision.

Washington Township's existing Act 537 Plan was completed in 1966. With exception of the urbanized Boroughs located within and adjacent to Washington Township, the existing land uses are primarily rural and agricultural. In general, Township residents have indicated at public meetings a desire to remain a rural, agricultural community, which should be considered in any revision to their original Act 537 Plan.

Plainfield Township's existing Act 537 Plan was completed in 1999, with recent revisions regarding the service area extending into the Township from the Wind Gap wastewater treatment plant.

Forks Township's existing Act 537 Plan was completed in 1996. There does not appear to be a need for revisions to the Plan at this time.

Public Education and Outreach

Watershed education and public participation are important aspects of any watershed management or NPDES Phase II stormwater program. Development of environmental education programs designed for school-aged children and adults is an effective watershed management approach. Citizen involvement and practices benefiting the Watershed should be publicized and encouraged. Positive practices include periodic septic system maintenance, stormwater management, recycling of yard wastes, safe storage and disposal of toxic materials, farm conservation management planning, timber management planning, environmentally sound recreation behavior, and proper lawn and yard maintenance. Citizens should also be discouraged from using invasive and invasive exotic plant species in their yard or garden landscaping. Training citizens to recognize and remove non-native invasive species found within the Watershed can have a positive impact on the spread of such plants which tend to devastate native plant and animal communities.

The Martins-Jacoby Watershed Association should develop and implement an environmental education program. The program

should include environmental education brochures, watershed protection workshops, interpretive outdoor programs within the Watershed focusing on local resources and initiatives for restoration, conservation, and preservation. The MJWA should partner with other conservation organizations to provide watershed events that increase stewardship and awareness about watershed management issues and initiatives.

In addition, the public education program should be expanded to include the development of programs for the general public and local school districts; the installation of educational kiosks at parks, public fishing areas, or other high use areas; and the distribution of additional fact sheets on a variety of topics to homeowners, township officials, township staff, municipal engineers, area-wide consulting firms, planners, surveyors, developers, and realtors. Important topics to be targeted for public education initiatives include septic system maintenance, lawn and yard care, watershed protection ordinances and planning, and information about the Martins-Jacoby Watershed.



K. Maxfield

The Lower Mt Bethel Visitor's Center offers a classroom for environmental education as well as setting an example itself of sustainable building practices.

Restore Natural Stream Flows

To the greatest extent possible, the streams in the Martins-Jacoby Watershed should be restored to their original flow patterns via removal of the existing obsolete small dams, repair of sink-hole damages, and restoration of floodplain areas throughout the Watershed.

These types of activities will require varying levels of design and permitting, in close coordination with Local, State, and Federal regulatory agencies. Many of these features and potential projects are located on privately held lands, and in all such cases will require landowner involvement, support, and approval (through legal documents). To the extent practicable, all projects should be completed in accordance with the highest standards for engineering design to help ensure the sustainability and long-term success, as well as to prevent unintended consequences of damages to upstream and downstream properties.

Dam Removal

Although dams provide many societal benefits, they can also cause considerable harm to streams within the Watershed. Dams can prevent fish migrations, flood spawning and riparian habitat, increase water temperatures, and change natural flows patterns. Dams can inhibit the ability of fish to move upstream or downstream in response to thermal stress, obtain sufficient food, escape other environmental stressors, or access upstream spawning habitat. According to American Rivers, more than 700 dams have been removed from our nation's waterways through November 2008.

The primary justifications for dam removal are correction of safety issues and ecological restoration. The average life expectancy of a dam is approximated at 50 years, an age now exceeded by approximately one-quarter of all US dams. Dam breaches due to structural flaws or large storms can cause serious property damage and loss of life. Ultimately, decisions to remove dams must reflect an understanding of the ecological, economic, and cultural costs and benefits associated with maintenance or removal of the structure. Design options that allow for the partial removal of the structure or the reduction of ecological impacts through means other than removal (e.g., modifications to the dam structure, installation of fish passage, etc.) must also be considered in terms of their costs and benefits.

There are at least eight (8) run-of-the-river dams, along with two (2) partially breached dams, on the streams within the Martins-Jacoby Watershed. Several of these dams were once associated with old mills which are no longer in operation, and most of which are no longer standing. A comprehensive feasibility study is recommended to determine the location of all dams within the Watershed, as well as if, when, and how each of the dams should be removed or modified (e.g. fish ladders or partial breach). A well-designed feasibility study will foster a collabor-

ative design process in which the full range of costs and benefits associated with various stakeholder groups (e.g. landowners, conservation groups, fishing clubs, etc.) are considered.



The dam above on the Jacoby Creek has been bypassed. The Hummel's Dam (below and facing page), also on the Jacoby Creek (Portland) has altered the natural stream flow significantly with its large drop off in elevation.



K. Maxfield

Floodplain Restoration

Floodplains within developed areas, such as the Martins-Jacoby Watershed, are generally altered in many ways. The most notable impacts are filling, development, and installation of flood control structures within floodplain areas. Modern ordinances and regulations provide greater protection against such activities, but only following decades, and even centuries, of unregulated impacts. Floodplain restoration can be quite complicated, but there are many smaller activities which can be undertaken without extensive studies, engineering, permitting, and associated costs.

Several floodplain impacts were observed as part of the watershed evaluations conducted as part of this plan development project, as listed in Appendix B and shown on Figure 31. While the total cost for restoration of the identified problem areas was estimated, it must be noted that restoration costs are highly variable because of unexpected conditions. Many other floodplain impacts exist within the Watershed, and should be further studied so that a more comprehensive plan for floodplain restoration may be developed and implemented.



The Hummel's Dam.

K. Maxfield

Logjam Removal Project: Martins Creek, Martins-Jacoby Watershed

The Martins-Jacoby Watershed Association partnered with the Northeast Regional Office of the DEP, Lehigh Valley Site Contractors and the municipality of Lower Mt Bethel to obtain a 30 day emergency stream crossing permit to remove a logjam in the Martins Creek.

THE PLAN:

Heavy equipment is used to removed the large material from the debris dam to the bank. Volunteers remove any remaining debris and take care that cleared materials do not float downstream.



BEFORE:

Only fallen trees from along the stream bank and material from the debris dam was stacked in this pile (photo below). The pile is only a portion of the materials removed from the flood plain.



A few days later, thirty-nine volunteers showed up on a rainy cold day to remove the woody debris from the flood plain. The sounds of chain saws and a wood chipper filled the stream valley. Piles of wood grew as the volunteers removed all potential blockages to the flood plain. Volunteers were directed on seeding and stabilizing the disturbed areas.

The size of the debris dam was beyond the ability of the landowner or small group of individuals to address. However, a partnership involving the community and local companies can make a dramatic difference. Hopefully, this project will be the start of more community-wide projects!



AFTER:

Photos courtesy of the Martins-Jacoby Watershed Association.

Sinkholes

Sinkholes are an inherent issue in areas of limestone geology, and they occur as a result of both natural conditions and human disturbances. Alterations in natural surface and groundwater flow are the primary cause of problematic sinkhole activity. Stormwater management, water storage basins, and stream channel changes represent the most problematic surface water alterations which may increase sinkhole activity. Quarrying, which by nature results in considerable alteration of groundwater flow and levels, is the primary subsurface activity which results in sinkhole activity near streams and other surface waterbodies. In some instances, and especially when exacerbated by human disturbances (e.g. quarrying, channelizing of streams, poor land development, etc.), sinkholes may develop along or within stream channels and result in partial to complete loss of streamflow into sinkholes. This condition can be devastating to a stream, especially under baseflow conditions which may result in a dry streambed downstream of the sinkhole activity.

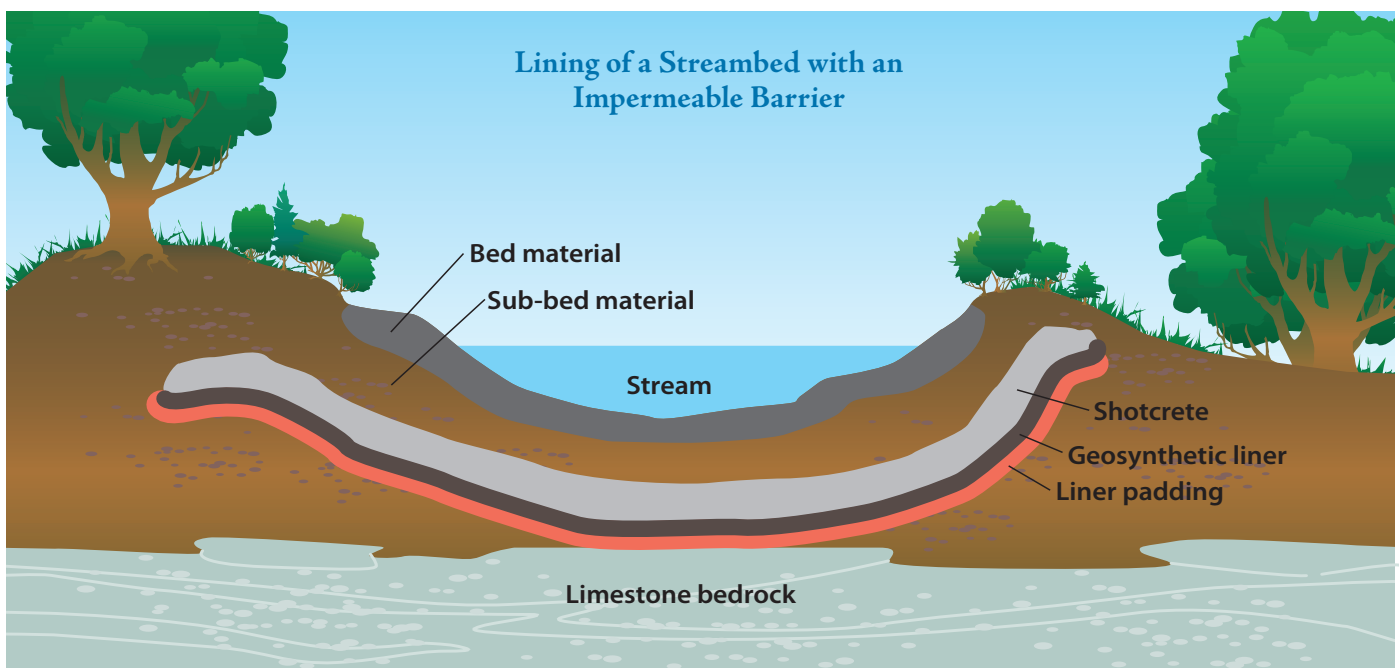
Common engineering practices to remediate sinkhole problems impacting streamflows include grouting of the sinkholes and/or installing an impermeable lining beneath the streambed through the problem area. Grouting of a sinkhole is a relatively simple, and often temporary, solution, whereby a sinkhole is filled with stone and cement to block continued flow into the feature. Lining of a stream with an impermeable barrier installed beneath the natural streambed through a sinkhole problem area is one potential solution to maintaining streamflow through a problem area, but is much more expensive and involved than grouting, alone. Stream lining includes installation of geosynthetic liner and shotcrete fill beneath the existing streambed. Streambed materials are first excavated and then replaced once the liner and shotcrete are installed, as shown below. The riparian zone is also

restored in an effort to restore shading to the stream channel with native shrubs and trees commonly planted.

Prior to completing any sinkhole repairs along a stream channel, a comprehensive hydrogeological study of the entire sinkhole area should be completed. Such a study should include installation of wells to measure groundwater levels, investigation of the hydrologic connection between the creek and the groundwater, and a determination of effects of nearby land-uses and their impacts on groundwater levels. Engineering study should also thoroughly address the applicability of stream lining based on hydrologic and hydraulic conditions associated with the proposed project reach, as well as other factors such as structural considerations (bed and sub-bed materials), projected growth and development within the Watershed, and other site-specific environmental considerations.

Currently, the only stream in the Martins-Jacoby Watershed which is known to be impacted by sinkhole problems is the Oughoughton Creek which commonly loses all baseflow to sinkholes within its downstream reaches. A comprehensive study should be completed for this section of the creek and remedial measures to restore normal streamflow through the area should be recommended. The MJWA should obtain funding for such a study, with follow-on funding for remediation per recommendations of the study.

All municipalities with karst geology are encouraged to adopt Carbonate Geology Ordinances, or Sinkhole Ordinances, to help prevent future problems that are commonly associated with site development, land-use, and stormwater management in karst areas. A model Carbonate Geology Ordinance is included in Appendix C.





Martins-Jacoby Watershed Association Earth Day Project. Volunteers work to remove debris from a floodplain.

J. Mauser

Page 98 Insert MAP 32

Page 99 Insert MAP 33

10. MANAGEMENT PLAN IMPLEMENTATION

Martins-Jacoby Watershed – Organizational Capacity Building

Because the Martins-Jacoby Watershed Association (MJWA) is identified as the primary organization for carrying out the Martins-Jacoby Watershed Conservation Plan, the maintenance of a strong organization is central to its ability to effectively implement the Plan. The MJWA needs to focus direct attention to organizational development in several key areas including membership, fundraising, organizational structure, partnerships, and technical capacity. The MJWA should create an Organizational Development Plan to serve as a companion document to the Watershed Conservation Plan that specifically addresses these needs. The following broad recommendations should be included in the Organizational Development Plan:



- ♦ **Conduct an annual membership drive** focused on the major residential communities to increase membership in MJWA.
- ♦ **Create and distribute hardcopy and electronic newsletters** for disseminating information about the organization, quarterly and monthly, respectively.
- ♦ **Develop a sustainability plan** to ensure that the MJWA does not rely only on grants for base funding, and which clearly defines and differentiates operational expenses and associated dependable funding sources.
- ♦ **Hold annual fundraising events** such as a watershed festival, open house, and an annual dinner or banquet to increase public visibility, create interest, and guarantee an annual revenue stream.
- ♦ **Create a corporate membership program** which targets corporate contributions for mutually beneficial watershed improvement initiatives. Solicit involvement by all prominent local businesses.
- ♦ **Expand and diversify the Board of Directors** to include more representation from partnering conservation groups, community associations, and local government agencies.
- ♦ **Create subcommittees for major focus areas** of MJWA, such as water monitoring, education and outreach, invasive species management, land planning/open space, and watershed BMP implementation.
- ♦ **Create a technical advisory group** (to the MJWA) composed of resource professionals from a variety of fields and backgrounds.
- ♦ **Identify a liaison for each major sub-watershed** within the Martins-Jacoby Watershed. Preferably the liaison would live within the sub-watershed, creating greater connection and sense of ownership.
- ♦ **Build in-house technical capacity** through enhanced volunteer training, GIS and database management training, and investing in better water monitoring equipment.
- ♦ **Strengthen ties to key partners**; specifically, the Watershed municipalities, property owners associations, Northampton County, land trusts (Wildlands Conservancy, Heritage Conservancy, The Nature Conservancy, etc.), hunting and fishing groups, PA Game Commission, neighboring watershed associations in Pennsylvania and New Jersey, and potential funding sources (PA DEP, PA DCNR, EPA, William Penn Foundation, etc.).
- ♦ **Encourage each Watershed municipality to have one Environmental Advisory Council member to be on the Board of Directors** for the MJWA to provide a liaison with municipal governance.
- ♦ **The MJWA should work diligently towards the full implementation of this Watershed Conservation Plan**, updating the Plan annually to adapt to changing conditions in the Watershed in outside controlling factors.

Priority Action Plan

This Watershed Conservation Plan is not a static document. Rather, it is an evolving vision and plan for the Watershed that must adapt and respond to changes within the Watershed and in accordance with an ever changing World. This concept is critical to ensuring that the Watershed Conservation Plan remains relevant and achieves its goals. The Martins-Jacoby Watershed Conservation Plan should be reviewed on an annual basis, with minor written updates. The annual update should not be a complete revision of the plan, but a brief memorandum that summarizes the progress towards plan implementation. This “state of the plan” report should provide a critical and quantitative analysis of progress towards goals in terms of project implementation, analyze changes in resource quality, identify organizational strengths and weaknesses, upcoming needs, and opportunities, and establish interim goals for the upcoming year within the general framework of the original plan. A critical component to the annual update will be adding additional watershed problem areas to the list of Non-point Source Pollution problem areas recommended for correction. All such problem areas should be identified in the Plan to qualify for funding opportunities. A more comprehensive Watershed Conservation Plan review and update should be undertaken every 10 years.

Non-point Source Pollution problem areas within the watershed are listed on pages 109 and 110 and shown on Map 31 page 71. Map 31 also shows a priority ranking of the problem areas.

Funding Sources

A list of possible funding sources for implementing the Martins-Jacoby Watershed Conservation Plan is provided in Table 18. The three primary funding sources for implementing the Watershed Conservation Plan are the Pennsylvania Department of Environmental Protection (PA DEP) Growing Greener Program, the EPA’s 319 Nonpoint Source Program, and the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) Community Conservation Partnerships Program (C2P2) Grants. The Growing Greener Program provides funding to perform watershed protection projects, implement Best Management Practices, and develop public education programs. The 319 Nonpoint Source Program is administered in Pennsylvania through the Growing Greener Program, and provides funds for watershed management projects and public education programs. The PA DCNR C2P2 Grants fund park and recreation planning, public recreation area improvements, and land acquisition of critical natural areas.

Below - Volunteers and MJWA members work to clear wood from a logjam.



J. Mauser

**Table 18: Possible Funding Sources
for Martins-Jacoby Watershed Conservation Plan**

Grant Program	Description of Grant Program	Administering Agency
Growing Greener	Funds watershed assessments, watershed organization development, technical assistance, watershed protection or restoration implementation, and education/outreach programs	PA DEP
319 Nonpoint Source Grants	Funds watershed management and public education projects	US EPA
Community Conservation Partnerships Program Grants	Funds land acquisition for public open space areas, park and recreation projects, municipal master planning, and natural area inventories	PA DCNR
Conservation Reserve Enhancement Program (CREP)	Provides cost-share payments for installation of riparian buffers and conservation easements on farms	PACD
Wetlands Reserve Program (WREP)	Provides cost-share payments for placing wetlands under conservation easements	USDA
Community Development Block Grants (CDBG)	Can be used to fund water, sewage, and stormwater improvements or greenways in economically challenged areas	Northampton County DCED
Flood Control Grants	Flood management projects	US NRCS
Watershed Protection and Flood Prevention (Small Watershed) Grants	Funds watershed improvements (watershed protection, flood prevention, sedimentation control, habitat enhancement, and recreation planning) in watersheds less than 250,000 acres	USDA NRCS
PA Flood Protection Programs	Funds design and construction of flood protection projects that are justifiable under state capital budget process	PA DEP Bureau of Waterways Engineering
PA Department of Community and Economic Development Grants	Various community-based grants for: Intermunicipal Projects, Industrial Sites Reuse Program (Brownfields), Land Use Planning and Technical Assistance Program, Local Government Capital Projects Loan Program, Municipalities Financial Recovery Act Program	PA DCED
PA Infrastructure Investment Authority (PennVest) Loans	Low-interest loans for repair of on-lot septic systems, and improvement of community drinking water & wastewater facilities	Penn Vest
Act 537 Sewage Facility Planning Grants	Grants for up to 50% of the costs to prepare or update a municipal Act 537 Plan	PA DEP Bureau of Water Supply
Act 167 Stormwater Management Grants	Funds stormwater planning and ordinances for cooperative efforts between municipalities at the watershed level	PA DEP Bureau of Watershed Conservation
Rivers, Trails, and Conservation Assistance Program	Funds conservation planning, trail development, and greenways development	National Park Service
PA Recreation Trails Funding	Programs that fund acquisition and development of recreation trails via National Recreational Trails Funding (Symms NRTA) & Rails to Trails Program	PA DCNR
Land and Water Conservation Fund	Provides matching grants to state and local governments for the acquisition and development of outdoor public recreation areas and facilities	National Park Service and PA DCNR

**Table 18: Possible Funding Sources
for Martins-Jacoby Watershed Conservation Plan (*continued*)**

Grant Program	Description of Grant Program	Administering Agency
Nutrient Management Plan Development Incentive Program	Grants to farmers for preparing nutrient management plans; low-interest loans to implement agricultural BMPs	County Conservation District
Agricultural Conservation Easement Purchase Program	Provides funds for the purchase of development rights on farmland to ensure that land will be available for agricultural use indefinitely	PA Bureau of Farmland Preservation
Rivers Conservation Program	Funds implementation of approved conservation plan	PA DCNR
Forest Legacy Program	Federal program in cooperation with state foresters. Supports property acquisition and conservation easements in sensitive forest lands	USDA Forest Service
Stream Improvement Program	Provides design and construction assistance to eliminate imminent threats to flooding and streambank erosion	PA DEP Bureau of Waterways Engineering
Water Resources Education Network (WREN) Grants	Funds community based educational projects that protect and improve the community's watershed (s).	WREN (PA DEP)
Coldwater Heritage Partnership Grants	Funds the development of Coldwater Conservation Plans which are focused on the protection, enhancement, and restoration of coldwater streams.	CHP (PA DCNR, PFBC, TU and Foundation for PA Watersheds)
William Penn Foundation Grants	Private foundation funds watershed protection and sustainable development efforts in the greater Philadelphia area	William Penn Foundation



Along the Delaware River.

J. Mauser

11. REFERENCES

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Slateford Creek area.

K. Maxfield

Appendix A

2007 Stream Station Water Quality Data

Martins-Jacoby Watershed

Baseflow Monitoring #1 *Location Name key is located at the bottom of page 107.*

Date M/D/Y	Time hhmm ss	Stn. No.	Name	pH std units	TKN mg/L	NO3/NO2 mg/L	NH4 mg/L	TP mg/L	TSS mg/L	Temp C	DO Conc mg/L	DO %	Cond mS/cm	Sp Cond mS/cm
6/25/2007	9:50:00	1	MR	7.8	0.70	4.57	0.50	1.5	0.033	16.50	8.95	92	0.259	0.309
6/25/2007	8:45:00	2	MC-L	7.7	0.90	2.71	0.60	3.0	0.016	17.80	8.04	84	0.275	0.319
6/25/2007	9:25:00	3	LMC	7.3	0.80	4.97	0.50	1.0	0.026	16.50	8.10	82	0.194	0.231
6/25/2007	10:20:00	4	WC	7.8	0.90	3.44	0.60	1.5	0.025	16.20	9.22	93	0.322	0.386
6/25/2007	11:00:00	5	GC	7.4	0.80	1.01	0.60	< 1.0	0.007	14.30	9.10	88	0.163	0.205
6/25/2007	10:40:00	6	MC-M	7.6	1.20	1.16	0.60	1.5	0.026	16.50	9.18	94	0.157	0.187
6/25/2007	11:20:00	7	MC-U	7.4	0.90	0.52	0.60	< 1.0	0.002	16.60	9.11	93	0.114	0.136
6/25/2007	9:50:00	8	OC-L	8.2	1.30	5.97	0.60	1.5	0.003	10.92	6.97	63	0.272	0.372
6/25/2007	10:19:00	9	OC-U	7.8	1.50	2.78	0.60	1.5	0.004	16.47	10.49	107	0.215	0.257
6/25/2007	13:05:00	10	SC	8.4	2.60	0.51	0.60	< 1.0	0.003	15.00	9.62	95	0.186	0.229
6/25/2007	12:40:00	11	JC-L	8.4	2.30	0.42	0.60	1.0	0.002	18.76	8.74	93	0.330	0.375
6/25/2007	11:50:00	12	JC-U	8.3	2.70	0.32	0.60	1.5	0.002	18.87	9.89	106	0.316	0.358
6/25/2007	11:00:00	13	AC-U	7.4	1.60	1.87	0.60	< 1.0	0.004	15.29	8.41	83	0.247	0.304
6/25/2007	10:40:00	14	UTAC	7.8	2.70	2.93	0.60	1.5	0.005	16.73	10.43	106	0.215	0.256
6/25/2007	11:24:00	15	AC-L	7.7	0.80	2.18	0.60	1.0	0.004	15.71	9.91	99	0.237	0.289

Baseflow Monitoring #2 *Location Name key is located at the bottom of page 107.*

Date M/D/Y	Time hhmm ss	Stn. No.	Name	pH std units	TKN mg/L	NO3/NO2 mg/L	NH4 mg/L	TP mg/L	TSS mg/L	Temp C	DO Conc mg/L	DO %	Cond mS/cm	Sp Cond mS/cm
10/23/2007	10:13:07	1	MR	9.0	0.60	4.19	0.10	< 1.0	0.036	15.25	10.53	105	0.309	0.380
10/23/2007	10:28:37	2	MC-L	8.0	< 1.00	3.79	< 0.10	< 1.0	< 0.001	14.45	11.13	109	0.286	0.358
10/23/2007	10:40:37	3	LMC	8.1	< 1.00	1.95	< 0.10	< 1.0	0.018	14.56	11.27	111	0.199	0.249
10/23/2007	14:46:22	4	WC	7.7	< 1.00	2.86	< 0.10	1.0	< 0.001	15.91	10.69	108	0.365	0.441
10/23/2007	14:24:39	5	GC	7.3	0.40	0.60	< 0.10	< 1.0	0.009	14.47	10.07	99	0.201	0.252
10/23/2007	14:56:00	6	MC-M	7.9	0.30	0.52	< 0.10	< 1.0	0.007	16.64	10.49	108	0.317	0.377
10/23/2007	14:09:29	7	MC-U	7.5	< 1.00	0.09	< 0.10	< 1.0	< 0.001	15.39	10.53	105	0.143	0.175
10/23/2007	11:04:46	8	OC-L	7.6	1.47	5.26	0.10	< 1.0	< 0.001	12.00	6.76	63	0.291	0.387
10/23/2007	11:25:43	9	OC-U	7.6	1.40	1.68	0.10	< 1.0	< 0.001	15.54	10.97	110	0.210	0.256
10/23/2007	12:33:50	10	SC	7.6	2.00	<0.01	< 0.10	< 1.0	< 0.001	13.61	11.22	108	0.192	0.245
10/23/2007	12:57:01	11	JC-L	8.5	3.00	<0.01	< 0.10	< 1.0	< 0.001	15.79	11.10	112	0.342	0.415
10/23/2007	12:17:50	12	JC-U	8.6	0.60	<0.01	< 0.10	< 1.0	< 0.001	15.88	11.45	116	0.345	0.418
10/23/2007	11:52:18	13	AC-U	7.7	1.40	<0.01	< 0.10	< 1.0	< 0.001	15.33	9.58	96	0.220	0.269
10/23/2007	11:44:27	14	UTAC	8.1	1.80	1.36	< 0.10	< 1.0	< 0.001	15.58	11.06	111	0.213	0.260
10/23/2007	11:58:28	15	AC-L	7.9	1.30	0.96	0.10	< 1.0	< 0.001	15.42	10.21	102	0.262	0.320

Appendix A

2007 Stream Station Water Quality Data

Martins-Jacoby Watershed

Baseflow Monitoring #3 Location Name key is located at the bottom of page.

Date M/D/Y	Time hhmm ss	Stn. No.	Name	pH std units	TKN mg/L	NO3/NO2 mg/L	NH4 mg/L	TP mg/L	TSS mg/L	Temp C	DO Conc mg/L	DO %	Cond mS/cm	Sp Cond mS/cm
1/21/2008	9:13:02	1	MR	8.3	< 1.00	0.51	0.10	1.0	< 0.010	0.89	13.23	93	0.192	0.357
1/21/2008	9:54:14	2	MC-L	8.0	< 1.00	0.75	0.25	2.0	0.040	0.02	15.58	107	0.163	0.311
1/21/2008	9:47:40	3	LMC	7.6	< 1.00	0.98	0.05	1.0	0.080	0.15	15.46	106	0.124	0.236
1/21/2008	14:30:49	4	WC	7.6	< 1.00	0.97	0.05	1.0	0.310	2.29	15.53	113	0.167	0.295
1/21/2008	14:01:47	5	GC	7.3	< 1.00	0.90	0.25	1.0	< 0.010	5.04	12.21	96	0.145	0.234
1/21/2008	14:19:48	6	MC-M	8.5	1.72	0.50	0.15	1.0	< 0.010	1.38	14.85	106	0.206	0.376
1/21/2008	13:47:01	7	MC-U	7.3	< 1.00	0.18	0.10	1.0	< 0.010	0.36	15.23	105	0.065	0.122
1/21/2008	10:16:45	8	OC-L	7.8	1.20	1.10	<0.01	1.0	< 0.010	4.36	11.85	91	0.196	0.324
1/21/2008	10:34:49	9	OC-U	7.7	< 1.00	0.48	0.05	1.0	< 0.010	0.33	14.58	101	0.123	0.233
1/21/2008	12:27:35	10	SC	7.4	< 1.00	0.08	< 0.01	1.0	0.020	0.01	14.18	97	0.073	0.140
1/21/2008	11:48:50	11	JC-L	8.3	< 1.00	0.16	0.05	1.0	< 0.010	0.32	14.43	100	0.217	0.410
1/21/2008	12:08:34	12	JC-U	8.2	< 1.00	0.15	0.05	5.0	0.040	0.23	14.12	97	0.200	0.379
1/21/2008	11:05:07	13	AC-U	8.0	< 1.00	0.42	0.02	2.0	0.170	1.65	13.94	100	0.175	0.315
1/21/2008	10:51:19	14	UTAC	7.8	< 1.00	0.95	< 0.01	1.0	1.160	0.03	14.83	102	0.127	0.242
1/21/2008	11:12:04	15	AC-L	8.0	< 1.00	0.20	< 0.01	8.0	0.050	1.37	14.02	100	0.160	0.291

AC - Allegheny Creek
 AC-L - Allegheny Creek, Lower
 AC-U - Allegheny Creek, Upper
 GC - Greenwalk Creek
 JC - Jacoby Creek
 JC-L - Jacoby Creek, Lower
 JC-U - Jacoby Creek, Upper
 LMC - Little Martins Creek
 MC - Martins Creek
 MC-L - Martins Creek, Lower
 MC-M - Martins Creek, Middle Section
 MC-U - Martins Creek, Upper
 MR - Mud Run
 OC - Oughoughton Creek
 OC-L - Oughoughton Creek, Lower
 OC-U - Oughoughton Creek, Upper
 SC - Slateford Creek
 UTSAC - Unnamed Tributary, Allegheny Creek
 WC - Waltz Creek

Appendix A

2007 Stream Station Water Quality Data

Martins-Jacoby Watershed

Stormflow Monitoring #1 *Location Name key is located at the bottom of page 107.*

Date M/D/Y	Time hhmm ss	Stn. No.	Name	pH std units	TKN mg/L	NO3/NO2 mg/L	NH4 mg/L	TP mg/L	TSS mg/L	Temp C	DO Conc mg/L	DO %	Cond mS/cm	Sp Cond mS/cm
10/27/2007	12:39:05	1	MR	8.4	7.10	2.71	< 0.10	13.5	0.141	15.12	10.12	101	0.244	0.301
10/27/2007	11:50:38	2	MC-L	7.2	5.80	1.20	< 0.10	< 1.0	0.049	13.95	10.10	98	0.184	0.233
10/27/2007	11:42:58	3	LMC	7.2	5.70	2.34	< 0.10	< 1.0	0.036	14.06	10.18	99	0.152	0.192
10/27/2007	8:08:28	4	WC	7.3	5.30	1.35	< 0.10	2.0	0.105	13.05	9.93	95	0.245	0.317
10/27/2007	8:40:41	5	GC	7.1	5.10	0.23	< 0.10	< 1.0	0.001	12.59	7.99	75	0.163	0.214
10/27/2007	8:16:02	6	MC-M	7.3	4.30	0.18	0.10	< 1.0	0.036	13.55	9.59	92	0.162	0.207
10/27/2007	8:52:05	7	MC-U	7.2	4.30	0.13	< 0.10	< 1.0	0.006	13.41	8.63	83	0.128	0.164
10/27/2007	11:08:52	8	OC-L	7.5	4.50	1.60	< 0.10	2.0	0.129	14.40	10.71	105	0.155	0.194
10/27/2007	10:48:44	9	OC-U	7.0	4.70	1.26	< 0.10	4.0	0.054	13.86	9.57	93	0.151	0.191
10/27/2007	9:23:57	10	SC	7.4	4.40	0.06	< 0.10	2.0	< 0.001	13.16	9.47	90	0.111	0.143
10/27/2007	9:50:52	11	JC-L	8.0	4.30	0.04	< 0.10	2.0	< 0.001	13.67	10.30	99	0.265	0.338
10/27/2007	9:38:08	12	JC-U	7.8	4.80	< 0.01	< 0.10	2.0	< 0.001	13.61	9.82	95	0.265	0.338
10/27/2007	10:15:16	13	AC-U	7.8	5.50	0.41	< 0.10	2.0	0.036	13.62	10.19	98	0.192	0.245
10/27/2007	10:32:39	14	UTAC	7.5	4.70	0.98	< 0.10	< 1.0	0.025	13.72	10.20	99	0.155	0.198
10/27/2007	10:23:05	15	AC-L	7.7	5.30	0.32	< 0.10	< 1.0	0.035	13.66	10.20	98	0.189	0.241

Stormflow Monitoring #2 *Location Name key is located at the bottom of page 107.*

Date M/D/Y	Time hhmm ss	Stn. No.	Name	pH std units	TKN mg/L	NO3/NO2 mg/L	NH4 mg/L	TP mg/L	TSS mg/L	Temp C	DO Conc mg/L	DO %	Cond mS/cm	Sp Cond mS/cm
3/5/2008	9:49:56	1	MR	8.2	< 0.50	3.00	0.05	155.0	0.270	6.81	12.39	102	0.141	0.216
3/5/2008	9:39:35	2	MC-L	7.2	< 0.50	2.20	0.10	91.0	0.210	5.04	13.10	103	0.102	0.165
3/5/2008	9:25:42	3	LMC	7.2	< 0.50	2.20	0.14	10.0	0.250	5.91	14.25	114	0.092	0.145
3/5/2008	10:16:51	4	WC	7.3	< 0.10	2.40	0.05	89.0	0.260	6.09	12.48	101	0.158	0.248
3/5/2008	6:45:28	5	GC	7.6	0.38	0.25	0.10	6.0	0.120	5.65	12.66	101	0.118	0.188
3/5/2008	10:27:31	6	MC-M	7.2	0.30	0.23	0.10	54.0	0.150	4.07	13.23	101	0.074	0.123
3/5/2008	6:58:59	7	MC-U	7.6	0.14	0.12	0.10	28.0	0.110	3.33	13.87	104	0.058	0.099
3/5/2008	9:06:29	8	OC-L	7.2	0.31	2.90	0.10	185.0	0.280	5.37	14.47	114	0.088	0.140
3/5/2008	8:09:17	9	OC-U	7.3	0.61	2.00	0.10	80.0	0.210	4.49	13.14	102	0.074	0.122
3/5/2008	7:45:24	10	SC	7.4	0.19	0.20	0.05	58.0	0.120	2.89	14.34	106	0.037	0.064
3/5/2008	7:31:51	11	JC-L	7.8	0.24	0.25	0.05	78.0	0.090	3.70	14.02	106	0.109	0.184
3/5/2008	7:22:09	12	JC-U	7.6	0.10	0.27	0.05	74.0	0.090	3.51	13.61	103	0.108	0.184
3/5/2008	8:33:32	13	AC-U	7.6	< 0.10	2.30	< 0.02	68.0	0.140	4.30	13.74	106	0.099	0.163
3/5/2008	8:25:05	14	UTAC	7.3	< 0.10	2.10	0.05	71.0	0.150	5.34	13.50	107	0.090	0.143
3/5/2008	8:44:36	15	AC-L	7.5	0.50	0.45	< 0.02	45.0	0.180	4.48	13.59	105	0.097	0.159

Appendix B Martins-Jacoby Watershed Nonpoint Source Problem Area Information and Map (see page 71)

Site No.	Sub-watershed	Municipality (Township)	Non-point Source Pollution Area Problem Type	Recommended Best Management Practices (BMP)	Estimated Restoration Cost	NPS Pollution Potential	Priority Ranking
10	Delaware & Intermittent North Area 1	Upper Mt Bethel	Riparian Buffer Loss Stormwater Mgt.	Riparian Buffer Reestablishment Stormwater Management Facility - Infiltration or Detention/Retention	\$13,300 \$16,000	4	4
13	Oughoughton Creek	Washington	E&S - Construction Site	Install E&S controls and restore disturbed areas	\$15,000	4	4
14	Oughoughton Creek	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$22,500	3	3
19	Delaware & Intermittent South Area	Lower Mt Bethel	Riparian Buffer Loss	Riparian Buffer Reestablishment	\$8,750	2	4
20	Delaware & Intermittent South Area	Lower Mt Bethel	Riparian Buffer Loss	Riparian Buffer Reestablishment	\$45,500	2	3
21	Delaware & Intermittent South Area	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$27,300	9	5
22	Delaware & Intermittent South Area	Lower Mt Bethel	Riparian Buffer Loss	Riparian Buffer Reestablishment	\$39,000	3	6
23	Delaware & Intermittent South Area	Forks	Agricultural	Agricultural - Nutrient Management Plan	\$2,500	4	4
24	Mud Run	Lower Mt Bethel	Riparian Buffer Loss	Restore riparian buffer with native trees, shrubs, and herbs & Stabilize streambank using structural and bio-engineering practices	\$16,500	3	4
			Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$13,700		
25	Mud Run	Plainfield	Riparian Buffer Loss	Riparian Buffer Reestablishment	\$116,600	2	2
26	Mud Run	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$48,000	5	6
27	Jacoby Creek	Upper Mt Bethel	Dam Encroachment	Dam Removal with Stream Restoration (2 small dams), sediment removal, bank stabilization	\$87,500	10	8
28	Martins Creek South	Lower Mt Bethel	Stream Process Streambank Erosion	Restore Floodplain Streambank Stabilization - Stabilize streambank (upper bank) using bio-engineering practices	\$197,500 \$46,850	8	9
29	Martins Creek South	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$40,500	5	7
30	Martins Creek South	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$33,000	5	8

Appendix B Martins-Jacoby Watershed Nonpoint Source Problem Area Information and Map (see page 71)

Site No.	Sub-watershed	Municipality (Township)	Non-point Source Pollution Area Problem Type	Recommended Best Management Practices (BMP)	Estimated Restoration Cost	NPS Pollution Potential	Priority Ranking
31	Martins Creek South	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices, upper bank requires repairs and planting with matting	\$77,500	9	8
32	Martins Creek South	Lower Mt Bethel	Stream Process Streambank Erosion	Debris Removal Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$5,000 \$40,500	8	8
33	Martins Creek South	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization & Deflectors	\$33,000	5	5
34	Martins Creek South	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization & Deflectors	\$62,500	5	6
35	Martins Creek South	Washington	Dam Encroachment	Dam Removal	\$12,000	4	4
36	Allegheny Creek	Upper Mt Bethel	E&S - Construction Site	Soil Stabilization	\$3,500	6	8
37	Allegheny Creek	Upper Mt Bethel	E&S - Construction Site	Soil Stabilization	\$4,500	6	8
38	Allegheny Creek	Upper Mt Bethel	Riparian Buffer Loss Streambank Erosion	Riparian Buffer Reestablishment Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$21,000 \$70,500	8	7
39	Allegheny Creek	Upper Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$34,500	8	8
40	Delaware & Intermittent Mid Area 2	Upper Mt Bethel	Agricultural Riparian Buffer Loss Streambank Erosion	Agricultural - streamside fencing Riparian Buffer Reestablishment Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$420 \$28,000 \$50,500	6	4
41	Delaware & Intermittent Mid Area 2	Upper Mt Bethel	Riparian Buffer Loss	Riparian Buffer Reestablishment	\$31,150	1	1
43	Delaware & Intermittent Mid Area 1	Lower Mt Bethel	Agricultural Riparian Buffer Loss	Agricultural - streamside fencing Riparian Buffer Reestablishment	\$1,540 \$74,500	2	2
44	Delaware & Intermittent Mid Area 1	Upper Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$30,500	4	4
45	Delaware & Intermittent Mid Area 1	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$20,500	7	7
46	Delaware & Intermittent Mid Area 1	Lower Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$30,500	6	4
47	Jacoby Creek	Upper Mt Bethel	Streambank Erosion	Streambank Stabilization - Stabilize streambank using structural and bio-engineering practices	\$40,500	10	10

Appendix C

Martins-Jacoby Watershed Model Ordinances and Regulations

Forks Township Ordinance Review

1.0 Introduction

Forks Township currently has the following ordinances that pertain to “watershed management and protection”:

- Subdivision and Land Development Ordinance (SALDO 2003)
- Zoning Ordinance (2006)
- Act 167 Stormwater Management Ordinance (Global, LVPC) (2007)

Each of the above ordinances has been thoroughly reviewed as part of the Martins-Jacoby Watershed Protection and Outreach Project, sponsored by the Martins-Jacoby Watershed Association through a grant by the Pennsylvania Department of Environmental Protection Growing Greener Program. The revisions and recommendations for each of the above-listed ordinances are discussed in detail in the following section, by ordinance.

2.0 Review of Existing Forks Township Ordinances

Forks Township Subdivision and Land Development Ordinance

Definitions:

Definitions should be updated to include the following terms

Hydric soil: Include a definition of hydric soils to read: Soils that are categorized as poorly drained that can support hydrophilic plants, but may not do so in many cases. For the purpose of this Ordinance, Hydric soils are general wetland indicator soils **Hydric soils found in the township should be identified in this definition.**

Riparian corridor (if adopted): An area surrounding surface water bodies, including creeks, lakes, watercourses, and wetlands that intercept surface water runoff, wastewater, subsurface flow, and/or deep groundwater flows from upland sources and function to remove or buffer the effects of associated nutrients, sediment, organic matter, pesticides, or other pollutants prior to entry into surface waters. This area may also provide wildlife habitat, control water temperature, attenuate flood flow, and provide opportunities for passive recreation.

Vernal pond: Include a definition of “vernal pond (aka vernal pool)” to read: Vernal ponds are seasonal depressional wetlands and/or ponds. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plains. Although generally isolated, they are sometimes connected to each other by small drainages known as vernal swales. Beneath natural vernal ponds lies either bedrock or a hard clay layer in the soil that helps keep water in the ponded area. Vernal ponds are regulated as wetlands and/or waterways (as ponds which are considered “waters of the United States” and “waters of the Commonwealth of Pennsylvania”), and therefore, they are under the jurisdiction of the state and/or federal governments.

Wetlands: Revise definition for “wetlands” to read: Wetlands are “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, certain types of vernal ponds (also known as vernal pools), and similar areas. Wetlands are to be delineated by a qualified professional in accordance with the guidance set forth in the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*); or the Pennsylvania Department of Environmental Protection *Wetlands Identification and Delineation*, Chapter 105, “Dam Safety and Waterways Management, Rules and Regulations”; or the U.S. Environmental Protection Agency *Wetlands Identification Delineation Manual, Volume I, Rational, Wetland Parameters, and Overview of Jurisdictional Approach, Volume II, Field Methodology*, or the most recently amended reports, will be considered a wetland for the purposes of this Ordinance. In the event the definition of a wetland accepted by the U.S. Army Corps of Engineers conflicts with the definition of a wetland accepted by the Pennsylvania Department of Environmental Protection, or the U.S. Environmental Protection Agency, the more restrictive definition shall apply.

Plan submissions:

The location of all wells, primary drain fields, and secondary drain fields for all adjoining properties should be clearly indicated on all required maps and drawings, in addition to the existing and proposed structures on the applicant's own property.

The Township should require a wetlands assessment by a qualified professional for all new development on parcels that contain any hydric soils areas, in accordance with the published list of hydric soils for Northampton County, Pennsylvania by the United States Department of Agriculture. The Township should maintain the right to require a Jurisdictional Determination by the United States Army Corps of Engineers, as necessary to substantiate the findings of the afore mentioned wetlands assessment.

Require a Landscape Plan for Major subdivisions showing required screening/buffer yards and plantings, street trees, tree protection areas, means for tree protection, trees to be preserved during development, and proposed planting schedule, including species, sizes, and numbers of plantings.

Sewage Systems

A section should be included on all applications pertaining to individual on-lot sewage disposal. Specifically stated should be setbacks from all wetlands and waterways, as well as neighboring wells and property lines.

The Township should initiate an inspection and repair program by Township Sewage Enforcement Officer for any new development that will be using a new or existing on-lot sewage disposal system.

Stream and Water Quality

A minimum 50 ft. vegetative, natural buffer should be required around all waterways (lakes, ponds, vernal ponds, rivers, and streams). This could be increased to 75 feet (each side), or optimally would be a two-tiered 100 ft buffer (75 ft more restrictive inner and 25 ft less restrictive outer).

Wetlands should have a 100 ft buffer and a 25 ft setback.

A two zone buffer is preferable.

Require water quality improvements from stormwater treatment BMPs which discharge into lakes, ponds, streams, and wetlands.

Adopt water conservation ordinance to protect groundwater resources in the Township.

Adopt a wellhead protection ordinance to protect groundwater resources in the Township.

Section Specific Comments:

Section 175-42.D: Prohibit building in entire flood prone area not only within floodway.

Section 175-42.H: Wells should be located no closer than 100 feet from a septic drainage field.

Section 175-56: Temporary wooden barricades or high-visibility fencing should be placed around existing trees and their roots to protect trees from damage and root compaction during the construction process.

Section 175-56.A.2(a): Remove non-native tree *Acer platanoides* (Norway Maple) from list of approved street trees. Street trees should be native to Northampton County.

Section 175-62.E: Prohibit low flow channels in detention basins

Forks Township Zoning Ordinance

General Comments:

The Township should initiate sewage inspection and repair program.

Adopt riparian and wetlands buffer protection standards (see model provided).

Change all references from DER to DEP.

Section Specific Comments:

Section 200-28 A: Require a 200 foot setback between manure storage and any watercourse or wetland.

Sections 200-28.E.4 and E.20: Prohibit new gas stations from within 300 feet of public water supply wellhead. Add language requiring that these uses include appropriate preventive measures to control unintended spills or leaks of petroleum, oils or similar pollutants from areas where vehicles are fueled, serviced or repaired.

Section 200-28.G.11: Require 150-foot setback, plotted horizontally, from mineral extraction operation to the average high water mark of a lake, pond, or perennial stream or the edge of a natural wetland of more than 1 acre. Require a performance bond to ensure land reclamation will be completed in a timely fashion.

Section 200-28.G.12: Require a 200 foot setback between a new waste facility and any watercourse or wetland.

Section 200-28.G.19: Require a 200 foot setback between a new landfill facility and any watercourse or wetland.

Section 200-34.B.4: Prohibit regrading of slopes greater than 25%.

Section 200-34.D.5(c): Prohibit structures noted in Section 200-34.D.5(b) from entire floodplain.

Section 200-34.D.6: Prohibit mobile homes from entire floodplain.

Section 200-36.A.5: Allow for alternative paving surfaces to asphalt for parking lots to encourage infiltration of stormwater from parking areas.

All Zones: Building setbacks should be 150 feet from any perennial stream, 100 feet for intermittent streams, and 50 feet from any drainage channel or swale (except for road crossings in all cases). Paving setback should be 50 ft. from all streams (perennial, intermittent, ephemeral) and drainage channels or swales.

All Zones: It should be required that whenever an existing single family dwelling is converted to a multifamily dwelling the existing sewage disposal system must be certified as being adequate to meet the new demand.

All Zones: It should be required that whenever an existing single family dwelling is converted to a daycare, bed and breakfast, or other commercial venture, the existing sewage disposal system must be certified as being adequate to meet the new demand.

3.0 Conclusions

Forks Township's current ordinances provide a relatively solid framework for resource protection. The proposed amendments, revisions, and additional ordinances will provide excellent protection of the natural resources that serve as the basis for the quality of life in Forks Township, while still allowing and providing for residential and economic development.

4.0 Recommendations

In addition to the amendments and revisions proposed above, the following "watershed protection" ordinances are provided for consideration in part, in whole, or in concept to supplement and compliment the existing township ordinances:

- ♦ Riparian and Wetland Buffer Guide/Model Regulations (LVPC, 2008)
- ♦ Floodplain Guide/Model Regulations (LVPC, 2008)
- ♦ Steep Slopes Guide/Model Regulations (LVPC, 2008)
- ♦ Woodlands Guide/Model Regulations (LVPC, 2008)
- ♦ Natural Features Conservation Ordinance (encompassing many otherwise unprotected features)
- ♦ Natural Landscape Ordinance
- ♦ Noxious Weed Control Ordinance
- ♦ Forest Conservation Ordinance
- ♦ Official Map Ordinance (for addition of environmental features, specifically including a 150 ft buffer from the main stem of streams mapped by the United States Geological Survey (USGS) which should be preserved and/or restored as part of all future proposed land development activities)

These additional ordinances provide examples of resource protection efforts being successfully implemented in other municipalities in eastern Pennsylvania.

Incorporating these ordinances, in part or in their entirety, into Forks Township's existing ordinances would be relatively easy, requiring simple amendments to the existing ordinances or referencing their use for the appropriate sections. Where feasible, these ordinances should be grouped into common chapters or appendices of the zoning code to facilitate subdivision, development and zoning issue review. These ordinances can be adopted and implemented as zoning overlay districts so that resource protection requirements will be applied consistently, to all lots, throughout the township.

New ordinances for which models are not readily available but which should be explored and adopted in some form by the Township to better protect land and water resources include:

- ♦ Wellhead Protection – for protection of important groundwater supply areas.
- ♦ Outdoor Wood Burning Boilers – for protection from unwarranted air pollution from substandard boiler units which do not meet the strictest standards of the Environmental Protection Agency.
- ♦ Geothermal Energy – for protection of groundwater supplies from contaminants commonly used in the subsurface components of geothermal heating and cooling systems.

Lower Mount Bethel Township Ordinance Review

1.0 Introduction

Lower Mount Bethel Township currently has the following ordinances that pertain to “watershed management and protection:”

- ♦ Subdivision and Land Development Ordinance (SALDO 1990)
- ♦ Zoning Ordinance (1971)
- ♦ Open Space Tax
- ♦ Environmental Advisory Council
- ♦ Act 167 Stormwater Management Ordinance (Global, LVPC) (2007)
- ♦ Weed Ordinance
- ♦ Property Maintenance Ordinance

Each of the above ordinances has been thoroughly reviewed as part of the Martins-Jacoby Watershed Protection and Outreach Project, sponsored by the Martins-Jacoby Watershed Association through a grant by the Pennsylvania Department of Environmental Protection Growing Greener Program. The revisions and recommendations for each of the above-listed ordinances are discussed in detail in the following section, by ordinance.

2.0 Review of Existing Lower Mount Bethel Township Ordinances

Lower Mount Bethel Township Subdivision and Land Development Ordinance

General Comments:

Change references of DER to DEP.

Definitions:

Definitions should be updated to include the following terms:

Add definition of Alluvial Soils to read: Areas subject to periodic flooding and listed in the Soil Survey of Northampton County, Pennsylvania, U.S. Department of Agricultural Soil Conservation Service, July 1974, as amended, as being “on, or in, the flood plain” or subject to flooding. **Alluvial soils found in the township should be identified in this definition.**

Add a definition of Carbonate Geology to read: Areas of the township underlain by geology composed of rock consisting chiefly of calcium and magnesium carbonates.

Add a definition of “Floodplain” to read: “The area along a natural watercourse which is subject to partial or complete inundation in event of the 100 year return interval storm or has a 1% chance of being partially or completely inundated during any given year.”

Add a definition of Hydric Soils to read: Soils that are categorized as poorly drained that can support hydrophilic plants, but may not do so in many cases. **For the purpose of this Ordinance, Hydric soils are general wetland indicator soils Hydric soils found in the township should be identified in this definition.**

Add a definition for Karst topography to read: The relief of an area underlain by limestone that dissolves intermittently to form numerous depressions or small basins.

Add a definition of Riparian Corridor (if adopted) to read: An area surrounding surface water bodies, including creeks, lakes, watercourses, and wetlands that intercept surface water runoff, wastewater, subsurface flow, and/or deep groundwater flows from upland sources and function to remove or buffer the effects of associated nutrients, sediment, organic matter, pesticides, or other pollutants prior to entry into surface waters. This area may also provide wildlife habitat, control water temperature, attenuate flood flow, and provide opportunities for passive recreation.

Add a definition of Steep Slope to read: Areas where the average slope exceeds fifteen (15) percent.

Add definition for Wetlands to read: Wetlands are “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, certain types of vernal ponds (also known as vernal pools), and similar areas. Wetlands are to be delineated by a qualified professional in accordance with the guidance set forth in the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*).

Add definition of Waterways to read: Waterways include all lakes, ponds, wetlands, vernal ponds (also known as vernal pools), and streams (see definition of “stream”). All waterways are to be delineated by a qualified professional in accordance with the guidance set forth in the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*.

Add definition of Stream to read: All flowing watercourses, natural or man-made, with definable “bed and bank” scenario, whether ephemeral, intermittent, or perennial.

Add definition of Vernal Pond (aka vernal pool) to read: Vernal ponds are seasonal depressional wetlands and/or ponds that occur throughout the Township, with especially high concentrations in the northern portion. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plains near the

foot of the Blue Ridge Mountain. Although generally isolated, they are sometimes connected to each other by small drainages known as vernal swales. Beneath natural vernal ponds lies either bedrock or a hard clay layer in the soil that helps keep water in the ponded area. Vernal ponds are regulated as wetlands and/or waterways (as ponds which are considered “waters of the United States” and “waters of the Commonwealth of Pennsylvania”), and therefore, they are under the jurisdiction of the state and/or federal governments.

Add definition of Woodland to include read: The woodland shall be measured from the drip line of the outer trees. Woodlands are also a grove of trees forming one (1) canopy where twelve (12) or more trees measure at least six (6”) inches diameter at breast height in dbh.

Add definition of Exotic Vegetation to read: Exotic vegetation is any plant species that is not native to Lower Mount Bethel Township, Northampton County, Pennsylvania.

The Township should require a wetlands assessment by a qualified professional for all new development on parcels that contain any hydric soils areas, in accordance with the published list of hydric soils for Northampton County, Pennsylvania by the United States Department of Agriculture. The Township should maintain the right to require a Jurisdictional Determination by the United States Army Corps of Engineers, as necessary to substantiate the findings of the afore mentioned wetlands assessment.

All maps and drawings submitted to the township for review and approval should include the surveyed location of all waterways and wetlands (as delineated using the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*) boundaries.

Buffers on wetlands, streams, ponds, and lakes should be consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission. Two zone buffers are preferable to provide resource protection and maintain reasonable landowner rights.

The Township should require an Erosion and Sedimentation Pollution Control Plan, approved by the Northampton County Conservation District, for all disturbances that occur within 100 ft. of a waterway or wetland, as measured from their jurisdictional boundaries.

The location of all wells, primary drain fields, and secondary drain fields for all adjoining properties should be clearly indicated on all required maps and drawings, in addition to the existing and proposed structures on the applicant’s own property.

For proposed industrial operations or industrial storage facilities (section P of preliminary application), a description for the potential for contamination of wetlands, waterways, and/or water supplies and an explanation of all proposed management and emergency action plans should be required by the Township.

A section should be included on all applications pertaining to individual on-lot sewage disposal. Specifically stated should be setbacks from all wetlands and waterways, as well as neighboring wells and property lines.

For all lots smaller than 1 acre, new on-lot sewage disposal systems should only be allowed if there is no potential connection to a community or central sewage system within 2,000 ft.

At the discretion of the Township, water quality monitoring should be required before, during, and after construction for new projects, as necessary to document potential project impacts to any lakes, ponds, vernal ponds, streams, and/or wetlands that occur within 500 feet of the project or which receive any direct or indirect stormwater runoff from the project. (It may be necessary to make this more definitive by adding conditions such as soil erodability, slopes, extent of total grading, etc.)

The Township should initiate an inspection and repair program by Township Sewage Enforcement Officer for any new development that will be using a new or existing on-lot sewage disposal system.

The installation of “dry” sewer lines should be required for all new development, if the Board of Supervisors or Township Engineer determines that the development is likely to be expanded and/or served by an extension of an existing sewage treatment plant within the next ten years.

Well Permits should be required in accordance with State standards.

Lower Mount Bethel Township Zoning Ordinance

General Comments:

The Township should initiate sewage inspection and repair program.

Adopt woodland, wetland and riparian corridor protection standards (see models provided).

Encourage use of pervious parking materials be used for overflow parking areas.

All required Plot Plans should include the locations of all lakes, ponds, rivers, streams, and wetlands, as well as the locations of on-lot septic systems and wells. Buffers on wetlands, streams, ponds, and lakes should be consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission. Two zone buffers are preferable to provide resource protection and maintain reasonable landowner rights.

All required Grading Plans must divert surface runoff away from all lakes, ponds, rivers, streams, and wetlands. Dry wells, rain

gardens, or other on-lot retention and infiltration Best Management Practices should be required.

All required Site Plans should show all on-site waterways and slope contour lines between the site and the waterways.

The ordinance should make note that any alteration to a watercourse will require a PADEP and/or USACE permit in addition to any required municipal permit.

The Township should initiate sewage inspection and repair program.

Act 24, which was signed by Governor Rendell in June, 2008, requires 58 Pennsylvania municipalities through which the Appalachian National Scenic Trail (AT) runs to use their zoning authority to preserve the AT and protect the natural, scenic, historic and aesthetic resources along the trail. Section 4 of that Act states that municipalities shall “take such action consistent with applicable law, as at least an interim measure, to preserve the natural, scenic, historic and aesthetic values of the trail and to conserve and maintain it as a public natural resource. Such action shall include the adoption, implementation and enforcement of zoning ordinances as the governing body deems necessary to preserve those values.” Lower Mount Bethel Township contains privately held lands which abut the AT, and therefore are required to adopt or amend their zoning ordinances, accordingly, under Act 24 to include all reasonable protective measures meeting the intent of the Act.

All Zones: For new construction on existing lots smaller than 1 acre, new on-lot sewage disposal systems should only be allowed if there is no potential connection to a community or public sewage system within 2,000 ft.

All Zones: For all proposed major subdivisions, a connection to any existing public sewage systems where a potential connection exists within 2,000 ft should be required.

All Zones: Building setbacks should be consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission.

All Zones: It should be required that whenever an existing single family dwelling is converted to a multifamily dwelling the existing sewage disposal system must be certified as being adequate to meet the new demand.

All Zones: It should be required that whenever an existing single family dwelling is converted to a daycare, bed and breakfast, or other commercial venture, the existing sewage disposal system must be certified as being adequate to meet the new demand.

All Zones: Building and paving setbacks should be consistent with the *Riparian and Wetland Buffers Guide/Model Regulations* (LVPC, 2008).

3.0 Conclusions

Lower Mount Bethel Township’s current ordinances provide a relatively solid framework for resource protection. The proposed amendments, revisions, and additional ordinances will provide excellent protection of the natural resources that serve as the basis for the quality of life in Lower Mount Bethel Township, while still allowing and providing for residential and economic development.

4.0 Recommendations

In addition to the amendments and revisions proposed above, the following “watershed protection” ordinances are provided for consideration in part, in whole, or in concept to supplement and compliment the existing township ordinances:

- Riparian and Wetland Buffer Guide/Model Regulations (LVPC, 2008)
- Floodplain Guide/Model Regulations (LVPC, 2008)
- Steep Slopes Guide/Model Regulations (LVPC, 2008)
- Woodlands Guide/Model Regulations (LVPC, 2008)
- Natural Features Conservation Ordinance (encompassing many otherwise unprotected features)
- Natural Landscape Ordinance
- Noxious Weed Control Ordinance
- Forest Conservation Ordinance
- Official Map Ordinance (for addition of environmental features, specifically including a 150 ft buffer from the main stem of streams mapped by the United States Geological Survey (USGS) which should be preserved and/or restored as part of all future proposed land development activities, as well as for protection of existing riparian woodlands throughout the municipality)

These additional ordinances provide examples of resource protection efforts being successfully implemented in other municipalities in eastern Pennsylvania.

Incorporating these ordinances, in part or in their entirety, into Lower Mount Bethel Township’s existing ordinances would be relatively easy, requiring simple amendments to the existing ordinances or referencing their use for the appropriate sections. Where feasible, these ordinances should be grouped into common chapters or appendices of the zoning code to facilitate subdivision, development and zoning issue review. These ordinances can be adopted and implemented as zoning overlay districts so that resource protection requirements will be applied consistently, to all lots, throughout the township.

New ordinances for which models are not readily available but which should be explored and adopted in some form by the Township to better protect land and water resources include:

- **Wellhead Protection** – for protection of important groundwater supply areas.
- **Outdoor Wood Burning Boilers** – for protection from unwarranted air pollution from substandard boiler units which do not meet the strictest standards of the Environmental Protection Agency.
- **Geothermal Energy** – for protection of groundwater supplies from contaminants commonly used in the subsurface components of geothermal heating and cooling systems.

In addition to ordinance development and adoption, Lower Mount Bethel Township should develop and implement an Open Space Plan which provides emphasis on the preservation of remaining natural areas within the Township, in addition to farmland preservation.

As a general recommendation, the Township should initiate a sewage system inspection and repair program as part of the next update to the Act 537 Wastewater Management Plan.

Plainfield Township Ordinance Review

1.0 Introduction

Plainfield Township currently has the following ordinances that pertain to “watershed management and protection:”

- Subdivision and Land Development Ordinance (SALDO 1991)
- Zoning Ordinance (1983)
- Open Space Tax (2007)
- Environmental Advisory Council (2008)
- Act 167 Stormwater Management Ordinance (Global, LVPC) (2007)

Each of the above ordinances has been thoroughly reviewed as part of the Martins-Jacoby Watershed Protection and Outreach Project, sponsored by the Martins-Jacoby Watershed Association through a grant by the Pennsylvania Department of Environmental Protection Growing Greener Program. The revisions and recommendations for the Zoning and the Subdivision and Land Development Ordinances are discussed in detail in the following section, by ordinance.

2.0 Review of Existing Plainfield Township Ordinances

Plainfield Township Subdivision and Land Development Ordinance

General Comments:

Change references of DER to DEP.

Definitions:

Definitions should be updated to include the following terms

Alluvial soil: Include definition of Alluvial Soils to read: Areas subject to periodic flooding and listed in the Soil Survey of Northampton County, Pennsylvania, U.S. Department of Agricultural Soil Conservation Service, July 1974, as amended, as being “on, or in, the flood plain” or subject to flooding. **Alluvial soils found in the township should be identified in this definition.**

Carbonate geology: Include a definition of Carbonate Geology to read: Areas of the township underlain by geology composed of rock consisting chiefly of calcium and magnesium carbonates.

Revise definition of “Floodplain” to read “The area along a natural watercourse which is subject to partial or complete inundation in event of the 100 year return interval storm or

has a 1% chance of being partially or completely inundated during any given year.”

Hydric soil: Include a definition of hydric soils to read: Soils that are categorized as poorly drained that can support hydrophilic plants, but may not do so in many cases. For the purpose of this Ordinance, Hydric soils are general wetland indicator soils. **Hydric soils found in the township should be identified in this definition.**

Karst topography: Include a definition for Karst topography to read: The relief of an area underlain by limestone that dissolves intermittently to form numerous depressions or small basins.

Riparian corridor (if adopted): An area surrounding surface water bodies, including creeks, lakes, watercourses, and wetlands that intercept surface water runoff, wastewater, subsurface flow, and/or deep groundwater flows from upland sources and function to remove or buffer the effects of associated nutrients, sediment, organic matter, pesticides, or other pollutants prior to entry into surface waters. This area may also provide wildlife habitat, control water temperature, attenuate flood flow, and provide opportunities for passive recreation.

Stream: Include a definition of “stream” to read: All flowing watercourses, natural or man-made, with definable “bed and bank” scenario, whether ephemeral, intermittent, or perennial.

Steep slope: Include a definition of steep slope to read: Areas where the average slope exceeds fifteen (15) percent.

Vernal pond: Include a definition of “vernal pond (aka vernal pool)” to read: Vernal ponds are seasonal depressional wetlands and/or ponds. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plains. Although generally isolated, they are sometimes connected to each other by small drainages known as vernal swales. Beneath natural vernal ponds lies either bedrock or a hard clay layer in the soil that helps keep water in the ponded area. Vernal ponds are regulated as wetlands and/or waterways (as ponds which are considered “waters of the United States” and “waters of the Commonwealth of Pennsylvania”), and therefore, they are under the jurisdiction of the state and/or federal governments.

Wetlands: Revise definition for “wetlands” to read: Wetlands are “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include

swamps, marshes, bogs, certain types of vernal ponds (also known as vernal pools), and similar areas. Wetlands are to be delineated by a qualified professional in accordance with the guidance set forth in the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*), or the Pennsylvania Department of Environmental Protection Wetlands Identification and Delineation, Chapter 105, Dam Safety and Waterways Management, Rules and Regulations; or the U.S. Environmental Protection Agency Wetlands Identification Delineation Manual, Volume I, Rational, Wetland Parameters, and Overview of Jurisdictional Approach, Volume II, Field Methodology, or the most recently amended reports, will be considered a wetland for the purposes of this Ordinance. In the event the definition of a wetland accepted by the U.S. Army Corps of Engineers conflicts with the definition of a wetland-accepted by the Pennsylvania Department of Environmental Protection, or the U.S. Environmental Protection Agency, the more restrictive definition shall apply.

Woodland: Include definition of woodland to include read: The woodland shall be measured from the drip line of the outer trees. Woodlands are also a grove of trees forming one (1) canopy where twelve (12) or more trees measure at least six (6") inches diameter at breast height in dbh.

Plan submissions:

In addition to the required elements currently in the SALDO regulation, all plan submissions (sketch, preliminary and final) should have wetland transitions areas, Karst topography or carbonate geology, and stream corridor or riparian buffer zone.

The location of all wells, primary drain fields, and secondary drain fields for all adjoining properties should be clearly indicated on all required maps and drawings, in addition to the existing and proposed structures on the applicant's own property.

The Township should require a wetlands assessment by a qualified professional for all new development on parcels that contain any hydric soils areas, in accordance with the published list of hydric soils for Northampton County, Pennsylvania by the United States Department of Agriculture. The Township should maintain the right to require a Jurisdictional Determination by the United States Army Corps of Engineers, as necessary to substantiate the findings of the afore mentioned wetlands assessment.

Sewage systems

The installation of "dry" sewer lines should be required for all new development, if the Board of Supervisors or Township Engineer determines that the development is likely to be expanded and/or served by an extension of an existing sewage treatment plant within the next ten years.

The Township should initiate an inspection and repair program by Township Sewage Enforcement Officer for any new develop-

ment that will be using a new or existing on-lot sewage disposal system.

Stream and water quality

A minimum 50 ft. vegetative, natural buffer should be required around all waterways (lakes, ponds, vernal ponds, rivers, and streams). This could be increased to 75 feet (each side), or optimally would be a two-tiered 100 ft buffer (75 ft more restrictive inner and 25 ft less restrictive outer).

Wetlands should have a 100 ft buffer and a 25 ft setback.

Two zone buffers are preferable to provide resource protection and maintain reasonable landowner rights.

Well Permits should be required in accordance with State standards.

Adopt water conservation ordinance to protect groundwater resources in the Township.

Adopt a wellhead protection ordinance to protect groundwater resources in the Township.

Section Specific Comments:

Section 4.3.B.: Require identification of woodlands on Sketch Plan Requirements.

Section 5.3.G.: Require identification of existing wells and septic drain fields within 200 feet of property lines.

Section 6.3.: Require a Landscape Plan for Major subdivisions showing required screening/buffer yards and plantings, street trees, tree protection areas, means for tree protection, trees to be preserved during development, and proposed planting schedule, including species, sizes, and numbers of plantings.

Section 10.10.C: For all proposed major subdivisions, a connection to any existing central sewage systems where a potential connection exists within 5,000 ft should be required. For all lots smaller than 1 acre, new on-lot sewage disposal systems should only be allowed if there is no potential connection to a community or central sewage system within 2,000 ft.

Section 10.11.C: Wells should be located no closer than 100 feet from a septic drainage field.

Section 10.19.A.1.c: Remove *Quercus acutissima* (Sawtooth Oak), from list of recommended street trees. Street trees should be native to Northampton County.

Section 10.19.C: Temporary wooden barricades or high-visibility fencing should be placed around existing trees and their roots to protect trees from damage and root compaction during the construction process.

Section 10.21: The Township should require an Erosion and Sedimentation Pollution Control Plan, approved by the Northampton County Conservation District, for all disturbances that occur within 100 ft. of a waterway or wetland, as measured from their jurisdictional boundaries.

Plainfield Township Zoning Ordinance

General Comments:

The Township should initiate sewage inspection and repair program.

Adopt woodland, wetland and riparian corridor protection standards (see models provided).

Encourage use of pervious parking materials be used for over-flow parking areas.

Act 24, which was signed by Governor Rendell in June, 2008, requires 58 Pennsylvania municipalities through which the Appalachian National Scenic Trail (AT) runs to use their zoning authority to preserve the AT and protect the natural, scenic, historic and aesthetic resources along the trail. Section 4 of that Act states that municipalities shall “take such action consistent with applicable law, as at least an interim measure, to preserve the natural, scenic, historic and aesthetic values of the trail and to conserve and maintain it as a public natural resource. Such action shall include the adoption, implementation and enforcement of zoning ordinances as the governing body deems necessary to preserve those values.” Plainfield Township contains privately held lands which abut the AT, and therefore are required to adopt or amend their zoning ordinances, accordingly, under Act 24 to include all reasonable protective measures meeting the intent of the Act.

Section Specific Comments:

Section 305.H: Reduce impervious coverage allowance to 20% in FF District.

Section 306.H: Reduce impervious coverage allowance in SR District to 30%.

Section 315.B.2: Require a 200 foot setback between manure storage and any watercourse or wetland.

Section 315.B.10 and 315.B.21: Prohibit new gas stations from within 300 feet of public water supply wellhead. Add language requiring that these uses include appropriate preventive measures to control unintended spills or leaks of petroleum, oils or similar pollutants from areas where vehicles are fueled, serviced or repaired.

Section 316.E.31: Require a 200 foot setback between a new junkyard and any watercourse or wetland.

Section 319.E.5: Require 150-foot setback, plotted horizontally, from mineral extraction operation to the average high water mark of a lake, pond, or perennial stream or the edge of a natural wetland of more than 1 acre. Require a performance bond to ensure land reclamation will be completed in a timely fashion.

Section 319.E.11: Require a 200 foot setback between a new landfill facility and any watercourse or wetland.

Section 319.E.13: Require a 200 foot setback between a new waste facility and any watercourse or wetland.

Section 404.D.3: Screening yards and buffers should require vegetation native to Northampton County.

Section 506: Identify Alluvial soils in Plainfield Township.

Article 5: Adopt woodland, steep slopes, floodplain, and riparian and wetland buffer performance standards included in model ordinances released by the Lehigh Valley Planning Commission (2008).

All Zones: Building and paving setbacks should be consistent with the Riparian and Wetland Buffers Guide/Model Regulations (LVPC, 2008).

3.0 Conclusions

Plainfield Township’s current ordinances provide a relatively solid framework for resource protection. The proposed amendments, revisions, and additional ordinances will provide excellent protection of the natural resources that serve as the basis for the quality of life in Plainfield Township, while still allowing and providing for residential and economic development.

4.0 Recommendations

In addition to the amendments and revisions proposed above, the following “watershed protection” ordinances are provided for consideration in part, in whole, or in concept to supplement and compliment the existing township ordinances:

- Riparian and Wetland Buffer Guide/Model Regulations (LVPC, 2008)
- Floodplain Guide/Model Regulations (LVPC, 2008)
- Steep Slopes Guide/Model Regulations (LVPC, 2008)
- Woodlands Guide/Model Regulations (LVPC, 2008)
- Natural Features Conservation Ordinance (encompassing many otherwise unprotected features)
- Natural Landscape Ordinance
- Noxious Weed Control Ordinance
- Forest Conservation Ordinance
- Official Map Ordinance (for addition of environmental features, specifically including a 150 ft buffer from the main stem of streams mapped by the United States Geological Survey (USGS) which should be preserved and/or restored as part of all future proposed land development activities, as well as for protection of existing riparian woodlands throughout the municipality)

These additional ordinances provide examples of resource protection efforts being successfully implemented in other municipalities in eastern Pennsylvania.

Incorporating these ordinances, in part or in their entirety, into Plainfield Township’s existing ordinances would be relatively easy, requiring simple amendments to the existing ordinances

or referencing their use for the appropriate sections. Where feasible, these ordinances should be grouped into common chapters or appendices of the zoning code to facilitate subdivision, development and zoning issue review. These ordinances can be adopted and implemented as zoning overlay districts so that resource protection requirements will be applied consistently, to all lots, throughout the township.

New ordinances for which models are not readily available but which should be explored and adopted in some form by the Township to better protect land and water resources include:

- ♦ **Wellhead Protection** – for protection of important groundwater supply areas.
- ♦ **Outdoor Wood Burning Boilers** – for protection from unwarranted air pollution from substandard boiler units which do not meet the strictest standards of the Environmental Protection Agency.
- ♦ **Geothermal Energy** – for protection of groundwater supplies from contaminants commonly used in the subsurface components of geothermal heating and cooling systems.

In addition to ordinance development and adoption, Plainfield Township should develop and implement an Open Space Plan which provides emphasis on the preservation of remaining natural areas within the Township, in addition to farmland preservation.

As a general recommendation, the Township should initiate a sewage system inspection and repair program as part of the next update to the Act 537 Wastewater Management Plan.

Upper Mount Bethel Township Ordinance Review

1.0 Introduction

Upper Mount Bethel Township currently has the following ordinances that pertain to “watershed management and protection:”

- Subdivision and Land Development Ordinance (2003)
- Zoning Ordinance (2004)
- Act 167 Stormwater Ordinance (2007)
- Wellhead Protection Ordinance
- Upper Mount Bethel Township Environmental Advisory Council Establishment Ordinance

Each of the above ordinances has been thoroughly reviewed as part of the Martins-Jacoby Watershed Protection Project, sponsored through a grant by the Pennsylvania Department of Environmental Protection Growing Greener Program. The revisions and recommendations for the Zoning and the Subdivision and Land Development Ordinances are discussed in detail in the following section, by ordinance.

2.0 Review of Existing Upper Mount Bethel Township Ordinances

Subdivision and Land Development Ordinance

General Comments:

Definitions:

Add definition of Alluvial Soils to read: Areas subject to periodic flooding and listed in the Soil Survey of Northampton County, Pennsylvania, U.S. Department of Agricultural Soil Conservation Service, July 1974, as amended, as being “on, or in, the flood plain” or subject to flooding. Alluvial soils found in the township should be identified in this definition.

Add a definition of Hydric Soils to read: Soils that are categorized as poorly drained that can support hydrophilic plants, but may not do so in many cases. For the purpose of this Ordinance, Hydric soils are general wetland indicator soils. Hydric soils found in the township should be identified in this definition.

Add a definition of Riparian Corridor (if adopted) to read: An area surrounding surface water bodies, including creeks, lakes, watercourses, and wetlands that intercept surface water runoff, wastewater, subsurface flow, and/or deep groundwater flows from upland sources and function to remove or buffer the effects of associated nutrients, sediment, organic matter, pesticides, or other pollutants prior to entry into surface waters. This area may also provide wildlife habitat, control water temperature, attenuate flood

flow, and provide opportunities for passive recreation.

Add a definition of Steep Slope to read: Areas where the average slope exceeds fifteen (15) percent.

Add definition for Wetlands to read: Wetlands are “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, certain types of vernal ponds (also known as vernal pools), and similar areas. Wetlands are to be delineated by a qualified professional in accordance with the guidance set forth in the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*).

Add definition of Waterways to read: Waterways include all lakes, ponds, wetlands, vernal ponds (also known as vernal pools), and streams (see definition of “stream”). All waterways are to be delineated by a qualified professional in accordance with the guidance set forth in the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*.

Add definition of Stream to read: All flowing watercourses, natural or man-made, with definable “bed and bank” scenario, whether ephemeral, intermittent, or perennial.

Add definition of Vernal Pond (aka vernal pool) to read: Vernal ponds are seasonal depressional wetlands and/or ponds that occur throughout the Township, with especially high concentrations in the northern portion. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plains near the foot of the Blue Ridge Mountain. Although generally isolated, they are sometimes connected to each other by small drainages known as vernal swales. Beneath natural vernal ponds lies either bedrock or a hard clay layer in the soil that helps keep water in the ponded area. Vernal ponds are regulated as wetlands and/or waterways (as ponds which are considered “waters of the United States” and “waters of the Commonwealth of Pennsylvania”), and therefore, they are under the jurisdiction of the state and/or federal governments.

Add definition of Woodland to include read: The woodland shall be measured from the drip line of the outer trees. Woodlands are also a grove of trees forming one (1) canopy where twelve (12) or more trees measure at least six (6”) inches diameter at breast height in dbh.

Add definition of Exotic Vegetation to read: Exotic vegetation is any plant species that is not native to Upper Mount Bethel Township, Northampton County, Pennsylvania.

The Township should require a wetlands assessment by a qualified professional for all new development on parcels that contain any hydric soils areas, in accordance with the published list of hydric soils for Northampton County, Pennsylvania by the United States Department of Agriculture. The Township should maintain the right to require a Jurisdictional Determination by the United States Army Corps of Engineers, as necessary to substantiate the findings of the afore mentioned wetlands assessment.

All maps and drawings submitted to the township for review and approval should include the surveyed location of all waterways and wetlands (as delineated using the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*) boundaries.

Buffers on wetlands, streams, ponds, and lakes should be consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission. Two zone buffers are preferable to provide resource protection and maintain reasonable landowner rights.

The Township should require an Erosion and Sedimentation Pollution Control Plan, approved by the Northampton County Conservation District, for all disturbances that occur within 100 ft. of a waterway or wetland, as measured from their jurisdictional boundaries.

The location of all wells, primary drain fields, and secondary drain fields for all adjoining properties should be clearly indicated on all required maps and drawings, in addition to the existing and proposed structures on the applicant's own property.

For proposed industrial operations or industrial storage facilities (section P of preliminary application), a description for the potential for contamination of wetlands, waterways, and/or water supplies and an explanation of all proposed management and emergency action plans should be required by the Township.

A section should be included on all applications pertaining to individual on-lot sewage disposal. Specifically stated should be setbacks from all wetlands and waterways, as well as neighboring wells and property lines.

For all lots smaller than 1 acre, new on-lot sewage disposal systems should only be allowed if there is no potential connection to a community or central sewage system within 2,000 ft.

At the discretion of the Township, water quality monitoring should be required before, during, and after construction for new projects, as necessary to document potential project impacts to any lakes, ponds, vernal ponds, streams, and/or wetlands that occur within 500 feet of the project or which receive any direct or indirect stormwater runoff from the project. (It may be necessary to make this more definitive by adding conditions such as soil erodability, slopes, extent of total grading, etc.)

The Township should initiate an inspection and repair program by Township Sewage Enforcement Officer for any new development that will be using a new or existing on-lot sewage disposal system.

The installation of "dry" sewer lines should be required for all new development, if the Board of Supervisors or Township Engineer determines that the development is likely to be expanded and/or served by an extension of an existing sewage treatment plant within the next ten years.

Well Permits should be required in accordance with State standards.

Zoning Ordinance

General Comments:

All required Plot Plans should include the locations of all lakes, ponds, rivers, streams, and wetlands, as well as the locations of on-lot septic systems and wells. Buffers on wetlands, streams, ponds, and lakes should be consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission. Two zone buffers are preferable to provide resource protection and maintain reasonable landowner rights.

All required Grading Plans must divert surface runoff away from all lakes, ponds, rivers, streams, and wetlands. Dry wells, rain gardens, or other on-lot retention and infiltration Best Management Practices should be required.

All required Site Plans should show all on-site waterways and slope contour lines between the site and the waterways.

The ordinance should make note that any alteration to a watercourse will require a PADEP and/or USACE permit in addition to any required municipal permit.

The Township should initiate sewage inspection and repair program.

Act 24, which was signed by Governor Rendell in June, 2008, requires 58 Pennsylvania municipalities through which the Appalachian National Scenic Trail (AT) runs to use their zoning authority to preserve the AT and protect the natural, scenic, historic and aesthetic resources along the trail. Section 4 of that Act states that municipalities shall "take such action consistent with applicable law, as at least an interim measure, to preserve the natural, scenic, historic and aesthetic values of the trail and to conserve and maintain it as a public natural resource. Such action shall include the adoption, implementation and enforcement of zoning ordinances as the governing body deems necessary to preserve those values." Upper Mount Bethel Township contains privately held lands which abut the AT, and therefore are required to adopt or amend their zoning ordinances, accordingly, under Act 24 to include all reasonable protective measures meeting the intent of the Act.

All Zones: For new construction on existing lots smaller than 1 acre, new on-lot sewage disposal systems should only be allowed if there is no potential connection to a community or public sewage system within 2,000 ft.

All Zones: For all proposed major subdivisions, a connection to any existing public sewage systems where a potential connection exists within 2,000 ft should be required.

All Zones: Building setbacks should be consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission.

All Zones: It should be required that whenever an existing single family dwelling is converted to a multifamily dwelling the existing sewage disposal system must be certified as being adequate to meet the new demand.

All Zones: It should be required that whenever an existing single family dwelling is converted to a daycare, bed and breakfast, or other commercial venture, the existing sewage disposal system must be certified as being as being adequate to meet the new demand.

3.0 Conclusions

Upper Mount Bethel Plainfield Township's current ordinances provide a relatively solid framework for resource protection. The proposed amendments, revisions, and additional ordinances will provide excellent protection of the natural resources that serve as the basis for the quality of life in Plainfield Township, while still allowing and providing for residential and economic development.

4.0 Recommendations

In addition to the amendments and revisions proposed above, the following "watershed protection" ordinances are provided for consideration in part, in whole, or in concept to supplement and compliment the existing township ordinances:

- ♦ Riparian and Wetland Buffer Guide/Model Regulations (LVPC, 2008)
- ♦ Floodplain Guide/Model Regulations (LVPC, 2008)
- ♦ Steep Slopes Guide/Model Regulations (LVPC, 2008)
- ♦ Woodlands Guide/Model Regulations (LVPC, 2008)
- ♦ Natural Features Conservation Ordinance (encompassing many otherwise unprotected features)
- ♦ Natural Landscape Ordinance
- ♦ Noxious Weed Control Ordinance
- ♦ Forest Conservation Ordinance
- ♦ Official Map Ordinance (for addition of environmental features, specifically including a 150 ft buffer from the main stem of streams mapped by the United States Geological Survey (USGS) which should be preserved and/or restored as part of all future proposed land development activities, as well as for protection of existing riparian woodlands throughout the municipality)

These additional ordinances provide examples of resource protection efforts being successfully implemented in other municipalities in eastern Pennsylvania.

Incorporating these ordinances, in part or in their entirety, into Plainfield Township's existing ordinances would be relatively easy, requiring simple amendments to the existing ordinances or referencing their use for the appropriate sections. Where feasible, these ordinances should be grouped into common chapters or appendices of the zoning code to facilitate subdivision, development and zoning issue review. These ordinances can be adopted and implemented as zoning overlay districts so that resource protection requirements will be applied consistently, to all lots, throughout the township.

New ordinances for which models are not readily available but which should be explored and adopted in some form by the Township to better protect land and water resources include:

- ♦ **Wellhead Protection** – for protection of important groundwater supply areas.
- ♦ **Outdoor Wood Burning Boilers** – for protection from unwarranted air pollution from substandard boiler units which do not meet the strictest standards of the Environmental Protection Agency.
- ♦ **Geothermal Energy** – for protection of groundwater supplies from contaminants commonly used in the subsurface components of geothermal heating and cooling systems.

As a general recommendation, the Township should initiate a sewage system inspection and repair program as part of the next update to the Act 537 Wastewater Management Plan.

Washington Township Ordinance Review

1.0 Introduction

Washington Township currently has the following ordinances that pertain to “watershed management and protection:”

- Subdivision and Land Development Ordinance (SALDO 1995)
- Zoning Ordinance (1997)
- Environmental Advisory Council (2008)
- Act 167 Stormwater Management Ordinance (Global, LVPC) (2007)
- Weed Ordinance

Each of the above ordinances has been thoroughly reviewed as part of the Martins-Jacoby Watershed Protection and Outreach Project, sponsored by the Martins-Jacoby Watershed Association through a grant by the Pennsylvania Department of Environmental Protection Growing Greener Program. The revisions and recommendations for the Zoning and the Subdivision and Land Development Ordinances are discussed in detail in the following section, by ordinance.

2.0 Review of Existing Washington Township Ordinances

Washington Township Subdivision and Land Development Ordinance

General Comments:

Change references of DER to DEP.

Definitions:

Definitions should be updated to include the following terms:

Alluvial soil: Include definition of Alluvial Soils to read: Areas subject to periodic flooding and listed in the Soil Survey of Northampton County, Pennsylvania, U.S. Department of Agricultural Soil Conservation Service, July 1974, as amended, as being “on, or in, the flood plain” or subject to flooding. **Alluvial soils found in the township should be identified in this definition.**

Add definition of “Floodplain” to read “The area along a natural watercourse which is subject to partial or complete inundation in event of the 100 year return interval storm or has a 1% chance of being partially or completely inundated during any given year.” has a 1% chance of being partially or completely inundated during any given year.”

Add definition of “Floodway” to read “The designated area of a floodplain required to carry the discharge waters of the one hundred (100) year magnitude.” (Same as the Zoning Ordinance definition).

Hydric soil: Include a definition of hydric soils to read: Soils that are categorized as poorly drained that can support hydrophilic plants, but may not do so in many cases. For the purpose of this Ordinance, Hydric soils are general wetland indicator soils. **Hydric soils found in the township should be identified in this definition.**

Riparian corridor (if adopted): An area surrounding surface water bodies, including creeks, lakes, watercourses, and wetlands that intercept surface water runoff, wastewater, subsurface flow, and/or deep groundwater flows from upland sources and function to remove or buffer the effects of associated nutrients, sediment, organic matter, pesticides, or other pollutants prior to entry into surface waters. This area may also provide wildlife habitat, control water temperature, attenuate flood flow, and provide opportunities for passive recreation.

Stream: Include a definition of “stream” to read: All flowing watercourses, natural or man-made, with definable “bed and bank” scenario, whether ephemeral, intermittent, or perennial.

Steep slope: Include a definition of steep slope to read: Areas where the average slope exceeds fifteen (15) percent.

Vernal pond: Include a definition of “vernal pond (aka vernal pool)” to read: Vernal ponds are seasonal depressional wetlands and/or ponds. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plains. Although generally isolated, they are sometimes connected to each other by small drainages known as vernal swales. Beneath natural vernal ponds lies either bedrock or a hard clay layer in the soil that helps keep water in the ponded area. Vernal ponds are regulated as wetlands and/or waterways (as ponds which are considered “waters of the United States” and “waters of the Commonwealth of Pennsylvania”), and therefore, they are under the jurisdiction of the state and/or federal governments.

Wetlands: Revise definition for “wetlands” to read: Wetlands are “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, certain types of vernal ponds (also known as vernal pools), and similar areas. Wetlands are to be delineated by a qualified professional in accordance with the guidance set forth in the United States Army Corps of Engineers 1987 *Wetlands Delineation Manual*), or the Pennsylvania Department of Environmental Protection Wetlands Identification and Delineation, Chapter 105, Dam

Safety and Waterways Management, Rules and Regulations; or the U.S. Environmental Protection Agency Wetlands Identification Delineation Manual, Volume I, Rational, Wetland Parameters, and Overview of Jurisdictional Approach, Volume II, Field Methodology, or the most recently amended reports, will be considered a wetland for the purposes of this Ordinance. In the event the definition of a wetland accepted by the U.S. Army Corps of Engineers conflicts with the definition of a wetland-accepted by the Pennsylvania Department of Environmental Protection, or the U.S. Environmental Protection Agency, the more restrictive definition shall apply.

Woodland: Include definition of woodland to include read: The woodland shall be measured from the drip line of the outer trees. Woodlands are also a grove of trees forming one (1) canopy where twelve (12) or more trees measure at least six (6") inches diameter at breast height in dbh.

Plan submissions:

In addition to the required elements currently in the SALDO regulation, all plan submissions (sketch, preliminary and final) should include buffers consistent with the Lehigh Valley Planning Commission model ordinances for wetlands, ponds, lakes, and streams. Woodlands, of Forest Land, should be shown on sketch plans.

The location of all wells, primary drain fields, and secondary drain fields for all adjoining properties should be clearly indicated on all required maps and drawings, in addition to the existing and proposed structures on the applicant's own property.

The Township should require a wetlands assessment by a qualified professional for all new development on parcels that contain any hydric soils areas, in accordance with the published list of hydric soils for Northampton County, Pennsylvania by the United States Department of Agriculture. The Township should maintain the right to require a Jurisdictional Determination by the United States Army Corps of Engineers, as necessary to substantiate the findings of the afore mentioned wetlands assessment.

Sewage systems

The installation of "dry" sewer lines should be required for all new development, if the Board of Supervisors or Township Engineer determines that the development is likely to be expanded and/or served by an extension of an existing sewage treatment plant within the next ten years.

The Township should initiate an inspection and repair program by Township Sewage Enforcement Officer for any new development that will be using a new or existing on-lot sewage disposal system.

Stream and water quality

A minimum 50 ft. vegetative, natural buffer should be required around all waterways (lakes, ponds, vernal ponds, rivers, and streams). This could be increased to 75 feet (each side), or optimally would be a two-tiered 100 ft buffer (75 ft more restrictive inner and 25 ft less restrictive outer).

Wetlands should have a 100 ft buffer and a 25 ft setback.

Two zone buffers are preferable to provide resource protection and maintain reasonable landowner rights.

Well Permits should be required in accordance with State standards.

Adopt water conservation ordinance to protect groundwater resources in the Township.

Adopt a wellhead protection ordinance to protect groundwater resources in the Township.

Section Specific Comments:

Section 4.3.B.: Require identification of woodlands on Sketch Plan Requirements.

Section 5.3.G.: Require identification of existing wells and septic drain fields within 200 feet of property lines.

Section 6.3.A: Require a Landscape Plan for Major subdivisions showing required screening/buffer yards and plantings, street trees, tree protection areas, means for tree protection, trees to be preserved during development, and proposed planting schedule, including species, sizes, and numbers of plantings.

Section 10.9.C: Require replacement systems for on-lot sewage disposal systems (shown on plan with testing data).

Section 10.10.C: For all proposed major subdivisions, a connection to any existing central sewage systems where a potential connection exists within 5,000 ft should be required. For all lots smaller than 1 acre, new on-lot sewage disposal systems should only be allowed if there is no potential connection to a community or central sewage system within 2,000 ft.

Section 10.: Street trees should be native species to Northampton County.

Section 10.: Temporary wooden barricades or high-visibility fencing should be placed around existing trees and their roots to protect trees from damage and root compaction during the construction process.

Section 10.: The Township should require an Erosion and Sedimentation Pollution Control Plan, approved by the Northampton County Conservation District, for all disturbances that occur within 100 ft. of a waterway or wetland, as measured from their jurisdictional boundaries.

Zoning Ordinance

General Comments:

Change references of DER to DEP.

Make all definitions consistent with those listed in the Subdivision and Land Development Ordinance, including the new definitions listed above.

The Township should initiate sewage inspection and repair program.

Adopt woodland, wetland and riparian corridor protection standards (see models provided).

Encourage use of pervious parking materials be used for overflow parking areas.

Act 24, which was signed by Governor Rendell in June, 2008, requires 58 Pennsylvania municipalities through which the Appalachian National Scenic Trail (AT) runs to use their zoning authority to preserve the AT and protect the natural, scenic, historic and aesthetic resources along the trail. Section 4 of that Act states that municipalities shall "take such action consistent with applicable law, as at least an interim measure, to preserve the natural, scenic, historic and aesthetic values of the trail and to conserve and maintain it as a public natural resource. Such action shall include the adoption, implementation and enforcement of zoning ordinances as the governing body deems necessary to preserve those values." Washington Township contains privately held lands which abut the AT, and therefore are required to adopt or amend their zoning ordinances, accordingly, under Act 24 to include all reasonable protective measures meeting the intent of the Act.

Section Specific Comments:

Section 3.12.2: Require a 200 foot setback between manure storage and any watercourse or wetland.

Section 3.12.2: Require wetland and watercourse setbacks consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission.

Section 3.12.4: Prohibit new gas stations from within 300 feet of public water supply wellhead. Add language requiring that these uses include appropriate preventive measures to control unintended spills or leaks of petroleum, oils or similar pollutants from areas where vehicles are fueled, serviced or repaired.

Section 3.12.8: Require wetland and watercourse setbacks consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission.

Section 3.12.11.b: Add "and 200 ft. setback from wetlands and watercourses."

Section 3.13.E.27.b.1: Require a 200 foot setback between a new sanitary landfill and any watercourse or wetland.

Section 4.4.D.3: Use only native plant species to Northampton County.

Section 4.8.C: The Township should require a wetlands assessment by a qualified professional for all new development on parcels that contain any hydric soils areas, in accordance with the published list of hydric soils for Northampton County, Pennsylvania by the United States Department of Agriculture. The Township should maintain the right to require a Jurisdictional Determination by the United States Army Corps of Engineers, as necessary to substantiate the findings of the afore mentioned wetlands assessment. A buffer should be place on all delineated wetlands which is consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission.

Section 5.3.B: Require an Erosion and Sediment Pollution Control Plan approved by the Northampton County Conservation District.

Section 5.5: Make section consistent with the Riparian and Wetland Buffer model ordinance by the Lehigh Valley Planning Commission.

Section 5.7: Make section consistent with the Floodplains model ordinance by the Lehigh Valley Planning Commission.

Section 5.16: The Township should require a wetlands assessment by a qualified professional for all new development on parcels that contain any hydric soils areas, in accordance with the published list of hydric soils for Northampton County, Pennsylvania by the United States Department of Agriculture. The Township should maintain the right to require a Jurisdictional Determination by the United States Army Corps of Engineers, as necessary to substantiate the findings of the afore mentioned wetlands assessment.

All Zones: Adopt woodland, steep slopes, floodplain, and riparian and wetland buffer performance standards included in model ordinances released by the Lehigh Valley Planning Commission (2008).

All Zones: Building and paving setbacks should be consistent with the Riparian and Wetland Buffers Guide/Model Regulations (LVPC, 2008).

3.0 Conclusions

Washington Township's current ordinances provide a relatively solid framework for resource protection. The proposed amendments, revisions, and additional ordinances will provide excellent protection of the natural resources that serve as the basis for the quality of life in Washington Township, while still allowing and providing for residential and economic development.

4.0 Recommendations

In addition to the amendments and revisions proposed above, the following “watershed protection” ordinances are provided for consideration in part, in whole, or in concept to supplement and compliment the existing township ordinances:

- ♦ Riparian and Wetland Buffer Guide/Model Regulations (LVPC, 2008)
- ♦ Floodplain Guide/Model Regulations (LVPC, 2008)
- ♦ Steep Slopes Guide/Model Regulations (LVPC, 2008)
- ♦ Woodlands Guide/Model Regulations (LVPC, 2008)
- ♦ Natural Features Conservation Ordinance (encompassing many otherwise unprotected features)
- ♦ Natural Landscape Ordinance
- ♦ Noxious Weed Control Ordinance
- ♦ Forest Conservation Ordinance
- ♦ Official Map Ordinance (for addition of environmental features, specifically including a 150 ft buffer from the main stem of streams mapped by the United States Geological Survey (USGS) which should be preserved and/or restored as part of all future proposed land development activities, as well as for protection of existing riparian woodlands throughout the municipality)

These additional ordinances provide examples of resource protection efforts being successfully implemented in other municipalities in eastern Pennsylvania.

Incorporating these ordinances, in part or in their entirety, into Plainfield Township’s existing ordinances would be relatively easy, requiring simple amendments to the existing ordinances or referencing their use for the appropriate sections. Where feasible, these ordinances should be grouped into common chapters or appendices of the zoning code to facilitate subdivision, development and zoning issue review. These ordinances can be adopted and implemented as zoning overlay districts so that resource protection requirements will be applied consistently, to all lots, throughout the township.

New ordinances for which models are not readily available but which should be explored and adopted in some form by the Township to better protect land and water resources include:

- ♦ **Wellhead Protection** – for protection of important groundwater supply areas.
- ♦ **Outdoor Wood Burning Boilers** – for protection from unwarranted air pollution from substandard boiler units which do not meet the strictest standards of the Environmental Protection Agency.
- ♦ **Geothermal Energy** – for protection of groundwater supplies from contaminants commonly used in the subsurface components of geothermal heating and cooling systems.

In addition to ordinance development and adoption, Washington Township should develop and implement an Open Space Program which provides emphasis on the preservation of remaining natural areas within the Township, in addition to farmland preservation. The Township should propose and approve a tax for the dedicated funding of Open Space Preservation, including both natural areas and farmland preservation.

As a general recommendation, the Township should initiate a sewage system inspection and repair program as part of the next update to the Act 537 Wastewater Management Plan.

ORDINANCE NO. _____

NATURAL LANDSCAPE ORDINANCE

PURPOSE: An Ordinance to promote the use of native vegetation, including native grasses and wildflowers, in managed yards and landscapes to allow the use of such plants in the preservation or restoration of natural plant communities.

TITLE: This ordinance shall be known as the _____ Township Natural Landscape Ordinance.

LEGISLATIVE PURPOSE: It is not the intent of this legislation to allow vegetated areas to be unmanaged or overgrown when such growth provides either a direct health hazard or provides a demonstrated breeding ground for fauna known to create a safety or health hazard. The legislature recognizes that a limited number of species may be indicators of neglect, a condition which may adversely affect human health or safety. Below, the township has specifically defined certain noxious weeds recognized to be indicators of neglect.

The use of wildflowers and other native plants in managed landscape design can be economical, low-maintenance, effective in soil and water conservation, and may preclude the excessive use of pesticides, herbicides, and fertilizers. Furthermore, native vegetation and native plant communities, on a worldwide basis, are disappearing at an alarmingly rapid rate. The township recognizes the desirability of permitting and encouraging managed natural vegetation within the limits of _____ Township while maintaining public health and safety.

DEFINITIONS:

NOXIOUS WEED – A plant that is determined to be injurious to public health, crops, livestock, agricultural land or other property. Such weeds may be included on Pennsylvania's Noxious Weed Control List. The listed noxious plant species do not come within the protection of this ordinance.

NOXIOUS WEED CONTROL LIST:

The Noxious Weed Control List, as defined in the Pennsylvania Code under section 3(b) of the Noxious Weed Control Law (3 P. S. § 255.3(b)), established by the Noxious Weed Control Committee, shall include but not be limited to the following weeds:

- (1) *Cannabis sativa*, commonly known as marijuana.
- (2) The *Lythrum salicaria* (commonly known as purple loosestrife) Complex: Any nonnative *Lythrum* including, *Lythrum salicaria* and *Lythrum virgatum*, their cultivars and any combination thereof.
- (3) *Cirsium arvense*, commonly known as Canada thistle.
- (4) *Rosa multiflora*, commonly known as multiflora rose.
- (5) *Sorghum halepense*, commonly known as Johnson grass.
- (6) *Carduus nutans*, commonly known as musk or nodding thistle.
- (7) *Cirsium vulgare*, commonly known as bull or spear thistle.
- (8) *Datura stramonium*, commonly known as jimson weed.
- (9) *Polygonum perfoliatum*, commonly known as mile-a-minute vine.
- (10) *Puerria lobata*, commonly known as kudzu vine.
- (11) *Sorghum bicolor* cv. *drummondii*, commonly known as shattercane.
- (12) *Heracleum mantegazzianum*, commonly known as giant hogweed.
- (13) *Galega officinalis*, commonly known as goatsrue.

The term “managed” as used in this ordinance means a planned and designed yard or landscape with the intent to control, direct, and maintain the growth of natural vegetation.

MANAGED NATURAL LANDSCAPING: It shall be lawful to grow native and naturalized plants to any heights, including ferns, wildflowers, grasses, forbs, shrubs, and trees, in a managed landscape design when said plants were obtained not in violation of local, state, or federal laws. No employee of the township may undertake to damage, remove, burn, or cut vegetation on a managed natural landscape incorporating native plants, except those specifically prohibited herein, and except on order of a court of record following a hearing at which it is established that noxious weeds exist in a managed natural landscape and that a condition creating a clear and present hazard to public health or safety has arisen. An action for a court order under this subsection shall provide that the destruction, cutting, or removal of vegetation shall be selective unless general cutting, destruction, or removal is necessary to eliminate the offending conditional.

Statements of intent:

1. If a complaint is filed by a citizen or the township against a piece of property, the burden of proof lies with the complainant to establish that a health or safety hazard in fact exists. Natural landscapes shall be assumed to be harmless, until proven otherwise.
2. The township shall not act upon anonymous complaints. The property owner shall have the right to face the accuser.
3. This and the noxious weed ordinance shall be proactively and uniformly enforced, and shall apply to all property not specifically exempted within the township limits.
4. Aesthetic judgments shall not be a consideration nor play any role in determining non-compliance or compliance with the ordinance.
5. The township shall notify the property owner of their rights of appeal.
6. It shall not be the policy of the township to enter upon private land and to destroy property thereon without due process of law.

ENACTED AND ORDAINED this ____th day of _____, _____

TOWNSHIP OF _____

BY: _____

_____, CHAIRMAN

ATTEST:

ORDINANCE NO. _____

NOXIOUS WEED CONTROL ORDINANCE

PURPOSE: This ordinance is intended to encourage the control of noxious vegetation in ??? Township to reduce the amount of natural irritants and pollens in the air; to prevent any noxious weeds from spreading; and to improve the aesthetic quality of the Township.

TITLE: This ordinance shall be known as the ??? Township Noxious Weed Control Ordinance.

DEFINITIONS:

NOXIOUS WEEDS – A plant that is determined to be injurious to public health, crops, livestock, agricultural land or other property. Such weeds may be included on Pennsylvania’s Noxious Weed Control List.

NOXIOUS WEED CONTROL LIST - The Noxious Weed Control List, as defined in the Pennsylvania Code under section 3(b) of the Noxious Weed Control Law (3 P. S. § 255.3(b)), established by the Noxious Weed Control Committee, shall include but not be limited to the following weeds:

- (1) *Cannabis sativa*, commonly known as marijuana.
- (2) The *Lythrum salicaria* (commonly known as purple loosestrife) Complex: Any nonnative *Lythrum* including, *Lythrum salicaria* and *Lythrum virgatum*, their cultivars and any combination thereof.
- (3) *Cirsium arvense*, commonly known as Canada thistle.
- (4) *Rosa multiflora*, commonly known as multiflora rose.
- (5) *Sorghum halepense*, commonly known as Johnson grass.
- (6) *Carduus nutans*, commonly known as musk or nodding thistle.
- (7) *Cirsium vulgare*, commonly known as bull or spear thistle.
- (8) *Datura stramonium*, commonly known as jimson weed.
- (9) *Polygonum perfoliatum*, commonly known as mile-a-minute vine.
- (10) *Puerria lobata*, commonly known as kudzu vine.
- (11) *Sorghum bicolor cv. drummondii*, commonly known as shattercane.
- (12) *Heracleum mantegazzianum*, commonly known as giant hogweed.
- (13) *Galega officinalis*, commonly known as goatsrue.

APPLICABILITY: During any calendar year, growth of any noxious weed in excess of eighteen (18) inches on any land not actively used for agricultural purposes is hereby declared to be a nuisance and a danger to public health and shall be prohibited. Exceptions may be made for controlled fences/boundaries of properties or active natural areas for wildlife.

WEED CONTROL AREA: A municipality, geographic area, or tract of land where a noxious weed must be treated as prescribed under this ordinance.

PUBLIC NOTICE: Once each year during the period of May – June, the Board of Supervisors or their designee shall authorize to be printed in a newspaper of general circulation within the Township a notice directed to the residents advising them of the general requirements of this Ordinance, and specifically the prohibitions as to the Noxious Weeds and the penalties for violations.

NOTICE TO VIOLATORS: Upon receipt of a formal, written complaint by a bonafide resident or landowner in ??? Township, or by direct observation of a Township Official, the Board of Supervisors or their designee shall authorize a certified written notice be given to the owner of the land whereon the offending growth is found to exist. The notice shall specify the location and the type of noxious weed and require its removal within ten (10) days of the date of the notice unless the owner of the land in question can demonstrate to the Board of Supervisors or their designate just cause as to why the offending growth cannot be removed. Failure of the landowner to comply with the requirements of such notice within ten (10) days after receipt shall be prima facie evidence of a violation of this Ordinance.

TOWNSHIP ACTION: In the event that the offending growth has not been removed or destroyed within the ten (10) day period after the certified notice was received, the Township or a party contracted by the Township may mow, destroy, or dispose of the offending growth in such a fashion as deemed appropriate. The owner of the property whereon the work was undertaken shall bear the cost of the work and shall be required to reimburse the Township in full upon receipt of an itemized bill.

VIOLATIONS AND PENALTIES: Any person who shall violate any of the provisions of this Ordinance shall, upon conviction thereof, in an action brought before the District Justice in the manner provided for the enforcement of summary offenses under the Pennsylvania Rule of Criminal Procedures be sentenced to pay a fine of not less than one hundred dollars (\$100.00) nor more than five hundred dollars (\$500.00) and the costs of prosecution.

REFERENCE: NOXIOUS WEED CONTROL LAW, ACT OF APRIL 7, 1982, P. L. 228, No. 74, AS AMENDED July 7, 1994.

ENACTED AND ORDAINED this ____th day of _____, _____

TOWNSHIP OF _____

BY: _____

_____, CHAIRMAN

ATTEST:

ORDINANCE NO. _____

PART 1 NATURAL FEATURES CONSERVATION

§101. Purpose

§102. Definitions

§103. Submission Requirements

§104. Minimum Conservation and Natural Resource Protection Standards

§105. Administration

Appendix A Application and Plan Checklist

Appendix B Application Form

Appendix C Escrow Calculation Form

§101. PURPOSE.

1. Short Title and Effective Date. This Part shall be known and may be cited as “The _____ Township Natural Features Conservation Ordinance.”

2. Purpose.

A. These regulations are intended to protect the rights of the residents of _____ Township to enjoy clean air, pure water and the natural, scenic, historic and aesthetic values of the environment, set forth in the Pennsylvania Constitution and in other Commonwealth and Federal statutes. In particular, it is the Township’s purpose, through this Part, to conserve the following natural features:

(1) Natural features identified as land or water resource areas, e.g., wetlands, groundwater recharge zones, springs, streams, agriculturally suited soils, woodlands, prime wildlife habitats and areas constituting high recreational and other amenity value.

(2) Natural features performing beneficial ambient air quality or micro climatic functions, e.g., vegetation, by abating glare and noise, entrapping dust and other particulate and contributing to the reduction of climatic stress and energy costs.

(3) Natural features which, if disturbed, may cause hazards or stress to life and property, e.g., steep slopes, floodplains and wetlands.

B. No provision of these regulations shall be construed to deny the right of any property owner to use his land as may be permitted by the Township’s Zoning Ordinance [Chapter 27]. Rather, it is the purpose of these regulations to insure that such uses minimize disturbances to natural features and that reasonable measures are taken to mitigate any adverse impacts of such uses.

3. Statutory Authority. This Part is adopted pursuant to the authority for the Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247, as amended by Act of December 21, 1988, P.L. No. 170 and the Second Class Township Code, 1933, May 1, P.L. 103; 1947, July 10, P.L. 1481, as amended, 53 P.S. §65101 et seq., to provide for the protection and preservation of natural resources and agricultural land and activities, to promote, protect and facilitate public health; to prevent the overcrowding of land; to preserve prime agricultural and farm land; and to provide for the development of land in a manner consistent with the Comprehensive Plan of _____ Township and the conservation and efficient use of open space to protect important natural resources.

4. Compatibility with Other Permit and Part Requirements. Permits and approvals issued pursuant to this Part do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance. If more stringent requirements concerning regulation of stormwater or erosion and sedimentation control are contained in the other code, rule, act or ordinance, the more stringent regulation shall apply. (Ord. 64B, 9/16/1993, Art. I)

§102. DEFINITIONS.

ACCESSORY STRUCTURE - a subordinate building, the use of which is customarily incidental to, and which is on the same lot as, the principal building. These structures shall include, but not be limited to, detached garages and storage sheds.

ADDITIONS - extensions added to the existing principal structure which increases the ground coverage of the principal structure. These extensions shall include, but not be limited to, fully enclosed rooms, attached garages, screened porches, decks and stoops.

AGRICULTURALLY SUITED SOILS - soil designated within land capability classes I and II in the soil survey of _____ County, U.S. Department of Agriculture, Soil Conservation Service.

CONSERVATION - the planned management of a natural feature to prevent its exploitation, destruction or neglect.

CRITICAL WILDLIFE HABITAT - those areas that are necessary for the survival of an individual or group of a given species such as rookeries, occupied den sites, etc.

DBH - the diameter of a tree at breast height, usually measured 4.5 feet from the ground surface.

EARTH DISTURBANCE - any activity including, but not limited to, construction, mining, farming, timber harvesting and grubbing which alters, disturbs and exposes existing land surfaces.

ENCROACHMENT - any physical action which may jeopardize the health and longevity of a natural feature, or any structure or activity which in any manner changes the course, current or cross section of any wetland, water course or body of water.

ENDANGERED - a species or subspecies in danger of extinction throughout all or a significant portion of its range.

ENVIRONMENTALLY SENSITIVE AREAS - those areas such as wetlands, high water table areas, rare, threatened or endangered plant communities and species and steep slopes that are susceptible to environmental degradation.

EROSION - the removal of soil particles by the action of water, wind, ice or other geological agents.

FLOODPLAIN - The land adjoining a river or stream that has been or may be expected to be inundated with flood waters in a 100 year frequency flood. The floodplain areas are identified on floodplain maps available at the XXXXX Township Municipal Building.

GROUNDWATER RECHARGE - replenishment of a geologic structures and rock or soil interstices which have the capacity to store water.

HEDGEROW - a line of plants that may occur naturally where seeds collect and are left undisturbed, such as along fence lines, property lines or between fields, or that is specially planted or left undisturbed, e.g., to act as a windbreak or vegetative buffer along a drainage channel or water course.

HIGH WATER TABLE AREAS - areas which have a year round or seasonal high water table which comes to within 20 inches of the ground surface.

MINIMIZE - to reduce to the smallest amount possible. "Minimize" shall not mean complete elimination, but shall require that the most substantial efforts possible under the circumstances have been taken to reduce the adverse effect of the action required to be minimized. With respect to activities, the conduct of which is adverse to the conservation of the natural features of land, the requirement to "minimize" shall include, but not be limited to, the requirement that the placement of dwellings and other structures and the location of roads, sedimentation and erosion control devices and earth disturbance activities shall be planned and designed so as to permit the adverse effect of the activity in question to be reduced to the smallest amount possible under the circumstances consistent with the otherwise permitted development.

MITIGATION - include (i) avoiding the impact altogether by not taking a certain action or parts of an action; (ii) minimizing impacts by limiting the degree or magnitude of the action or its implementation; (iii) rectifying the impact by repairing, rehabilitating or restoring the affected natural feature; (iv) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (v) compensating for the impact by replacing or providing substitute resources.

MULTIFAMILY RESIDENTIAL BUILDING - a building containing three or more dwelling units including, but not limited to, a four family dwelling (fourplex, quadraplex), townhouse (single-family attached) or apartment building.

NATURAL FEATURE - a component of a landscape identified by _____ Township a important for conservation in §101(2) of this Par

OLD FIELD - an upland area containing a dominance of herbaceous vegetation and recently established woody shrubs, seedlings and saplings.

OPEN SPACE - that part of a parcel not included within parking areas, areas laid out in lots or areas occupied by structures.

PRESERVATION - the maintenance of a natural resource in its original, undisturbed state.

PRIME WILDLIFE HABITAT - those areas necessary to maintain an existing population of a given species, the destruction of which will cause a significant reduction in population density.

PROTECT - to defend the integrity of a given right or natural resource.

RARE - a species or subspecies that due to unique habitat requirements or sporadic distribution may not commonly occur in a given area or region.

ROCK OUTCROPS - areas consisting of exposures of solid bedrock.

SEASONAL HIGH WATER TABLE SOILS - those soils in which the groundwater surface is no more than 20 inches from the ground surface at certain times of the year. According to the _____ County Soil Survey, these soils are Alden, Alluvial land, Alvira, Braceville, Buchanan, Chippewa, Empeyville, Morris, Mucky peat, Norwich, Rexford, Sheffield, Shelmadine, Volusia and Wayland.

SITE DISTURBANCE - any activity which involves removal of vegetation or which causes land on a given site to be exposed to the danger of erosion, including clearing, grading, filling, plowing and other types of earthmoving.

STEEP SLOPE - any slope greater than 25%.

STEEPLY SLOPED LAND - land with a topographic gradient in excess of 12%.

STREAM - a natural drainageway having defined bed and banks that supports aquatic life including, but not limited to, fish, reptiles and macro invertebrates.

SWALE - a natural channel of other low lying stretch of land which collects or carries surface water runoff.

THREATENED - a species or subspecies which is likely to become endangered in the foreseeable future throughout all or part of its range.

WETLAND - wetlands are those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and than under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs and similar areas.

WETLAND BUFFER AREA - a land area extending from the outer limit of the delineated wetland for a distance of 10 feet.

WETLAND IMPACT AREA - a land area extending from the outer limit of the wetland in which land uses and activities, including any earth disturbance, is regulated to prevent the destruction, degradation or adverse impact on the wetland. For the purposes of this Part the wetland impact area in _____ Township is 100 feet.

WOODLAND - an area characterized by a more or less dense and extensive tree cover. More particularly, a plant community predominantly of healthy tree and other woody vegetation. (Ord. 64B, 9/16/1993, Art. II)

§103. SUBMISSION REQUIREMENTS.

1. Applicability.

A. No person, corporation or other entity shall disturb or impact any natural feature listed below in _____ Township except in compliance with this Part.

B. The natural features intended to be conserved and protected by this Part:

- (1) Wetlands.
- (2) Steep slopes, shallow soil areas, agricultural soils.
- (3) Seasonal high water table soil areas.
- (4) Surface and groundwater resources.
- (5) Floodplains.
- (6) Prime and critical wildlife habitat.
- (7) Natural woodland communities.
- (8) Rare, threatened, endangered or unique plant communities and species.

2. Conservation Plan.

A. Any person, corporation or other entity proposing an activity listed in subsection (2)(B), below, that disturbs or impacts any natural feature listed in §103(1) of this Part, must obtain approval of a conservation plan from the Board of Supervisors of _____ Township, or the Zoning Officer as required by §105 of this Part. It shall be the responsibility of the applicant to determine whether a conservation plan is required in accordance with the provisions of this Part.

B. The following activities are subject to the requirement of an approved conservation plan showing adherence to the standards in §105 of this Part:

- (1) Building construction.
 - (a) All nonresidential buildings, excluding agricultural buildings and buildings accessory to single-family residential use.
 - (b) All multifamily residential buildings.
 - (c) Single-family homes where the construction occurs in a wetland, wetland buffer area, steep slope or floodplain area as defined in §102 or involves more than 1 acre of land area.
- (2) All subdivisions, land developments and planned residential developments.
- (3) All special exceptions and other land uses under the Zoning Ordinance [Chapter 27], that require site plan approval.
- (4) Construction of any of the following structures or facilities which exceed 5,000 square feet of earth disturbances:
 - (a) Public utility facilities and structures.
 - (b) Liquid and solid waste collection, storage, conveyance and treatment facilities, including landfills.
 - (c) Stormwater management basins and related facilities.
 - (d) Any other structure of similar character or impact as determined by the Township Planning Commission or Board of Supervisors.

- (5) Construction of the following streets, parking areas, loading and storage areas, including:
 - (a) All streets to be dedicated to the Township.
 - (b) All private streets and driveways involving more than 5,000 square feet of earth disturbance.
 - (c) Any parking area, loading and storage area or any similar area which exceeds 5,000 square feet of earth disturbance.
- (6) Any construction, excavation or encroachment that occurs in a wetland area.
- (7) Any site disturbance involving more than 1 acre of land area.

3. Exemptions.

A. Construction of single-family homes and attendant landscaping, except where the construction occurs in a wetland, wetland buffer area, steep slope or floodplain area as defined in §102, above, or involves more than 1 acre of land area, in which case the provisions of this Part apply.

(1) The construction of additions to single-family homes which increase the ground coverage of the home by up to 800 square feet and/or the construction of structures accessory to single-family homes with ground coverage of up to 800 square feet, when construction occurs in the wetland impact area, shall also be exempt from the requirement of an approved conservation plan if it can be demonstrated by the applicant that no disturbance of a wetland or wetland buffer area will occur.

(2) Notwithstanding the exemptions stated above, prior to the issuance of a zoning permit for the construction of a single-family home, addition or accessory structure in a wetland impact area, the property owner shall have recorded, at the _____ County Recorder of Deeds office, a deed setting forth the plan and metes and bounds description of the wetlands delineation. Permanent pins or monuments establishing the delineation line shall be placed on the property and their location shall also be shown on the recorded deed and plan.

B. Construction of any street, road, parking area or loading and storage area involving less than 5,000 square feet of earth disturbance, except where it occurs in a wetland area.

C. Agricultural and farming activities such as, but not limited to, production of field crops, truck gardening, planting and production of nursery stock, household gardening, field maintenance by way of mowing, trimming and hedgerow-fence row management, provided such activities are conducted with the approval of the _____ County Conservation District or the Soil Conservation Service if required by State regulations. A conservation plan must be submitted if the activity occurs in a wetland area.

D. Standard forestry management practices, provided that any timber harvesting operations are following the Department of Environmental Protection management practices in its publication "Soil Erosion and Sedimentation Control Guidelines for Forestry," are operating under an erosion and sedimentation control plan approved by the _____ County Conservation District and are not being conducted in environmentally sensitive areas or reserved open space as defined by this Part, in which case the provisions of this Part apply and approval of a conservation plan must be obtained from the Board of Supervisors. [Ord. 97]

E. Wildlife habitat management approved by local, State or Federal agencies with appropriate jurisdiction.

4. Conservation Plan Content.

A. Prior to commencing any site disturbance, a conservation plan as described below shall be submitted to and approved by the Board of Supervisors and/or the Zoning Officer for all land use activities listed in §103(2) of this Part.

B. A conservation plan shall include the following minimum information described in subsections (4)(C) and (4)(D) of this Section. When any of this information already has been prepared as part of an application under the _____ Township Subdivision and Land Development Ordinance [Chapter 22], then it shall be duplicated and inserted, by the applicant, into the pertinent section of the conservation plan.

C. Conservation Plan Mapping.

(1) Property Base Map. A base map of the applicant's property shall meet the requirements for preliminary plan approval, as set forth in the §402 of the Township Subdivision and Land Development Ordinance [Chapter 22], with respect to: sheet size, scale, property acreage calculations, delineation of courses and distances of property boundaries, dedicated street rights-of-way and easements.

(2) Boundary and Adjoining Property Conditions. The following information shall be indicated on the property base map: names of adjoining property owners and residential and institutional structures within 100 feet of the applicant's property. A smaller scale map, drawn as an inset on the base map sheet, may be used to present information on adjoining property conditions.

(3) Existing Natural Features Inventory. The following information shall be shown or noted on the property base map:

(a) Geologic numbers, based upon the geologic and hydrologic map of _____ County, Pennsylvania, and the approximate location and extent of rock outcrops.

(b) Topography, the contour line intervals of which shall be not more than 2 feet for land with average natural slope of 4% or less and not more than 5 feet for land with average natural slope exceeding 4%. Location and elevation to which contour elevations refer shall be identified; where reasonably feasible, this shall be a known established bench mark. Slopes between 12% and 25% and slopes exceeding 25% shall be indicated clearly. A source list of available aerial photography is on file with the Township Board of Supervisors.

(c) The location and delineation of ponds, streams, floodplain and natural drainage swales.

(d) Soil series and phases, as mapped by the Soil Conservation Service, and accompanying data tabulated for each soil, including: its name, depth to seasonal high water table, depth to bedrock, agricultural capability class and subclass and hydrologic group.

(e) Wetlands, as delineated by a qualified wetlands scientist and surveyed by a licensed land surveyor.

(f) Vegetative cover conditions on the property according to general cover type, e.g., cultivated land; permanent grass land; old field; hedgerow; woodland; emergent, scrub-shrub and forested wetland; etc.

(g) For each general vegetative cover category, the dominant and typical species should be identified. For all woodlands, the applicant shall indicate the principal species of dominant and codominant trees and the shrub understory. Areas dominated by trees over 24 inches dbh shall be indicated, along with the species of such trees.

(h) Identification and classification of prime and critical wildlife habitat and identification of wildlife corridors as described in §104(2)(E)(4).

(i) Location of any rare, threatened or endangered species as identified by the Pennsylvania Natural Diversity Inventory (available from the Township).

(j) If any of the natural features listed above do not occur on the property, a note to that effect shall appear on the plan.

(4) Proposed Site Alternations. The following information shall be shown on the property base map:

(a) Location of all proposed improvements.

(b) Grading plans which clearly show all proposed alternations to the property's existing topography.

D. Conservation Plan Narrative-Impact Assessment.

(1) All applicants shall assess the onsite and offsite impacts of their proposed activities and improvements on existing natural features. The assessment shall include the following:

(a) Compliance with the minimum standards set by §104 of this Part.

(b) Tabulation of the acreage of natural resources which would be disturbed utilizing the list of natural features in §103(1) of this Part.

- (c) Tabulation of the dimensions or gross square foot coverage of all improvements proposed by the applicant, including any proposed impervious surfaces identified in §103(2) of this Part.
- (d) Consideration of all reasonable alternatives to minimize disturbances to natural features.

(2) A copy of a wetland delineation report, the Army Corps of Engineers' verification letter or other available documentation for wetlands delineated according to subsection (C)(3)(e), shall be included in the narrative.

(3) An erosion and sedimentation control plan approved by the _____ County Conservation District.

(4) The narrative shall include a tentative construction schedule that lists all earthmoving activities and target dates. A copy of the schedule from an erosion and sedimentation control plan approved by the _____ County Conservation District is acceptable. (Ord. 64B, 9/16/1993, Art. III; as amended by Ord. 97, 2/16/1999)

§104. MINIMUM CONSERVATION AND NATURAL RESOURCE PROTECTION STANDARDS.

1. Applicability. No person shall disturb any natural feature within _____ Township identified in §103(1) of this Part, except in compliance with §104 of this Part. In assessing compliance with the standards in §104, the Board of Supervisors and/or the Zoning Officer may take into account the extent to which the property owner is taking other remedial or compensatory actions which would fulfill the same basic intent as the conservation standards.

2. Site Planning.

A. Conservation of Surface and Groundwater Resources.

(1) Floodplains. Areas identified in the conservation plan as being in a floodplain area shall not be altered, regraded, filled or built upon except in conformance with Part 10 of the _____ Township Zoning Ordinance [Chapter 27].

(2) Stream, Watercourses, Wetlands, Lakes and Ponds. Such areas shall not be altered, regraded, developed, filled, piped, excavated, diverted or built upon except in accordance with regulations of the Pennsylvania Department of Environmental Protection and the U.S. Army Corps of Engineers. Final approval by the Township for any activity requiring a Federal or State permit shall be conditional upon obtaining such permit. All uses and activities identified in §103(2) of this Part that are proposed in wetland areas shall be regulated in the following manner: [Ord. 97]

(a) All such uses and activities shall be minimized to the extent that there will be no destruction, degradation or adverse impact on the wetland.

(b) Wells, septic systems, stormwater retention, detention and recharge basins, including ground absorption areas, shall not be located in a wetland area unless all required State and/or Federal permits are obtained and included in the conservation plan.

(3) Stormwater, Soil Erosion and Sedimentation. All site modifications shall conform with the requirements of the _____ Township Stormwater Management and Earth Disturbance Ordinance [Chapter 26, Part 2].

(4) Wetland Impact Areas. All uses and activities identified in §103(2) of this Part that are proposed in wetland impact areas shall be regulated in the following manner:

(a) In the wetland buffer area, as defined herein, absolutely no wetland impact area disturbance, as defined herein, shall occur or be allowed.

(b) Within the balance of the wetland impact area, being that land area extending from the 10 foot wetland buffer area set forth in subsection

(4)(a), above, to the line establishing the edge of the wetland impact area, the following types or courses of construction shall be made part of the conservation plan and be followed in the actual course of construction:

- 1) The depth of any excavation shall be minimized.

- 2) Roof runoff shall be directed to a dry well as designed by the applicant's engineer, unless the applicant's engineer demonstrates that it is not feasible or appropriate based on specific site conditions.
- 3) Driveways shall not be paved.
- 4) Driveways and required erosion control devices shall be completely installed prior to other earth disturbance on the premises.
- 5) No vegetation, other than for installation of a driveway, shall be removed outside of the building setbacks, unless otherwise authorized by the Township Zoning Officer.
- (c) Based upon the review and recommendation for approval by the Township Engineer or consultant, the conservation plan shall be amended to show the types or courses of construction being required. The conservation plan (amended as necessary) shall then be forwarded:
 - 1) Under §105(1)(A) of this Part, to the Township Planning Commission for their review and recommendation, then to the Board of Supervisors for final action.
 - 2) Under §105(1)(B) of this Part, to the Zoning Officer for final action.
- (d) As a further condition to the approval of a conservation plan, the property owner shall have recorded, at the _____ County Recorder of Deeds office, a deed setting forth the plan and metes and bounds description of the wetlands delineation. Permanent pins or monuments establishing the delineation line shall be placed on the property and their location shall also be shown on the recorded deed and plan.
- (5) High Water Table Areas. Any proposed land use which may, either directly by means of effluent discharge into the ground or indirectly through leaching of stored materials, result in the pollution of the groundwater shall be prohibited in such areas. The determination of the groundwater table shall be by the Township Sewage Enforcement Officer.

B. Conservation of Steeply Sloped Lands.

- (1) No site disturbance shall be permitted on slopes exceeding 25% with the following exceptions:
 - (a) Grading for a portion of a driveway accessing a single-family dwelling when it can be demonstrated that no other routing which avoids slopes exceeding 25% is feasible. In such a case, the driveway access must be designed by a professional engineer so as to meet the design requirements of _____ Township Driveway Regulations [Chapter 21] and have a slope length of no more than 75 feet.
 - (b) Logging shall be by specific approval of the Board of Supervisors. A conservation plan shall include an approved soil erosion and sediment pollution control plan; a listing of the amounts and species of timber to be harvested, which in no case can be conducted on more than 15% of the acreage located on these slopes; and a reclamation plan for restoring the site. Precaution shall be taken to avoid destruction or injury of brush and trees.
- (2) Site disturbance on slopes of between 12% and 25% shall be limited by the following restrictions:
 - (a) Grading or earth moving on all lands sloping between 12% and 25% shall not result in earth cuts or fills whose highest vertical dimensions exceed 10 feet, except where no alternative exists for construction of public roads, drainage structures and other public improvements in which case such vertical dimensions shall not exceed 20 feet. Finished slopes of all cuts and fills shall not exceed 3:1, unless the applicant can demonstrate that steeper slopes can be stabilized and maintained adequately.
 - (b) Logging is permitted by selective cutting only. Clear cutting is prohibited. The selective cutting shall not be conducted on more than 25% of the acreage located on these slopes.
 - (c) For all land uses and activities identified in §103(2) of this Part, natural vegetation shall be retained or suitable new vegetation planted so that not more than 15% of the land area shall be permanently developed or regraded or stripped of vegetation.

C. Conservation of Agriculturally Suited Soils. In subdivisions where permanent open space is to be retained, the applicant shall, whenever possible and in conjunction with other applicable ordinances, include in such open space

those agriculturally suited soils whose acreage, configuration and location offer future opportunity for agricultural use.

D. Conservation of Woodlands and Other Vegetation. Except in conjunction with routine property maintenance or safety precautions, the following shall be minimized:

(1) Disturbance or removal of vegetation occupying environmentally sensitive areas shall be undertaken only when necessary and on a limited, selective basis to minimize the adverse impacts of such actions and to maintain the natural integrity of these areas. These sensitive areas shall include, but not necessarily be limited to, wetlands, floodplains, stream and pond banks, steep slopes, erodible soils, seasonal high water table soils and rare, threatened or endangered plant communities and species.

(2) Removal of vegetation with all building setbacks.

E. Conservation of Open Space. The conservation plan shall be developed in a manner that will preserve the open space character of the land area and will respect the physical and environmental limitations of the land area utilizing the following guidelines:

(1) Wherever possible, lakes, ponds and water courses shall be left as permanent open space. Environmentally sensitive areas such as land areas with high water tables, steeply sloped areas and rock outcroppings shall likewise be left as permanent open space.

(2) All wetlands and areas containing rare, threatened or endangered plant communities and species shall be left as permanent open space.

(3) With the exception of approved logging operations, only 30% of forested areas left as open space may be cleared or developed, with 70% maintained in its natural stand.

(4) Wherever possible, land areas containing prime wildlife habitat shall be left as permanent open space. All critical habitat shall be left as permanent open space. All land uses and activities described in §103(2) of this Part shall provide in the conservation plan for the need for wildlife to move from one location to another by establishing wildlife corridors in reserved open space lands. Such wildlife corridors shall include, wherever possible, contiguous environmentally sensitive areas such as wetlands, watercourses and steep slopes.

3. Site Disturbance.

A. Protection of Vegetation From Excavations.

(1) When digging trenches for utility lines or similar uses, disturbances to the root zones of all woody vegetation should be avoided.

(2) If trenches must be excavated in the root zone, all disturbed roots shall be cut as cleanly as possible. The trench shall be back filled as quickly as possible.

B. Protection of Topsoil.

(1) Removal of Topsoil From Site.

(a) No topsoil shall be removed from a site unless a sufficient amount is retained to provide at least 4 inches of topsoil cover over all of the site's exposed earth surfaces. More than 4 may be required if the Township determines that a greater amount is needed for the longterm viability of certain plantings.

(b) If topsoil is removed from the site, the applicant shall provide the Township with proof that the Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation, has been contacted to determine the applicability of State regulation for surface mining. [Ord. 97]

(2) Topsoil removed by grading operations shall be redistributed and stabilized as quickly as possible following the completion of a project or project phase. All exposed earth surfaces shall be stabilized by the following methods or _____ County Conservation District approved equal:

(a) Seeding or planting with tacked mulch at 3 tons/acre on slopes of 10% or less.

(b) Sodding, hydro-seeding or rip-rap with tacked mulch at 3 tons/acre on slopes exceeding 10%.

C. Protection During Cleanup.

(1) All construction debris shall be hauled away from the property unless provisions acceptable to the Board are made for the onsite disposal of such debris.

(2) If debris is disposed onsite, the applicant shall provide the Township with proof that the Pennsylvania Department of Environmental Protection, Bureau of Solid Waste Management, has been contacted to determine the applicability of State regulation. [Ord. 97]

4. Modifications and Waivers.

A. At the discretion of the Board of Supervisors after review and recommendation from the Township Engineer, consultant and/or Planning Commission, a modification or waiver of the minimum standards contained in this Section may be granted where:

(1) Literal compliance with the mandatory provisions is shown by the applicant to be unreasonable, will cause undue hardship and an alternative standard can be shown to achieve equal or better results. The applicant shall provide evidence that no practicable alternative is available which can meet overall project purposes which would have less impact on the natural feature. In considering whether an alternative is practicable, consideration shall be given to cost, existing technology, logistics, project purposes and the restrictions imposed by other applicable Federal, State and local regulations. The applicant shall submit a mitigation plan and design, including such erosion and sedimentation control measures, construction procedures and other actions as are necessary and appropriate to reduce the risk of damage to, or destruction of, the natural feature.

B. All requests for modification or waiver shall be in writing and shall accompany and be a part of the application for conservation plan approval.

C. This request shall state in full the grounds and facts of unreasonableness or hardship and the provision or provisions of the ordinance involved and the minimum modification necessary.

D. The granting of a modification or variance is within the discretion of the Board of Supervisors and may not be contrary to the public interest or violate the intent and purpose of the Part. (Ord. 64B, 9/16/1993, Art. IV; as amended by Ord. 97, 2/16/1999)

§105. ADMINISTRATION.

1. Conservation Plan Submittal and Review Procedures.

A. Where the site disturbance activities for which a conservation plan is required pursuant to §103(2) of this Part involves the submittal of a subdivision/land development plan pursuant to _____ Township Subdivision and Land Development Ordinance [Chapter 22], or a site development plan pursuant to _____ Township Zoning Ordinance [Chapter 27], the conservation plan shall be submitted and reviewed pursuant to the procedures outlined in those ordinances. An application form is provided as Appendix B to this Part.

(1) The conservation plan shall be accompanied by the requisite fees as provided by §105(3) of this Part.

(2) Five copies of the conservation plan and application must be submitted to the Township Planning Commission Secretary.

(3) The Township Planning Commission Secretary shall forward the conservation plan and application to the following individuals or agencies for review and comment:

- (a) Two copies to the Township Planning Commission.
- (b) One copy to the Township Engineer or consultant.
- (c) One copy to the Township Zoning Officer.
- (d) One copy to the appropriate utility company if applicable.

B. Where the site disturbance activities for which a conservation plan is required pursuant to §103(2) of this Part does not require a review under the Township Subdivision/Land Development Ordinance [Chapter 22] or the Zoning Ordinance [Chapter 27], the developer shall submit a conservation plan application and conservation plan to the Township Zoning Officer accompanying the zoning permit application. The Township Zoning Officer shall review the application and plan according to the checklist found in Appendix A, and if all of the sub-

mission requirements of this Part are met, shall issue an official submission receipt to the applicant. An application form is provided as Appendix B to this Part.

- (1) The conservation plan shall be accompanied by the requisite fees as provided by §105(3) of this Part.
- (2) Three copies of the conservation plan and application must be submitted to the Zoning Officer.
- (3) The Zoning Officer shall forward the conservation plan and application to the following individuals or agencies for review and comment:
 - (a) One copy to the Township Engineer or consultant.
 - (b) One copy to the appropriate utility company if applicable.

C. The Board of Supervisors shall have a total of 90 days to review and approve or disapprove a conservation plan submitted under subsection (1)(A) of this Section, and the Zoning Officer shall have a total of 30 days to review and approve or disapprove a conservation plan submitted under subsection (1)(B) of this Section. The Board of Supervisors or the Zoning Officer may require additional information within 30 days under subsection (1)(A) and 15 days under subsection (1)(B). Failure of the conservation plan to comply with the standards set forth in §104 shall be grounds for disapproval of the plan.

D. All approved plans must be officially dated and signed by the Board of Supervisors or the Zoning Officer and the applicant prior to commencing any site disturbance. The applicant's signature shall constitute a written certification that work shall be performed in accordance with the plan.

2. Inspections.

A. No site disturbance work shall begin, or proceed to a subsequent phase, until inspected and approved by the Township representative who shall then file a report thereon with the Township.

B. The phase of construction and corresponding times of inspection shall be as follows:

- (1) Upon completion of rough grading, but prior to placing topsoil, installing permanent drainage or other site improvements, or establishing ground covers.
- (2) Upon completion of final grading, landscape improvements and other mitigation work undertaken in accordance with the approved conservation plan.
- (3) The Township representative may make random inspections as deemed necessary and appropriate. A report shall be filed with the Township after every inspection.

C. The applicant shall file a preconstruction inspection schedule with the Township Board of Supervisors and/or the Zoning Officer prior to beginning site disturbance work. This schedule shall be prepared in accordance with subsection (2)(B) of this Section and, if applicable, §§310 and 601(4) of the _____ Township Land Subdivision and Development Ordinance [Chapter 22].

D. The Township representative shall have discretion to modify or waive the otherwise applicable inspection schedule called for above. The reasons for such modifications or waivers shall be noted in a report to the Township.

E. The applicant shall notify the Township representative at least 72 hours prior to completion of each phase identified in subsection (2)(B) of this Section to schedule the required inspection. Upon receiving such notice, the Township representative shall inspect the work within 48 hours of completion and immediately notify the permittee, in writing, of its acceptability or in what respect there has been a failure to comply. Any portion of the work which does not comply shall be corrected promptly by the permittee. No work on subsequent phase shall proceed until such corrections are carried out to the satisfaction of the Township representative.

3. Fees.

A. The applicant shall agree, in writing, to reimburse the Township for all costs of administration and review of the application by the Township Engineer or consultant. The amount of the required fees shall be determined by completing the escrow fee calculation form found in Appendix C of this Part. The completed escrow fee calculation

form shall be submitted along with the application and conservation plan. The number of escrow fee calculation forms to be submitted shall correspond to the number of applications and conservation plans required by §105(1) of this Part.

B. Excluding fixed administration costs, the applicant shall be charged only for time and materials actually expended and detailed in bills from the Township Engineer or consultant. Any unexpended balance of the deposit for plan review shall be returned to the applicant following approval of the conservation plan.

C. If actual time required of the Township Engineer or consultant will exceed the deposited amount, the Township shall render to the applicant a preliminary statement of time and materials expended and an additional amount must be deposited with the Township prior to plan approval.

D. Fees covering the cost of inspections shall be paid by the applicant to the Township prior to plan approval. The amounts of these inspection fees shall be fixed by resolution of the Board of Supervisors. If problems arise requiring more extensive involvement of the Township Engineer or consultant during the inspection process, any resulting costs that exceed the initial fees will be assessed to the applicant.

4. Enforcement.

A. Notice of Violation.

(1) If, at any time during inspection the Township Engineer, consultant and/or Zoning Officer determines that the site work does not conform to the approved plan, a written notice to comply shall be given to the applicant. Such notice shall set forth the nature of corrections required and the time within which corrections shall be made.

(2) The failure to comply with the notice, within the time specified, constitutes a violation of this Part and the Township shall institute enforcement actions pursuant to subsections (4)(B) and (4)(C) of this Section.

(3) The issuance of a notice of violation shall operate as a cease and desist order on all work at the site until corrections are made as required by the notice.

B. Summary Enforcement. Any person, firm or corporation who shall violate any provision of this Chapter, upon conviction thereof in an action brought before a district justice in the manner provided for the enforcement of summary offenses under the Pennsylvania Rules of Criminal procedure, shall be sentenced to pay a fine of not more than \$1,000 plus costs and, in default of payment of said fine and costs, to a term of imprisonment not to exceed 90 days. Each day that a violation of this Part continues or each Section of this Part which shall be found to have been violated shall constitute a separate offense.

C. Causes of Action. In case any natural feature defined in §103(B) of this Part is disturbed or impacted, or is proposed to be disturbed or impacted in violation of this Part, the Township may institute any appropriate action or proceeding to restrain, correct, abate or prevent said violation. Any judgment entered on behalf of the Township shall include costs and reasonable attorney's fees.

D. Restitution. If the applicant refuses or fails to complete site work as part of an approved conservation plan, then the work may be completed by the Township and the costs charged to the applicant. [Ord. 97]

5. Appeals. All appeals from decisions hereunder shall be taken in the manner set forth in the statutory authorities in §101(3) this Part.

6. Conservation Plan Amendments.

A. Major modifications of any approved conservation plan as determined by the Township, shall be submitted to the Township and reprocessed in the same manner as the original plan. All development and land disturbances activities shall be suspended pending the approval of modified plans.

B. Field modifications of a minor nature may be approved by the Township Engineer or consultant in the form of written authorization. (Ord. 64B, 9/16/1993, Art. V; as amended by Ord. 97, 2/16/1999)

APPENDIX A — APPLICATION AND PLAN CHECKLIST

Plan

- _____ Property base map conforming to §402 of Subdivision Ordinance [Chapter 22].
- _____ Names of adjacent property owners.
- _____ Residential and institutional structures within 100 feet of site.
- _____ Geologic members.
- _____ Rock outcrops or note that none exist.
- _____ Two or 5 foot contour topography.
- _____ Slopes 12% to 25% or note that none exist.
- _____ Ponds, streams, floodplains, swales or note that none exists.
- _____ Soil series and phase; table indicating soil type, depth to water table, depth to bedrock, agricultural capability class/subclass, hydrologic group.
- _____ Wetlands boundaries or note that none exists.
- _____ Vegetative cover types; table/key indicating dominant/typical species.
- _____ Prime and critical wildlife habitat or note that none exist.
- _____ Species of special concern or note that none exist.
- _____ Location of proposed improvements.
- _____ Grading.

Narrative

- _____ Application form.
- _____ Tabulation of acreage of natural resources affected.
- _____ Tabulation of all proposed improvements.
- _____ Description of compliance with §401 and §402.
- _____ Consideration of all reasonable alternatives to minimize disturbances to natural features.
- _____ Documentation of wetland delineation (if available).

APPENDIX B — APPLICATION FORM

1. Name, Address, Daytime Phone Number of Applicant:

2. Project Location (distance and direction from nearest intersection and name of subdivision, if applicable): _____

3. Type of Activity:

Nonresidential Building _____

Multi-family Building _____

Subdivision/Land Development _____

Public Utility Facility _____ Area: _____ sq. ft.

Liquid/Solid Waste Facility _____ Area: _____ sq. ft.

Stormwater Management Facility _____ Area: _____ sq. ft.

Township Street _____

Private Street _____ Area: _____ sq. ft.

Parking, Loading, Storage Area _____ Area: _____ sq. ft.

Site Disturbance greater than 1 acre. _____ Acre(s)

Any activity in environmentally sensitive area _____

4. Natural Features on Site:

Wetlands _____ Groundwater Resources _____

Steep Slopes _____ Floodplain _____

Shallow Soil Areas _____ Critical Wildlife Habitat _____

Agricultural Soils _____ Prime Wildlife Habitat _____

Seasonal High Water Table Soils _____ Woodlands _____

Surface Water Resources _____

Rare, threatened, endangered or unique plant communities _____

APPENDIX C - ESCROW FEE CALCULATION FORM

Applicants for the review of any plans planning modules or other items required in the _____ Township ordinances or other regulations shall complete the following information and submit this form with the required escrow amount to the Township.

The undersigned hereby applies for review of the plans described below:

1. Date submitted to the Township _____

2. Name of Development _____

Location _____

Deed Book # _____ Page # _____

Zoning District _____

Tax Assessment # _____

Total Acreage _____

Number of Units (if applicable) _____

3. Name of Property Owner (s) _____

Address _____

_____ Telephone Number _____

4. Name of Applicant (if other than owner)

Name _____

Address _____

_____ Telephone Number _____

Applicants Interest _____

5. Engineer, Surveyor or other person or firm responsible for the preparation of the Plan

Name _____

Address _____

_____ Telephone Number _____

Please check one:

_____ Engineer _____ Surveyor

_____ Other (specify) _____

6. Please check all items which are applicable:

- _____ Sketch Plan
- _____ Preliminary Plan
- _____ Final Plan
- _____ Planning Module
- _____ Conservation Plan
- _____ Drainage Plan
- _____ Site Development Plan
- _____ Tentative Approval Plan (PRD)

7. Please check the type of development (all which apply):

- _____ Land Development
- _____ Major Subdivision
- _____ Minor Subdivision
- _____ Conditional Use
- _____ Commercial
- _____ Industrial
- _____ Planned Residential Development
- _____ Single-Family
- _____ Multifamily
- _____ Other _____

ESCROW ACCOUNT DESCRIPTION

Review Fees.

All engineering, legal and other appropriate consulting fees shall be paid by the applicant. To accomplish this end, for each project, the Township shall establish an escrow account. The escrow fee required for the project shall be paid to the Township Secretary at the time that the required application, plan(s) or planning module is submitted for review. The escrow account will be used to pay for expenses as they are incurred for engineering reviews, legal services and other professional consulting services which will be billed at prevailing hourly rates, plus a twenty percent administration charge.

The Township Engineer shall review the escrow fee calculation form and determine if the fee submitted is adequate. If the escrow amount is inadequate, then the applicant will be informed in writing of the additional amount required and how it was determined. The Township will consider the application incomplete and no action will be taken until the escrow amount is paid in full.

If, during the review and approval process, all of the escrow account has been billed for the services described above because of multiple reviews, complexities in the site or other reasonable expenses, and the review is not complete, an additional escrow fee (or fees) will be requested from the applicant in order to continue processing the application.

The Township will stop the review process until the additional fee (or fees) are paid in full. After the review of the plan(s) or planning module has been completed by the Township and it has been determined that there are no outstanding charges, the amount remaining in the escrow account will be returned to the applicant.

Field Inspections.

An escrow account will also be set up by the Township for all required site inspection after the final plan(s) have been approved by the Board of Supervisors. The amount required by the applicant for the inspection escrow account will be determined by the Township Engineer based on the inspection schedule, the schedule of construction and the size and complexity of the site.

Any other review or inspections required by any ordinances or regulations of _____Township which are not specifically outlined in this form shall have a minimum escrow fee of \$500. If the Township Engineer or other professional consultant determines that this minimum fee is not adequate to properly review or inspect the project, then the additional amount required will be determined and requested from the applicant and no reviews or inspections will be initiated until the additional amount is received by the Township. If during the review or inspection process the escrow account has been depleted, then additional fee(s) will be requested from the applicant, in writing, and the review or inspection process will be stopped until the fee is received.

Required Escrow Fees (for review of submissions only)

I. Major Subdivisions and/or Multi-Unit Residential Land Developments.

Total No of units or lots _____ Total acreage _____

A. Subdivision and Land Development Ordinance.

No. Units Fee/Unit Total or lots or lot Fee

First 10 units or lots _____ \$ 250.00 _____

Next 11 to 50 units/lots _____ \$ 30.00 _____

Next 51 to 100 units/lots _____ \$ 10.00 _____

Each additional unit/lot over 100 _____ \$ 5.00 _____

Escrow Subtotal (A) _____

B. Natural Features Conservation Ordinance.

No. Acres Fee/Acre Total Fee

First 10 acres _____ \$300.00

Each additional acre over 10 _____ \$ 2.00 _____

Escrow Subtotal (B) _____

C. Stormwater Management and Earth Disturbance Ordinance.

No. Acres Fee/Acre Total Fee

First 20 acres _____ \$ 500.00 Each

Each additional acre over 20 _____ \$ 10.00 _____

Escrow Subtotal (C) _____

Subtotal for Major Subdivisions and/or Multi-Unit Residential Land Developments

Subdivision and Land Development Ordinance (A) _____

Natural Features Conservation Ordinance (B) _____

Stormwater Management and Earth Disturbance Ordinance (C) _____

Subtotal Escrow Fee Required (A + B + C) _____

II. Commercial and/or Industrial Land Developments.

Total Acreage _____

A. Subdivision and Land Development Ordinance.

No. Acre Fee/Acre Total Fee

First 10 acres _____ \$ 250.00 _____

Next 11 to 50 acres _____ \$ 30.00 _____

Next 51 to 100 acres _____ \$ 10.00 _____

Each additional acre over 100 _____ \$ 5.00 _____

Escrow Subtotal (A) _____

B. Natural Features Conservation Ordinance.

No. Acres Fee/Acre Total Fee

First 10 acres _____ \$500.00

Each additional acre over 10 _____ \$ 5.00 _____

Escrow Subtotal (B) _____

C. Stormwater Management and Earth Disturbance Ordinance.

No. Acres Fee/Acre Total Fee

First 10 acres _____ \$ 500.00

Each additional acre over 10 _____ \$ 10.00 _____

Escrow Subtotal (C) _____

Subtotal for Commercial and/or Industrial Land Developments

NOTE: Minor Subdivisions under §404(K) combining lots (with certain provisions being met) requires a \$100 flat fee including administrative charges, which is not held in escrow.

Subdivision and Land Development Ordinance (A) _____

Natural Features Conservation Ordinance (B) _____

Stormwater Management and Earth Disturbance Ordinance (C) _____

Subtotal Escrow Fee Required (A + B + C) _____

III. Minor Subdivision and all Others Requiring Natural Features or Stormwater Management and Earth Disturbance Review.

Total No of units or lots _____ Total acreage _____

A. Subdivision and Land Development Ordinance.

Minor Subdivision1 \$200.00

Escrow Subtotal (A) _____

B. Natural Features Conservation Ordinance.

No. Acres Fee/Acre Total Fee

First 10 acres _____ \$250.00

Each additional Acre Over 10 _____ \$ 2.00 _____

Escrow Subtotal (B) _____

C. Stormwater Management and Earth Disturbance Ordinance.

No. Acres Fee/Acre Total Fee

First 20 acres _____ \$300.00

Each additional acre over 20 _____ \$ 5.00 _____

Escrow Subtotal (C) _____

Subtotal for Minor Subdivision and all others

Subdivision and Land Development Ordinance (A) _____

Natural Features Conservation Ordinance (B) _____

Storm Water Management and Earth Disturbance Ordinance (C) _____

Subtotal Escrow Fee Required (A + B + C) _____

IV. Planning Modules.

No. of EDU's * _____

* EDU is an equivalent dwelling unit. For the purposes of calculating the fee only, one EDU will equal 262.5 gallons per day.

No. EDU's Fee/EDU Total Fee

First 50 EDU's _____ \$ 500.00

Each additional EDU over 50 _____ \$ 10.00

Escrow Subtotal _____

V. All Other Reviews and Inspections Not Included Above.

Minimum Escrow Amount \$ 500.00

SUMMARY FORM

Total Escrow Submitted

I. Major Subdivision and/or Multi-Unit Residential Land Developments _____

II. Commercial and/or Industrial Land Developments _____

III. Minor Subdivision Subdivisions and All others which require Natural Features or Stormwater Review ____

IV. Planning Modules _____

V. Other Reviews and Inspections _____

Subtotal _____

Plus 20% Administration _____

Total Amount Submitted _____

To be signed by all applicants.

The information on this form is correct to the best of my knowledge and I have read and understand the requirements of the escrow account.

Signature of Applicant

Date

To be completed by Township:

Date Received: _____ Check No. _____

Amount Received: _____ Twp. Eng. Review: _____

Received by: _____ Title: _____

FOREST RESOURCE ORDINANCE

(To be inserted into existing Subdivision or Landuse Ordinance or as a Stand-alone Ordinance)

1. Statutory Authority

_____Township is empowered to regulate these activities by the authority of the Act of (insert appropriate regulation/act).

2. Applicability

The provisions of this Chapter shall apply to all unincorporated lands within the territorial limits of the Township.

3. Definitions

(Note: May be added to definitions in zoning ordinance if forest resource model ordinance is incorporated into the zoning ordinance)

Unless specifically defined below, or in Pennsylvania's Erosion and Sediment Control Standards (P.A.C. 25:102), or Pennsylvania's Water Quality Standards (P.A.C. 25:93), words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage.

FLOODPLAIN - the lands adjoining a river or stream that have been or may be expected to be inundated by floodwaters in a 100-year frequency flood.

AFFORESTATION - the planting of trees where no or little forest exists on the site, in order to meet certain thresholds.

INTERMITTENT STREAMS - a stream with a drainage area of 50 acres or less and does not flow continuously through out the year in most years.

PERENNIAL STREAMS - a stream that flows continuously throughout the year in most years.

REFORESTATION - the planting of tree to replace forest which has been recently removed.

STORMWATER RUNOFF - flow on the surface of the ground, resulting from precipitation.

WETLANDS - an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation; provided, however, that in designating a wetland, the three parameter approach (that is, hydrology, soils and vegetation) enumerated in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands," and any subsequent amendments thereto shall be used.

4. Purpose

This Chapter is adopted with the intent that new development in the Township take place in such a way that the conservation, protection and planting of trees to produce forested areas will help accomplish the following:

- a. Stabilization of soil by the prevention of erosion and sedimentation;
- b. Reduction of stormwater runoff and the potential damage it may create;
- c. Removal of pollutants from the air and assistance in the generation of oxygen;
- d. Recreation of buffers and screens against noise pollution;
- e. Control of drainage and restoration of denuded soil subsequent to construction or grading;
- f. Creation of protected environments for birds and other wildlife;
- g. Creation of shade and shelter for people;
- h. Protection and enhancement of property values;
- i. Conservation and enhancement of the Township's physical and aesthetic appearance; and
- j. Protection of the public health and safety, as well as the general welfare.

5. General Plan Requirements

- a. All required plans shall be prepared by a licensed forester, licensed landscape architect, or other qualified professional.
- b. When an Applicant is proposing a minor subdivision (10 lots or less) or a site plan, a Combined Preliminary/Final Forest Conservation Plan may be submitted. Also, the Forest Stand Delineation Plan may be submitted simultaneously with the Forest Conservation Plan for all minor subdivision proposals and for any site plan proposals.
- c. A Combined Preliminary/Final Forest Conservation Plan shall contain all requirements of both the Preliminary and Final Forest Conservation Plan requirements.

6. Forest Stand Delineation Plan Requirements

- a. A Forest Stand Delineation Plan shall be submitted simultaneously with a sketch plan, or preliminary subdivision plan, whichever is submitted first, but before a erosion and sediment control plan is submitted for the lot or parcel being developed, whichever is applicable.
- b. The delineation plan shall be used during the preliminary review process to determine the most suitable and practical areas for forest conservation and shall contain the following components:
 - i. A topographic map delineating intermittent and perennial streams, and steep slopes over 25 percent;
 - ii. A soils map delineating soils with structural limitations, hydric soils, or soils with a soil K value (erodibility factor) greater than 0.35 on slopes on 15 percent or more;
 - iii. Forest stand maps indicating species, location, and size of trees, dominant and codominant forest types, and Natural Community Types listed by the Pennsylvania Natural Diversity Inventory (PNDI) Biota of Concern In Pennsylvania (Bocip) Lists;
 - iv. 100-year floodplain as described in the Flood Insurance Rate Maps published by the Federal Emergency Management Agency and verified by field inspection; and
 - v. Other information the Township determines is necessary to implement this Ordinance.
- c. If approved by the Township, a Simplified Forest Stand Delineation Plan may be submitted for an area:
 - i. When no forest cover is disturbed during a construction activity; and
 - ii. Designated to be under a long term protective agreement.
- d. The Township shall consider a Simplified Forest Stand Delineation Plan complete if it includes:
 - i. All requirements under Section 6B (1 and 5) of this article;
 - ii. A map showing existing forest cover as verified by field inspection; and
 - iii. Other information required by the Township.
- e. An approved Forest Stand Delineation Plan may remain in effect for a period not longer than 5 years.
- f. Time for Submittal.
 - i. Within 30 calendar days after receipt of the Forest Stand Delineation Plan, the Township shall notify the Applicant at its regularly scheduled public meeting as to whether the Forest Stand Delineation Plan is complete and correct. If the applicant is not notified, the plan shall be treated as complete and correct.
 - ii. The Township may require further information or extend its time for review and notification for an additional 15 calendar days under extenuating circumstances.

7. Forest Conservation Plan Requirements

- a. In developing a forest conservation plan, the applicant shall give priority to techniques for retaining existing forest on the site.
- b. If existing forest on the site subject to a forest conservation plan cannot be retained, the applicant shall demonstrate to the satisfaction of the Township:

- i. How techniques for forest retention have been exhausted;
- ii. That every effort has been made to reduce destruction of high quality habitats and natural areas, specifically,
 - (1) Those areas that correspond to Natural Community Types listed by the Pennsylvania Natural Diversity Inventory (PNDI) Biota of Concern In Pennsylvania (Bocip) Lists.
 - (2) Those areas within which Pennsylvania Endangered or Threatened Plants occur as listed within P.A.C 17:45:12 and 13.
- c. If an Applicant proposes to make a payment into the ??? Township Forest Conservation Fund instead of afforestation or reforestation, then the Applicant shall demonstrate to the satisfaction of the Township that the requirements for afforestation or reforestation cannot be reasonably accomplished on site or offsite.
- d. Wetlands. In situations where a regulated activity is proposed that occurs wholly or partly in regulated wetland and/or where reforestation or afforestation is planned:
 - i. Include an anticipated construction timetable showing the sequence for forest conservation procedures;
 - ii. Include when applicable an afforestation or reforestation plan prepared by a qualified professional, with a timetable and description of needed site and soil preparation, species, size, and spacing to be used;
 - iii. Show the planned limits of disturbance;
 - iv. Show planned stockpile areas;
 - v. Incorporate a commitment to complete all required afforestation and reforestation within 2 (two) full growing seasons or 1 (one) year after development project completion;
 - vi. Include other information the Township determines is necessary to implement this Ordinance;
 - vii. Include an explanation as to how the provisions of this ordinance have been met.

8. Preliminary Forest Conservation Plan Requirements

- a. In cases where a major subdivision or land development is proposed, the applicant shall submit a Preliminary Forest Conservation Plan, for approval by ??? Township.
- b. The preliminary plan shall include all items set forth in Section 7.
- c. In the case of a minor subdivision or land development, a combined Preliminary and Final Forest Conservation Plan may be submitted as described in Section 9A and 5C.

9. Final Forest Conservation Plan Requirements

- a. A Final Forest Conservation Plan shall:
 - i. Be submitted with the following:
 - (1) A final subdivision plat;
 - (2) As a Combined Preliminary/Final Forest Conservation Plan with a minor subdivision plat or a site plan.
 - (3) Include a map of the site drawn at the same scale as the grading or final subdivision plan; and
 - (4) Include all the information required under Section 7, except as expressed in Subsection C of this Section.
- b. Time for submittal:
 - i. Within 45 calendar days after receipt of the Final Forest Conservation Plan, the Township shall notify the Applicant whether the Final Forest Conservation Plan is complete and approved. If the Applicant is not notified, the plan shall be treated as complete and correct.
 - ii. The Township may require further information and extend its time for review and notification for an additional 15 calendar days under extenuating circumstances.

c. The Township's review of a Final Forest Conservation Plan shall be concurrent with the review of the final subdivision plan. In the case of a major subdivision plan, (where an Applicant has an approved Preliminary Forest Conservation Plan, and no changes are made), the necessary forest easements and notes may be drawn directly on the Final Subdivision Plat and/or improvements plans in lieu of submitting a separate Final Forest Conservation Plan. These notes should include the following:

- i. Locations and types of protective devices to be used during construction activities to protect trees and areas of forest designated for conservation;
- ii. A binding 2-year maintenance agreement that details how the areas designated for afforestation or reforestation will be maintained to ensure protection or satisfactory establishment, including:
 - (1) Watering, and
 - (2) A reinforcement planting provision if survival rates fall below acceptable standards.
- iii. A binding protective agreement that:
 - (1) Provides protection for areas of forest conservation, including areas of afforestation, reforestation, and retention;
 - (2) Limits uses in areas of forest conservation to those uses that are consistent with forest conservation, including recreational activities and forest management practices that are used to preserve forest; and
 - (3) Incorporates conservation easements, deed restrictions, covenants, and other agreements as necessary;

d. If a Forest Conservation Plan is required by this Ordinance, a person may not cut, clear, or grade on the development site until the Township has approved the final plan or the person will be in violation of this chapter.

e. The final plan cannot be altered without expressed written approval from the Township.

f. The Township may revoke approval for a forest conservation plan if it finds that:

- i. A provision of the plan has been violated;
- ii. Approval of the plan was obtained through fraud, misrepresentation, a false or misleading statement, or omission of a relevant or material fact; or
- iii. Changes in the development or in the condition of the site necessitate preparation of a new or amended plan.

g. Prior to revoking approval of a forest conservation plan, the Township shall notify the developer in writing and provide an opportunity for a hearing before the Planning Commission.

10. Retention and Conservation Priorities Design Criteria

a. The following trees, shrubs, plants, and specific areas shall be considered high priority for retention and protection and shall be left in an undisturbed condition and the Applicant must demonstrate, to the satisfaction of the Township, that reasonable efforts have been made to protect them:

- i. Trees, shrubs, and plants located in sensitive areas including the 100-year floodplain, streams and their buffers, steep slopes (25 percent), and critical habitats, and wetlands;
- ii. Contiguous forest that connects large undeveloped or heavily vegetated tracts of land within and adjacent to the site;
- iii. Trees, shrubs, or plants identified on the list of rare, threatened, and endangered species of the United States Fish and Wildlife Service;
- iv. Trees, shrubs, or plants identified that are listed as PA Endangered or Threatened under P.A.C 17:45:12 and 13;
- v. Trees, shrubs, or plants occurring within areas that correspond to Natural Community Types listed by the Pennsylvania Natural Diversity Inventory (PNDI) Biota of Concern In Pennsylvania (Bocip) Lists;

- vi. Trees that:
 - (1) Are part of a historic site;
 - (2) Are associated with a historic structure; or
 - (3) Have been designated by the State or the Township as a national, state, county, or municipal champion tree; and
- vii. Trees having a diameter measured at 4.5 feet above the ground of:
 - (1) 30 inches or more; or
 - (2) 75 percent of the diameter, measured at 4.5 feet above the ground of the current State, County, or municipal champion tree of that species as designated by the State of Pennsylvania Department of Natural Resources, or _____ County, or the Municipality.
- b. The preferred priorities for forest conservation, after techniques for retaining existing forest on the site have been exhausted, are as follows:
 - i. Selective clearing and supplemental planting on site;
 - ii. Onsite afforestation, or reforestation, if economically feasible, using transplanted or nursery stock that is greater than 1.5 inches diameter measured at 4.5 feet above the ground;
 - iii. Onsite afforestation, or reforestation, using whip and seeding stock;
 - iv. Landscaping of areas under an approved landscaping plan which establishes a forest that is at least 35 feet wide and covering 2,500 square feet of area; and/or landscape credits expressed in Section 15;
 - v. Offsite afforestation, or reforestation, using transplanted or nursery stock that is greater than 1.5 inches diameter measured at 4.5 feet above the ground;
 - vi. Offsite afforestation, or reforestation, using whip and seedling stock;
 - vii. Natural regeneration onsite; and
 - viii. Natural regeneration offsite.
- c. A sequence other than the one described in Section B of this Section may be used for a specific project, if necessary, to achieve the objectives of the Township land use plan or Township land use policies, or to take advantage of opportunities to consolidate forest conservation efforts.
- d. The following shall be considered a priority for afforestation and reforestation to:
 - i. Establish or enhance forest buffers adjacent to intermittent and perennial streams to widths of at least 50 feet, and when afforestation occurs offsite, especially on Agriculturally zoned or used land;
 - ii. Establish or enhance forested areas in 100-year floodplains, when appropriate;
 - iii. Establish or increase existing forested corridors to connect existing forests within or adjacent to the site and where practical, forested corridors should be minimum of 300 feet in width to facilitate wildlife movement;
 - iv. Establish or enhance forest buffers adjacent to critical habitats where appropriate;
 - v. Establish plantings to stabilize slopes of 25 percent or greater and slopes of 15 percent or greater with a soil K value greater than 0.35 including the slopes of ravines or other natural depressions;
 - vi. Establish buffers adjacent to areas of differing land use where appropriate, or adjacent to highways or utility rights-of-way;
 - vii. Establish forest areas adjacent to existing forests to increase the overall area of contiguous forest cover, when appropriate; and
 - viii. Use native plant materials for afforestation or reforestation, when appropriate.
- e. Work must be completed within one (1) year or 2 growing seasons, whichever is greater, following completion of final site grading.

11. Afforestation and Afforestation Threshold Design Criteria

“Afforestation” under this section means the planting of trees where no or little forest exists on the site, in order to meet certain thresholds. A person making application after the effective date of this Ordinance for subdivision approval, site plan, or a grading permit, for an area of land of 40,000 square feet or more:

- a. Shall conduct afforestation on the lot or parcel in accordance with the following:
 - i. A tract having less than 20 percent of the net tract area in forest cover shall be afforested to at least 20 percent of the net tract area for the following zoning categories:
 - (1) RU - Rural District Zones; and
 - (2) R-1 - Low Density Residential District Zones;
 - ii. A tract with less than 15 percent of its net tract area in forest cover shall be afforested up to at least 15 percent of the net tract area for the following zoning categories:
 - (1) Institutional uses in any zone;
 - (2) ND - Neighborhood Development District Zones; and
 - (3) RV - Recreational Vehicle Park District Zones.
- b. Shall comply with the following when cutting into forest cover that is currently below these afforestation percentages:
 - i. The required afforestation level shall be determined by the amount of forest existing before cutting or clearing begins; and
 - ii. Forest cut or cleared below the required afforestation level shall be reforested or afforested at a 2 to 1 ratio and added to the amount of afforestation necessary to reach the minimum required afforestation level, as determined by the amount of forest existing before cutting or clearing began.

12. Reforestation and Conservation Threshold Design Criteria

“Reforestation” under this section means the planting of tree to replace forest which has been recently removed.

- a. In addition to the Afforestation Threshold, there is a Forest Conservation Threshold established for each zoning category, as provided in subsection B of this Section. The Forest Conservation Threshold means the percentage of the net tract area at which the reforestation requirement changes from a ratio of _ acre planted for every acre removed to a ratio of 2 acres planted for every acre removed.
- b. After every reasonable effort to minimize the cutting or clearing of trees and other woody plants has been exhausted in the development of a subdivision or project plan, grading and erosion and sediment control activities, and implementation of the forest conservation plan, the forest conservation plan shall provide for reforestation, or payment into the Forest Conservation Fund, according to the formula provided in Section C of this Section and consistent with the following Forest Conservation Threshold for the applicable zoning category:

CATEGORY OF USE	THRESHOLD PERCENTAGE
(1) Agricultural and Conservation Zone	50 percent
(2) R-1 Residential Zoned areas	25 percent
(3) ND - Neighborhood Development District Zones	20 percent
(4) RV - Recreational Vehicle Park District Zones	20 percent

c. Calculations.

- i. If the percentage of forest cover remaining on the net tract area after cutting or clearing are completed equals or exceeds the threshold established by subsection B of this Section, the site shall be reforested at a ratio of _ acre planted for ever acre removed.
- ii. Each acre of forest retained on the net tract area above the threshold shall be credited against the total number of acres required to be reforested under Subsection (1) of this Section. The Calculation of the credit shall be according to the criteria provided in the ??? Township Forest Conservation Technical Manual.
- iii. For all existing forest cover measured to the nearest 1/10th acre cleared on the net tract area below the applicable Forest Conservation Threshold, the area of forest removed shall be reforested at a ratio of 2 acres planted for each acre removed below the threshold.

13. Recommended Tree Species

Tree species used for afforestation or reforestation shall be native to ??? County, Pennsylvania, as listed on the PPL Approved Native Species Planting List, or identified in "The Vascular Flora of Pennsylvania: Annotated Checklist and Atlas" by Rhoads, A. F., and W. M. Klein, Jr. 1993.

14. Standards for Protecting Trees from Construction Activities

- a. The Developer shall comply with the tree protection guidelines established with the *Pennsylvania Handbook of Best Management Practices for Developing Areas*, 1998.
- b. Before cutting, clearing, grading, or construction begins on a site for which a forest conservation plan is required by the Ordinance, the developer shall demonstrate to the Township that appropriate protective devices have been established.
- c. Clearing and grading of forests and native vegetation at a site shall be limited to a minimum amount needed to build lots, allow access, and provide fire protection.
- d. The limits of disturbance shall be clearly delineated on site by flagging or fencing.
- e. Construction access shall coincide with existing roadways whenever possible.
- f. The limit of disturbance around building pads shall be 10 ft. except when larger areas are required because of fire concerns.

15. Landscape Credits

Landscaping or street trees not in forest settings will be credited towards afforestation or reforestation requirements at a rate of _ of an acre credit for each are of canopy cover of the landscaping or street trees at their expected 20 year growth.

16. Payment in Lieu of Reforestation

There is hereby created a _____Township Forest Conservation Fund.

- a. An Applicant required by Section 11 or 12 of this Ordinance to conduct reforestation may make a payment to the _____Township Forest Conservation Fund of \$0.30 per square foot of the area of required planting upon determination by the Township, based on the Applicant's demonstration that reforestation or afforestation cannot reasonably be accomplished by the Applicant onsite or offsite.
- b. Money contributed in lieu of reforestation under this Subsection shall be paid prior to the release of other surety held by the Township for grading.
- c. The Township shall accomplish the reforestation for which the money is deposited within 2 (two) growing seasons after receipt of the money, afterwhich any or all monies not spent shall be returned to the Applicant, upon written request.

d. Money contributed under this Section:

- i. May be used only for reforestation and afforestation, including site identification, acquisition, preparation, and maintenance;
- ii. Shall be deposited in a separate forest conservation fund; and
- iii. Shall not revert to the general fund.

e. Sites for afforestation or reforestation using fund money will be sought in the Township and watershed in which the original project is located, but if this cannot be reasonably achieved, the monies may be used to accomplish afforestation or reforestation anywhere in the Township or the state.

17. Guarantee for Reforestation

a. Persons required to conduct reforestation or afforestation under this Ordinance shall furnish to the Township surety in the form of a guarantee, an irrevocable letter of credit, or other security approved by the Township Attorney's Office. The surety shall:

- i. Assure that the reforestation and associated management plan are conducted and maintained in accordance with the approved forest conservation plan;
- ii. Be in the amount equal to the estimated cost, as determined by the developer; and, approved by the Township;
- iii. Be in a form and of a content approved by the Township Attorney.

b. If after 1 (one) complete growing season the planting associated with the reforestation meets or exceeds acceptable standards as determined by field inspected by a professional forester, 50 percent of the amount of any cash bond that has been posted shall be returned. If the surety has been given in the form of a letter of credit, or another form of surety, the Township shall notify the appropriate entity that liability has been reduced by 50 percent.

c. If after 2 (two) complete growing seasons the planting associated with the reforestation meets or exceeds acceptable standards as determined by field inspected by a professional forester, the remaining amount of the cash bond, letter of credit, or other surety, shall be returned or released.

SINKHOLE/CARBONATE REGULATIONS (Amendment to SALDO)

_____TOWNSHIP
_____COUNTY, PENNSYLVANIA
ORDINANCE _____

AN ORDINANCE OF _____ TOWNSHIP, _____COUNTY, PENNSYLVANIA AMENDING THE _____TOWNSHIP SUBDIVISION AND LAND DEVELOPMENT ORDINANCE TO CREATE A NEW ARTICLE _____ ENTITLED SINKHOLE/CARBONATE REGULATIONS TO PROVIDE FOR REGULATIONS PERTAINING TO SUBDIVISION AND LAND DEVELOPMENT IN AREAS PRONE TO SINKHOLES AND FURTHER AMENDING THE _____ TOWNSHIP SUBDIVISION AND LAND DEVELOPMENT ORDINANCE PRELIMINARY PLAN FOR MAJOR SUBDIVISIONS OR LAND DEVELOPMENT CHECKLIST AND LIST OF SUBMITTAL REQUIREMENTS GOVERNING ALL DOCUMENTATION PERTAINING TO RELEVANT INFORMATION CONCERNING SINKHOLES WHICH MUST BE SUBMITTED WITH LAND DEVELOPMENT OR SUBDIVISION APPLICATIONS.

WHEREAS, the _____ Township Board of Supervisors believes it is necessary to promote safe development; and

WHEREAS, a substantial amount of the land in _____ Township has been found to be susceptible to the development of sinkholes (all lands mapped geologically as limestone and/or dolomite - formations present in _____Township consist of Epler, Rickenbach, Allentown and Leithsville Formations); and

WHEREAS, the Board of Supervisors is of the belief that the susceptibility of a property to the development of sinkholes is an important issue for property owners and/or developers to address and provide relevant information pertaining to identification and remediation or problems associated with the same when filing applications for subdivision and land development approvals to the Township; and

WHEREAS, the Board of Supervisors believes it is in the best interest of the health, safety and welfare of the residents to take a proactive approach to minimize the risk of sinkhole occurrences in the areas of new development and to the lands adjacent to these developments; and

WHEREAS, said proposed ordinance has been forwarded to the Lehigh Valley Planning Commission for review and comment; and

WHEREAS, said proposed amendment has been forwarded to the _____ Township Planning Commission for review and comment; and

WHEREAS, the _____ Township Board of Supervisors has held a public hearing on _____ after giving appropriate public notice regarding the review and enactment of the proposed amendments to the _____ Township Subdivision and Land Development Ordinance;

THEREFORE, BE IT ENACTED AND ORDAINED, by the Township of _____, _____County, Pennsylvania, by the authority vested in the _____ Township Board of Supervisors via the act of the General Assembly of the Commonwealth of Pennsylvania known and cited as the Pennsylvania Municipalities Planning Code as amended as follows:

I. The _____ Township Subdivision and Land Development Ordinance shall be amended to include a new Article _____ entitled “Sinkhole/Carbonate Regulations”, which shall read as follows:

Article _____

Sinkhole/Carbonate Regulations

A. Purpose

_____ Township’s topography may be defined as karst topography due to the presence of carbonate bedrock that generally consists of dolomite and limestone. The limestone and dolomite are divided into formations. The carbonate formations present in _____ Township consist of Epler, Rickenbach, Allentown, and Leithsville Formations. These formations are susceptible to the development of solution cavities and sinkhole development. Therefore, anyone considering developing property within the Township beware of the potential geological hazards. The regulations contained herein are intended to minimize the risk of sinkhole occurrence in areas of new development and on lands adjacent to these developments.

B. Governance

The regulations established by this ordinance shall apply to all land development or subdivision applications pertaining to commercial, governmental (except those owned by _____ Township), industrial/office structures, apartment complexes, and multiple single family home developments with three or more lots.

A Carbonate Ordinance Assessment Report will be required as part of the land development or subdivision project applications that are submitted to the Township for all commercial, governmental (except those owned by the Township), industrial/office structures, apartment complexes, and multiple single family home developments with three or more lots.

C. Exemptions

All single family homes and the alteration of single family homes to include detached structures such as garages, barns and swimming pools shall be exempt from the regulations established in this section.

D. Specific Carbonate Ordinance Regulations

1. All of the following specific requirements shall apply to land developments and/or subdivisions covered by this ordinance:

a. No buildings, structures, parking lots, roads, stormwater management facilities shall be placed in or over the following features if unremediated in accordance with the terms of this ordinance: sinkholes, closed depressions, lineaments, fractures, faults, ghost lakes or disappearing streams or similar topographic features. [Need for a clear and proper definition of “remediation of sinkholes and/or associated problems” to be added to this ordinance to substantiate this requirement as stated. Suggestion: “For any existing sinkhole or subsidence problems within the site boundaries, a Sinkhole Remediation Plan will be developed by the Developer/Applicant’s Professional Engineer or Professional Geologist, licensed in the Commonwealth of Pennsylvania, and shall be submitted to the Township Engineer for review and approval, as part of the Carbonate Ordinance Assessment Report. The Township reserves the right to reject any plan that in their opinion was authored by an individual or firm which does not possess the background to properly develop the Sinkhole Remediation Plan, as it relates to this ordinance. The Developer/Applicant will be responsible for implementing the Sinkhole Remediation Plan. All remediation work must be completed before final plan approval for the proposed project.” All sink holes are different and require different types of remediation.]

- b. Buildings, structures and stormwater management basins shall be located no closer than 100 feet from the rim of unremediated sinkholes, closed depressions or disappearing streams and no closer than 50 feet from lineaments, fractures or faults or similar topographic features.
 - c. Outflow from a stormwater management basin and/or post development stormwater flows shall not be directed to any of the following carbonate features: Sinkholes, closed depressions, lineaments, fractures, caverns, ghost lakes or disappearing streams or similar topographic features.
 - d. Lagoons containing substances defined as toxic and/or harmful by the Pennsylvania Department of Environmental Protection are not permitted. [Unless PADEP or local regulations do not allow such lagoons, it seems as though a properly designed and lined lagoon would be allowable, or permitted.]
 - e. Storage and handling areas for toxic or harmful materials must have impermeable surfaces designed to contain materials stored/handled from which they shall be directed to a predetermined collection point.
 - f. The land application of harmful materials is not permitted.
 - g. The underground storage of any toxic materials, except permitted gasoline and diesel fuel, shall be prohibited.
 - h. All companies, businesses or other entities, including governmental, handling toxic or harmful materials shall inventory and register these materials with the Township and submit a spill contingency plan which meets state and federal environmental regulations.
 - i. Groundwater monitoring devices, approved by the Township are required for all facilities handling toxic or harmful materials.
 - j. Impermeable liners and all weather coverings are to be installed at all road de-icing salt facilities.
 - k. Stormwater management facilities shall be designed to provide both water quantity and quality control, as required by Phase II of the National Pollution Discharge Elimination System program and in accordance with the ordinance developed for stormwater management in areas of Karst topography by the Lehigh Valley Planning Commission.
2. The Township Board of Supervisors shall not entertain requests for waivers from the requirements listed above until a Carbonate Ordinance Assessment Report, as required by this ordinance, has been supplied to the Planning Commission and the Township Engineer for their review and comment.

E. Carbonate Ordinance Assessment Report

- 1. All land developments and/or subdivisions covered by this ordinance shall be evaluated by a Professional Engineer, licensed in the Commonwealth of Pennsylvania, with expertise in geotechnical engineering, and where necessary, evaluation by a Professional Geologist, licensed in the Commonwealth of Pennsylvania. A list of the engineer/geologist qualifications shall be submitted to the Township prior to the commencement of the site evaluation. The Township reserves the right to reject any report that in their opinion was authored by an individual or firm which does not possess the background to properly assess the site conditions as they relate to this ordinance. Further, the Carbonate Ordinance Assessment Report submitted to the Township must be signed and sealed by the Professional Engineer, and if applicable, by the Professional Geologist.
- 2. The format and content of the Carbonate Ordinance Assessment Report shall include, but not be limited to the following:
 - a. Statement of Purpose: This section shall indicate those specific Carbonate Ordinance standards being addressed in the Report and whether the applicant is attempting to demonstrate compliance or justify non-compliance with those specific Carbonate Ordinance standards.

b. 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 of property.

c. A map, at a scale no smaller than 1 inch = 100 feet and a contour interval of two feet, indicating the location of the property and all proposed improvements.

d. The Developer/Applicant shall submit information for the affected properties indicating the presence of any of the following carbonate features: depressions, fissures, lineaments, faults, fractures, ghost lakes, bedrock outcrops, sinkholes, seasonal high water levels, soil mottling, springs, surface drainage entering the ground, losing streams, disappearing lakes or streams and caverns.

e. A recommended plan for the repair or remediation of surface or subsurface features that may impact the proposed development as well as the adjacent improved or unimproved properties.

f. The Developer/Applicant shall describe in detail all stormwater management BMPs (all that convey, drain, or hold water) proposed for the project and shall justify the selection of said BMPs regarding their adequacy to prevent sinkholes and subsidence in the subsidence prone areas, both on and off-site (if off-site discharge to karst areas is proposed).

The information requested above shall be based upon field surveys which may include test borings, excavation of test pits, air-track probes, geophysical methods, and previously published data, as necessary to accurately characterize subsidence prone areas within the site boundaries. If any off-site discharge of stormwater to karst areas is proposed, similar study of those off-site areas shall be required of the Developer/Applicant.

3. In addition to the Carbonate Ordinance Assessment Report, the Developer shall also be required to provide the following information:

a. A plan indicating the existing and proposed drainage conditions, locations of all proposed private and public sewage disposal systems, and the location of existing private and public water supplies on adjoining properties.

b. Type, location and phasing of proposed site disturbance and construction, as well as proposed future ownership, utilization, and maintenance of the property and the proposed improvements.

c. Proposed measures to control potential adverse environmental impacts on groundwater quality, stormwater management, or groundwater withdrawal resulting from the development and utilization of the property.

d. Plans describing the design and construction of the proposed stormwater management facilities for the project. Descriptions of the minimum requirements are outlined below.

4. Stormwater Management:

a. All submissions for proposed developments must include a stormwater management plan prepared in accordance with adopted regulations and which limits surface water runoff and the intrusion of concentrated flow of surface water into the subsurface. Facilities that are required as part of the storm water management plan include the collection of all runoff from building roofs into storm drains by water tight gasketed joint conduits and the collection of surface water flow on pavements into drop inlets connected to a water tight gasketed joint storm water conduit. The stormwater conduit must discharge into lined detention basins. All stormwater detention and/or retention facilities shall outlet directly to existing, stable stream channels or other areas deemed safe for discharge in the Carbonate Ordinance Assessment Report.

b. Approved stormwater conduits include HDPE, PVC, concrete, steel, and cast iron pipe all with water tight rubber gaskets at each joint. The use of corrugated metal pipe is not permitted. Construction of the piping system must follow all other applicable ordinances. Where rock is encountered at or above the planned conduit design grade the rock shall be undercut and over excavated a minimum of one foot and backfilled with a compacted fine grained soil.

c. All detention/retention basins in areas of sinkhole prone soil shall be lined. The liner used in a detention basin may consist of a clay liner, a composite synthetic and soil liner or a synthetic liner. The type of liner required shall depend on the condition of the detention basin bottom and the probability of sinkhole occurrence resulting from the construction of the detention basin. The use of low flow channels may also be required depending on the duration and frequency of stormwater discharge into the detention basin. Subsurface detention systems must properly designed with impermeable liners and other sealing methods. The Townships Engineer shall make the final determination as to what is an acceptable form of liner for the proposed detention basins.

Additional items that must be included in the stormwater management plan include details with regard to the sealing of all pavement curbs and gutters, manholes and drop inlets.

F. Review Process.

1. The Carbonate Ordinance Assessment Report must be received by the Township when a plan is submitted for preliminary land development or subdivision approval. However, the Report may be submitted at the time of sketch plan review. Four copies of the Report shall be submitted to the Township. The Report shall be reviewed by the Township Engineer and other consultants as designated by the Township. Based on this review, the Township may require additional information to be submitted if the Township concludes that such information would be instrumental in assessing the proposed development as it relates to the Carbonate Ordinance.

2. Approvals Required.

Where compliance with this section is required as part of an application for subdivision or land development approval, the Township's decision on whether compliance has been achieved shall be made part of its review of the subdivision or land development application.

Where the application is part of a request for zoning permit, the zoning officer shall issue no permit until he/she receives adequate written substantiation from the Township Engineer and other appropriate designated experts referred to above, that 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.

G. Limitations.

In carbonate areas, alteration 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 the review of individual applications, the Township shall attempt to make reasonable judgments as to the applicant's compliance with the Carbonate Ordinance. Under no circumstances shall the Township or any officer or employee of the Township or Consultant to the Township assume any liability for any damages that may result from an Applicant's or any interested party's reliance upon the regulations of the Carbonate Ordinance or any decisions made by the Township in the administration of such regulations by an applicant, developer, and/or any interested party.

II. The _____ Township Preliminary Plan for Major Subdivision or Land Development Checklist and List of Submittal Requirements shall be amended to include a new subsection "Q" entitled "Carbonate/Sinkhole Ordinance Requirements." Said subsection shall read as follows:

A. Carbonate/Sinkhole Regulation Requirements

1. Four (4) copies of the Carbonate Ordinance Assessment Report.
2. A plan indicating the existing and proposed private and public sewage disposal systems and the location of existing private and public water supplies on adjoining properties.
3. Type, location, and phasing of proposed disturbances and construction, as well as, proposed future ownership and maintenance of the property and the proposed improvements, including the stormwater management facilities.
4. Plans describing the design of the proposed stormwater management facilities for the project.

B. All other terms, conditions, and provisions of the aforesaid _____ Township Subdivision and Land Development Ordinance shall remain in full force and effect.

C. This ordinance shall take effect five days after its adoption.

ENACTED AND ORDAINED into law by the _____ Township Board of Supervisors this _____ day of _____, 20XX.

_____ TOWNSHIP BOARD OF SUPERVISORS

CHAIRMAN

ATTESTED BY:

_____,
SECRETARY TO THE BOARD OF SUPERVISORS

ORDINANCE TO CREATE AN ENVIRONMENTAL ADVISORY COUNCIL

ORDINANCE NO. _____

AN ORDINANCE CREATING AN ENVIRONMENTAL ADVISORY COUNCIL, PROVIDING OPERATING PROCEDURES, AND STATING THE POWERS OF THE COUNCIL

The Board of Supervisors of _____ Township, _____ County, hereby ordains as follows:

Section 1. An advisory council to be known as the _____ Township Environmental Advisory Council, is hereby created and shall continue to function until this ordinance is revoked.

Section 2. The Environmental Advisory Council shall be composed of five residents of this municipality.

Section 3. Council members shall be appointed in accordance with the following procedures:

- (1) All council members shall be appointed by the Governing Body of the political subdivision.
- (2) Council members' terms of office shall expire on the first Monday in January following the last year of their term of office.
- (3) Duly appointed council members shall serve a term of three years, except that initial appointment shall be so staggered that the terms of approximately one-third of the membership shall expire each year.
- (4) Whenever possible, one member shall also be a member of the local planning commission.

Section 4. Council members shall receive no compensation for their services, but may be reimbursed for the expenses actually and necessarily incurred by them in the performance of their duties.

Section 5. The EAC is to be advisory to and shall coordinate its activities with the elected officials, planning commission, historical commission, and other such local governmental agencies.

Section 6. The governing body shall designate the chairman of the council.

Section 7. The Environmental Advisory Council shall have the following powers:

- (1) Identify environmental problems.
- (2) 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 the area of this municipality.
- (3) Make recommendations as to the possible use of open land areas of this municipality.
- (4) Promote a community environmental program.
- (5) Keep an index of all open areas, publicly or privately owned, including, but not limited to, flood prone areas, swamps, and other unique natural areas.
- (6) Advise the appropriate local governmental agencies in the acquisition of property, both real and personal.
- (7) To undertake such environmental tasks as requested by the governing body of this municipality.

Section 8. The Environmental Advisory Council shall keep records of its meetings and activities and shall make an annual report which shall be printed in the annual municipal report or otherwise made known and available. Minutes of each meeting shall be forwarded to the governing body.

Section 9. The governing body of this municipality may, from time to time, appropriate funds for the expenses incurred by the council.

ENACTED AND ORDAINED on this 1st day of _____, _____. This ordinance shall become effective five (5) days after adoption.

_____, TOWNSHIP SUPERVISORS

_____, Chairman

_____, Vice-Chairman

_____, Member

ATTEST:

_____, Manager/Secretary

**AN ORDINANCE ADOPTING AN OFFICIAL MAP OF THE TOWNSHIP
OF _____ PURSUANT TO THE PENNSYLVANIA
MUNICIPALITIES PLANNING CODE.**

ORDINANCE NO. _____

WHEREAS, Article IV of the Pennsylvania Municipalities Planning Code authorizes the Board of Supervisors of Bushkill Township to make or cause to be made an Official Map of the Township; and

WHEREAS, agencies of the Township working in conjunction with the _____ Planning Commission and _____ Council of Governments, and upon consideration of the Comprehensive Plan heretofore adopted by the Board of Supervisors of _____ Township and the _____ Area Council of Governments multi-municipal Comprehensive Plan, with supporting documentation, studies, review, and analysis, have undertaken the drafting of an Official Map consistent with the provisions of Section 401 of the Pennsylvania Municipalities Planning Code; and

WHEREAS, the Official Map has been submitted for review and comment to the agencies and municipalities as required by the Pennsylvania Municipalities Planning Code,

NOW, THEREFORE, be it ordained and enacted by the Board of Supervisors of _____ Township pursuant to the authority granted it under the Pennsylvania Municipalities Planning Code, and it is enacted and ordained as follows:

SECTION 1. The Official Map of _____ Township, _____ County, Pennsylvania, attached hereto, made a part hereof, and marked Exhibit "A", is hereby adopted as the Official Map of _____ Township pursuant to Article IV of the Municipalities Planning Code,

SECTION 2. After adoption of the Official Map, all streets, watercourses, public grounds and elements listed in Section 401 of the Municipalities Code on final, recorded plats which are subsequently approved as provided by the Pennsylvania Municipalities Planning Code shall be deemed amendments to the Official Map.

SECTION 3. The adoption of any street, street lines, or other public lands as part of the Official Map shall not, in and of itself, constitute or be deemed to constitute the opening or establishment of any street nor the taking or acceptance of any land, nor shall it obligate the Township to improve or maintain any such street or land. The adoption of the proposed watercourses, or public grounds as part of the Official Map shall not, in and of itself, constitute or be deemed to constitute the taking or acceptance of any land of the Township.

SECTION 4. For the purposes of preserving the integrity of the Official Map of _____ Township, no permit shall be issued for any building within the lines of any street, watercourse, or public ground shown or laid out on the Official Map. No person shall recover any damages for the taking for public use of any building or improvements constructed within the lines of any street, watercourse, or public ground after the same shall have been included in the Official Map, and any such building or improvement shall be removed at the expense of the owner. However, when the property of which the reserved location forms a part, cannot yield a reasonable return to the owner unless a permit shall be granted, the owner may apply to the Board of Supervisors of _____ Township for the grant of a Special Encroachment Permit to build. Before granting any Special Encroachment Permit authorized in this section, the Board of Supervisors may submit the application for Special Encroachment Permit to the _____ Township Planning Commission and allow the Planning Commission thirty (30) days for review and comment and shall give public notice and hold a Public Hearing at which all parties in interest shall have an opportunity to be heard. A refusal by the Board of Supervisors to grant the Special Encroachment Permit applied for may be appealed by the applicant to the Zoning Hearing Board in the same manner, and within the same time limitation, as provided by the Pennsylvania Municipalities Planning Code.

SECTION 5. Adoption of the Official Map shall be subject to the provisions of Section 406 of the Municipalities Planning Code providing for Time Limitations on Reservation for Future Taking, and Section 407 of the Pennsylvania Municipalities Planning Code providing for Release of Damage Claims of Compensation. The Official Map provides designation of parcel boundaries, public recreation land, Township facilities, public paths, existing roadway classifications, and proposed greenways to be reserved for open space. Subsequent to the adoption of the Ordinance and Official Map, any Subdivision or Land Development Plan submitted to the Township must incorporate the identified features classifications.

SECTION 6. If any provision, sentence, clause, section, or part of this Ordinance is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality, or invalidity shall not affect or impair any of the remaining provisions of this Ordinance. It is hereby declared as the intent of _____ Township that this Ordinance would have been adopted had such stricken provisions not been included herein.

SECTION 7. All Ordinances or parts of Ordinances inconsistent herewith are hereby revealed.

SECTION 8. This Ordinance shall become effective five (5) days after adoption thereof.

DULY ENACTED AND ORDAINED this _____ day of _____, 200__

TOWNSHIP OF _____
BOARD OF SUPERVISORS

BY: _____, Chair

ATTEST:

_____, Secretary

