

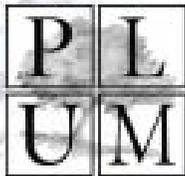
Paunacussing Creek

Watershed
Conservation
Plan
2005

Executive Summary



NATURAL
LANDS
TRUST



FOREWORD

The Paunacussing Creek Watershed Conservation Plan (hereinafter known as “the Plan”) is designed to serve as a guidebook for landowners, municipalities, conservation groups, and citizens interested in taking concrete steps to enhance the long-term health of the Paunacussing. Included in the Paunacussing Creek Watershed is the Hickory Run, a smaller, intermittent stream located just east of Ferry Road. A major portion of the Plan is devoted to an Action Plan listing general and specific management recommendations for municipalities, landowners and conservation groups to utilize in planning and funding watershed protection projects.

The Plan includes a summary of findings on existing natural features and physical, biological and chemical stream data gathered in several recent assessments, including the *Paunacussing Creek Non-point Source Pollution Assessment*, *Paunacussing Creek Landscape Conservation Plan*, and the *Paunacussing Watershed Stream Protection and Restoration Plan*.

Paunacussing Watershed Assessment. It catalogues current and projected land use and land ownership patterns affecting the area and assesses how local zoning ordinances and other municipal tools can be used to optimize the balance of open space and development. The input of municipal and county officials, landowners, and private citizens solicited through public workshops, meetings and interviews has also been summarized. The Plan provides a comprehensive geographic information system (GIS) database of computer map information available to local governments and organizations for environmental planning, conservation and restoration efforts in the watershed.

Funding for *The Paunacussing Creek Watershed Conservation Plan* was provided by a grant from the Pennsylvania Department of Conservation and Natural Resources (DCNR), Rivers Conservation Program. When DCNR approves the final Conservation Plan, the Paunacussing Creek will be submitted for inclusion on the “Pennsylvania Rivers Conservation Registry”, providing the basis for DCNR matching grants to municipalities and environmental organizations interested in carrying out local protection and restoration projects listed in or supported by the Action Plan. These municipalities, or groups sponsored by them, will be eligible to apply annually to DCNR for grants to implement the recommendations in the report.

The project team partners are described as follows:

The Partnership for Land Use Management (PLUM) is a local, non-profit organization whose mission is to encourage sustainable growth and development that does not exceed the carrying capacity of the Delaware River Valley's natural environment. PLUM accomplishes this by providing local officials with expert technical research and support that will help them to make decisions about land development within the Paunacussing Creek Watershed.

Natural Lands Trust is a regional, non-profit land conservation organization working proactively to protect significant open lands in communities throughout the greater Philadelphia region. Since its founding in the 1950's, the Trust has helped protect over 100,000 acres of open space, through conservation planning, conservation easements, and a system of 45 nature preserves. The Trust's main preserve in Bucks County is the 108-acre Paunacussing Preserve on Holicong Road in Buckingham Township, situated at the headwaters of the Middle Branch of the Paunacussing Creek. The Paunacussing Preserve protects a combination of scenic productive farmland, a historic 18th-century farmstead, wildflower meadows and forested wetlands that characterize the headwaters landscape of the Paunacussing Creek Watershed. The Trust works with local municipalities to inventory and protect land, and holds conservation easements on over 1,000 acres of contiguous land in the Aquetong Valley Preserve in Solebury Township, approximately one mile south of the Paunacussing.

The communities of the Paunacussing Creek and Hickory Run watershed are fortunate to have retained their rural landscape, historic villages and high quality streams and aquifers that provide a healthy living environment for people, plants and animals. To avoid the fate of other watersheds that have been overcome by sprawl, the Paunacussing and Hickory Run watershed will require dedicated action and cooperation to implement many of the Action Plan recommendations. All of the valuable information, ideas and guidance contained in this Plan are only as good as the ability of local communities to implement them. Effective implementation requires the ongoing commitment of Buckingham, Solebury and Plumstead Townships, PLUM, the Paunacussing Watershed Association, Natural Lands Trust, and other conservation groups, and county and state agencies. In so doing, conservation professionals and volunteers in the Paunacussing area will be making a valuable local contribution to landscape conservation in central Bucks County, while also helping to maintain the viability of the lower Delaware River corridor.

Introduction

The Paunacussing Creek and Hickory Run watershed and adjoining stream valleys together represent an intact, culturally and ecologically diverse rural landscape of scenic farmland, forested stream valleys and historic villages that characterizes the rapidly growing Lower Delaware River Corridor.

The project study area for the Paunacussing Creek Watershed Conservation Plan is a 10.4-square mile (6,655 acre) landscape that includes all of the Paunacussing Creek and adjacent Hickory Run watersheds and several unnamed tributaries of the Delaware River in Bucks County (**Figure 1 – Location, Figure 2 – Aerial Photograph**). The stream networks within this area benefit from extensive riparian forest buffers, with approximately 80% of all 11+ stream miles protected by full riparian forest buffers. The area is underlain by a groundwater aquifer contained in the underlying Stockton Formation shale bedrock. The largest blocks of forest-interior habitat (fairly rounded or square woodlands of 30 acres or greater) in this project area are situated on the plateaus and ravines closest to the Delaware River. The entire Paunacussing Creek watershed has been designated a “Priority 2” preservation site in the Bucks County Natural Areas Inventory.

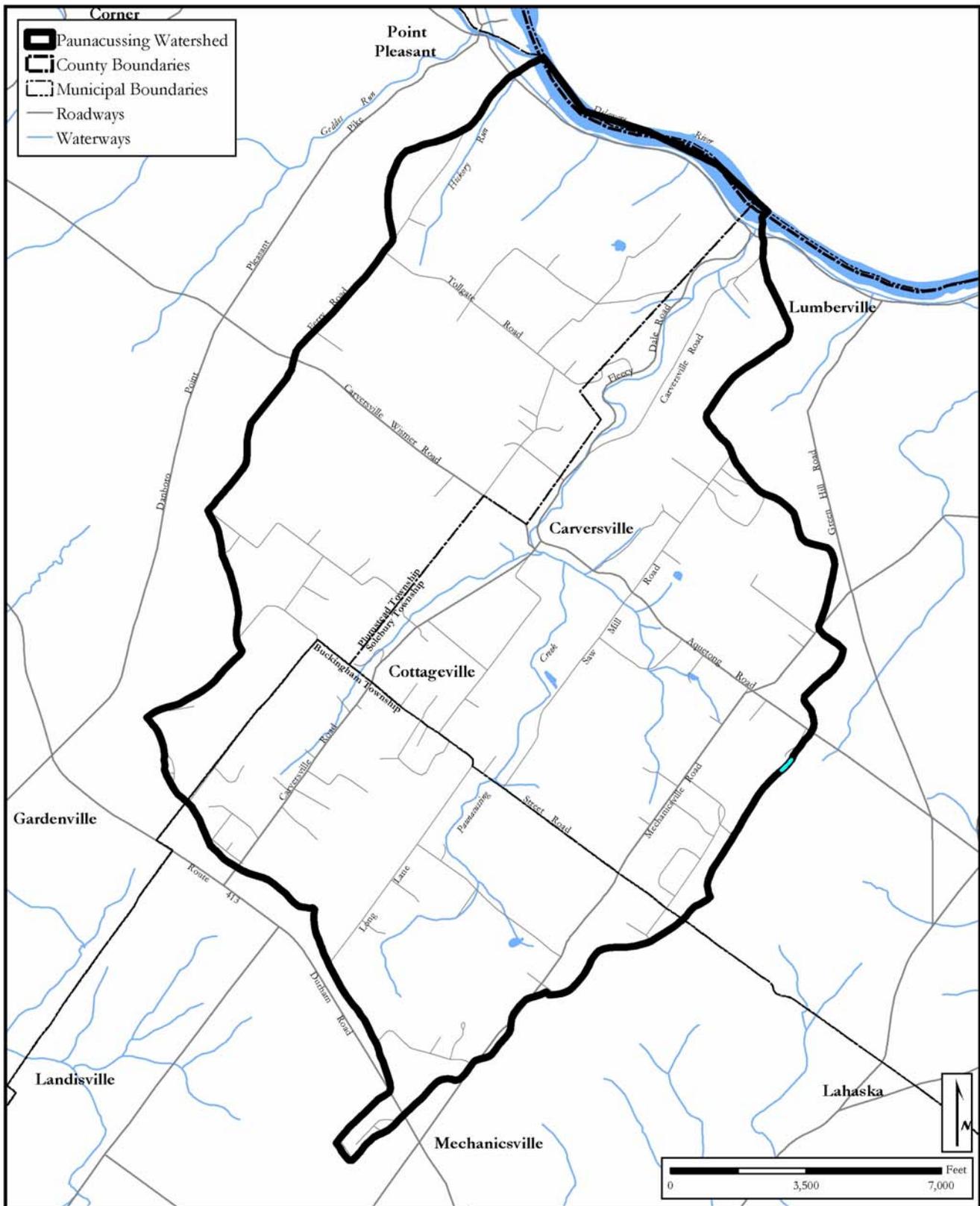
Three distinct landscape types define the Paunacussing/Hickory Run landscape:

- 1) *Headwater Plateaus(sp)*: the broad, fairly level landscape of historic farms, hedgerows and woodlots in the headwaters areas east of Route 413;
- 2) *Ravines*: the unusually dramatic forested ravines of oak, beech and hemlock, drained by High Quality, Cold Water Fisheries streams flowing past the historic villages of Carversville, Lumberville, Cottageville and Point Pleasant to their confluences with the Delaware River; and
- 3) *Delaware River Corridor*: with its broad river channel and prominent forested shale ridges or “palisades” perched high above the floodplain. The ecological and cultural integrity inherent in this landscape has also resulted in an extraordinary combination of unique native plant communities, rich wildlife habitat, and treasured cultural and historic structures and villages.

This unique combination of ecological and cultural factors, and the threat to the Paunacussing landscape posed by rapidly encroaching suburban development in central Bucks County has motivated the townships of Buckingham, Solebury and Plumstead to work aggressively toward permanent protection of key open space properties in the watershed, with significant voter-approved funding for acquisition of conservation easements.¹ Natural Lands Trust (NLT) includes this landscape in its list of priority conservation focus areas for southeastern Pennsylvania.

The watershed is mostly rural, with over 50% of the land devoted to agriculture and over 25% of it supporting woodlands. The headwaters of the Paunacussing rise in springs feeding three tributary streams flowing through the farm fields, woods, and scattered residential areas east of Route 413. The streams converge in the historic village of Carversville, where they form the main stem that continues flowing east for a mile along

¹ The Solebury Township Open Space Plan (2000) indicates that, between 1990 and 1998, the populations of Buckingham, Solebury, and Plumstead Townships together grew by 55.2%, from 21,277 to 33,765 individuals.

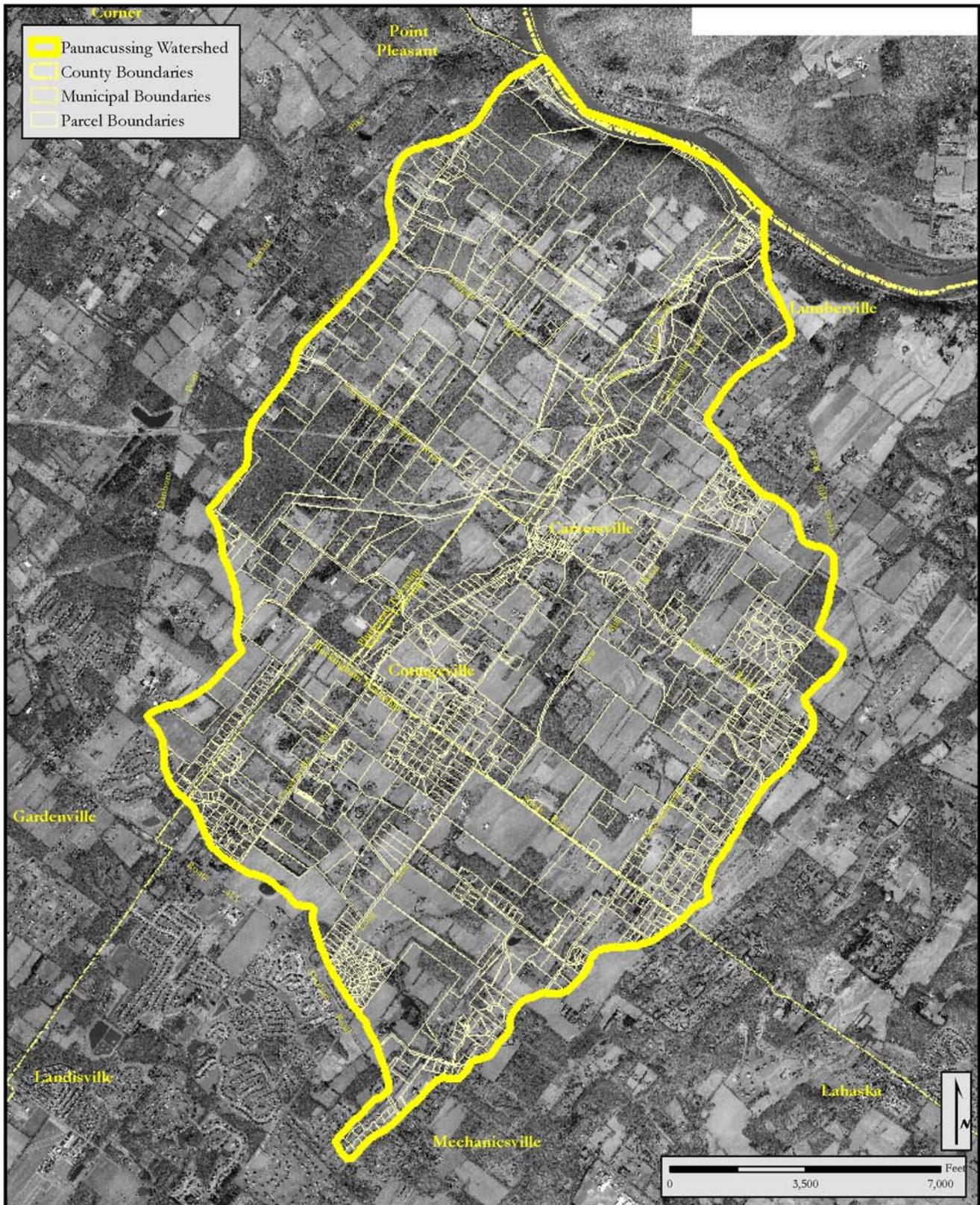


Paunacussing Creek
Watershed Conservation Plan
Bucks County, Pennsylvania

FIGURE 1
Location

Compiled by DCC
Date 08/30/03
County boundaries, municipal boundaries, roadways, and
waterways are from GIS/PAEDA (www.pasda.gov)

Partnership for Land
Use Management
in partnership with
Natural Lands Trust



Paunacussing Creek
Watershed Conservation Plan
Bucks County, Pennsylvania

FIGURE 2
2000 Aerial Photograph

Compiled by L.C.K. Hites Date 10/30/05
1. County boundaries courtesy of Bucks County and aerial photographs, scanned through FADIS (www.pencil.com/arcgis)
2. Municipal boundaries courtesy of Bucks County
3. Aerial Photographs Date 12/2000 from DTPBC

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Use Management
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Natural Lands Trust

Fleecydale Road before reaching its confluence with the Delaware River at Lumberville. All of the people living in the watershed rely on local groundwater and use private wells and septic systems rather than public water or sewer. Because of its relatively undeveloped nature, the Paunacussing has achieved protected status as a state-designated High Quality – Cold Water Fishery stream. The Pennsylvania Department of Environmental Protection (DEP) categorizes the Paunacussing as part of State Water Plan Subbasin 02E, which includes the Delaware River and its tributaries from Tohickon Creek south to Neshaminy Creek.

The Paunacussing watershed and its streams, wetlands, groundwater and landscapes face serious threats from suburban development that is rapidly changing the land use pattern of the area. Indeed, all of central Bucks County in which the Paunacussing Creek is situated has experienced extremely high growth rates and intense development pressure. According to Census 2000, Plumstead Township ranked as the 7th fastest growing municipality in the Philadelphia region, with a population increase of 81% during the 1990s, while Buckingham Township ranked as the 9th fastest growing, with a 76% increase in population. Solebury Township experienced a 29% increase in population over the last 20 years, peaking in the 1990s. Population growth in these municipalities is expected to continue. Land conservation efforts are underway in the area, but the pressure to develop remaining open parcels continues.

As more land is converted to conventional suburban uses, the implications for a small watershed such as the Paunacussing are serious: water quality is typically degraded due to non-point source pollutants contained in runoff from paved areas, lawns, construction sites, and septic systems. Increased impervious surfaces combined with a growing number of private wells combine to take more water out of the hydrologic system faster than it can be recharged. New structures and lawns are designed and built in ways that fragment, degrade and destroy the native habitat because they clear woodlands, meadows and hedgerows. **One of the most important results of this Plan will be to provide clear, concise strategies for avoiding this destructive pattern that has degraded so many watersheds across southeastern Pennsylvania.**

PROJECTS REFERENCED and SUMMARIZED IN THIS PLAN

Title: Paunacussing Creek Landscape Conservation Plan

Prepared by: Natural Lands Trust

Date: 2001

Purpose: To identify priority parcels in the watershed for protection to achieve long term goals for enhancing water quality and conservation of biodiversity.

Title: Paunacussing Creek Non-point Source Pollution Assessment

Prepared by: Partnership for Land Use Management, Natural Lands Trust, Biohabitats

Prepared for: Partnership for Land Use Management

Date: 2003

Purpose: To assess biological and chemical data for streams in the 3 branches and the main stem of the Paunacussing Creek, to determine potential land use and land management impacts, and recommend actions to protect and enhance stream water quality.

Title: Paunacussing Watershed Stream Protection and Restoration Plan

Prepared by: Biohabitats

Prepared for: Delaware Riverkeeper Network

Date: 2003

Purpose: To assess physical stream characteristics, rank problem areas, and prioritize restoration opportunities such as stream stabilization, riparian buffer establishment, and dam removal.

A CASE FOR PROTECTION OF THE PAUNACUSSING CREEK AND HICKORY RUN WATERSHED

The Paunacussing Creek, its tributaries and Hickory Run meander through the communities in and around the historic villages of Mechanicsville, Cottageville, Carversville, Lumberville, and Point Pleasant, connecting places and people, and weaving together a local story of ecology, agriculture, industry and changing land use. Hickory Run follows a similar path just east of Ferry Road in Plumstead Township en route to its confluence with the Delaware at Point Pleasant. The living history of these streams can be read in the deep rich woods along Fleecydale Road, the productive farms in the more level headwaters areas, the historic villages, and the expanding network of private and public lands protected permanently as open space. The stewardship ethic of local residents is evident in the well-maintained farmsteads, livable towns, and rich natural areas that define the landscape. There is a growing awareness among local residents, businesses, and municipalities that the quality and quantity of ground- and surface-water are integral to a healthy living environment. The voices and activities of such long-standing organizations as the Paunacussing Watershed Association (1970) and PLUM (1995) are further evidence of the intense interest in conservation in this area.

However, the last 300 years of land use along the Paunacussing Creek and Hickory Run have left a legacy of degradation among certain sections of streams, wetlands, and groundwater, which has compromised the quality and quantity of water, and the health of the local living environment. There are no known hazardous waste sites in the watershed, but vigilance is required to protect local aquifers and wells from this kind of pollution.

Numerous wetlands have been drained and filled to support agriculture or development; thus their vital natural functions as water purifiers, flood control devices, and habitat for flora and fauna have been lost. The stream quality has been degraded by many things:

- clearing trees along banks, floodplains and slopes
- unrestricted livestock access to the creek
- the construction of dams and ponds
- polluted runoff from roads, parking lots, lawns, crop fields and construction sites
- failing septic systems
- the unhealthy heating of streams that are exposed to full sunlight.

Such degradation is exacerbated by reduced baseflows resulting from increased stormwater runoff that causes the water to flow more quickly downstream to the Delaware rather than seep in and regenerate the local aquifer. Pumping groundwater for wells also adds to the decreased baseflow. It is now difficult to locate breeding populations of native brook trout, an important indicator of stream health which were once common in the Paunacussing stream network.

All of the households in the watershed rely on local groundwater and use private wells and septic systems rather than public water or sewer. Heavy clay soils in the watershed provide poor drainage and tend to

support perched water tables that create numerous wet areas. Sand mounds are required for on-site septic systems. Residents have experienced severe flash-flooding due to the topographic nature of the watershed: the flatter, perched water table areas at the west end of the watershed drain rapidly to creeks in steeper ravines that merge into the main stem at Carversville. Historic homes, roads and bridges are often in the path of floodwaters, and the intensity and frequency of floods can be expected to increase as the watershed continues to experience development. Recent flood events have led local residents to form the Carversville Safety Committee to deal with flooding problems in the village

The *Paunacussing Creek Watershed Conservation Plan* provides an overview of key natural and cultural elements as well as water quality and quantity concerns. The Plan also assesses major land use changes that have the potential to seriously alter the health of the watershed and the quality of life of its residents. Water is a vital resource, but it is not infinitely available and it is vulnerable to pollution. Many factors have critical influence on the future of the Paunacussing area as a desirable place to live:

- trends in the ownership of land
- the body of laws that govern land use
- the pattern and density of development
- demands for water supply, wastewater treatment and stormwater management, and the eternal natural cycles of flooding and drought.

Development over the next 20 years and the community's response to that development will decide the fate of the land and water resources that make up the watershed. The *Paunacussing Creek Watershed Conservation Plan* presents concrete recommendations on how the local community can influence the future health of the entire watershed. The series of Recommendations contained in the section entitled: Action Plan.

PRINCIPLES OF THE CONSERVATION PLAN

The Paunacussing Creek Watershed Conservation Plan is prepared with the guidance of the following principles: Throughout the document, more specific goals, objectives and recommendations developed from these primary principles are described:

- **General Awareness.** The Paunacussing Creek Watershed should come to be widely understood by those who live and work in the area as an interrelated natural system of land and water on which humans, plants and animals depend. Raising awareness among municipal officials about their role as watershed stewards is critically important. Such awareness includes the recognition that the issues affecting water quality and quantity in the Paunacussing also affect the ability of the watershed to support all forms of life.
- **Coordinated Action within the Watershed.** Through the coordinated actions of all parties – municipalities, agencies, landowners, citizens, institutions, businesses and private groups – the ecology and scenic beauty of the Paunacussing Creek Watershed should be preserved and, where possible, restored.
- **Coordinated Action with other Watersheds.** Those involved with the implementation of the Paunacussing Creek Watershed Conservation Plan should coordinate their work with other local watershed organizations, such as those working on the Tohickon Creek and Middle Delaware River, so that common issues are addressed in a coordinated fashion.
- **Central Role of Municipalities.** Municipalities should pursue the implementation of recommendations found in *The Paunacussing Creek Watershed Conservation Plan*, using matching funding sources such as the Pennsylvania Rivers Conservation Program, Growing Greener, and funding from private foundations. Multi-municipal water-based land use planning is an essential outcome of this watershed-based planning process.

ACTION PLAN

FOR THE

PAUNACUSSING CREEK

WATERSHED CONSERVATION PLAN

The Action Plan that follows is organized according to the Major Issues that affect the conservation of the Paunacussing Watershed. Each section begins with Goals specific to the Paunacussing Creek, followed by Management Recommendations. Following certain Recommendations are Background Sections that explain the rationale for the Recommendations.

The identification of Major Issues, Goals and Management Recommendations in the Paunacussing Creek watershed is based input from public meetings, meetings with municipal officials, and from research and analysis of data from a variety of sources.

The issues that affect stream, wetland and aquifer protection tend to overlap, thus their separation into these discrete Major Issues may seem at times artificial. Often a Recommended Implementation Action for one issue is also contained in a Goal Statement for another. The most important objectives, for example a commitment to preserving and enhancing riparian buffers, are those that address most of the issues simultaneously. Rather than repeating similar information, the recommendations are placed under what seem to be the most fitting issue.

MAJOR ISSUE #1

GUIDE LAND DEVELOPMENT

GOALS

The overall pattern and intensity of land uses in communities throughout the Paunacussing Creek watershed should be planned in a manner that:

- Permanently protects critical environmental features such as streams, wetlands, floodplains, riparian woodlands, major forest blocks and steep slopes from clearing, excavation and development.
- Retains the traditional pattern of development in the area, with homes and businesses on smaller lots in or near existing hamlets, villages and towns and crossroads (where major roads and utilities already exist), and rural lots and large properties in areas dominated by farmland and woodlands.
- Provides flexible standards for developers to design more compact communities adjoining substantial areas of protected open space.
- Explicitly recognizes the value of regional planning among neighboring municipalities.

MANAGEMENT RECOMMENDATIONS

1. Flexible zoning and subdivision ordinances should be adopted by municipalities.
2. Municipalities should review and consider establishing Transfer of Development Rights (TDR) programs.
3. Municipalities should review and consider adopting Village Extension Overlay ordinances.
4. Increase enrollment of Paunacussing properties in County and State land preservation programs for agricultural lands and natural areas. This effort can be made by a coalition of municipalities, county agencies and conservation groups.
5. Municipalities should consider the use of Effective Agricultural Zoning in areas where farming is a primary use of land.
6. Neighboring municipalities should consider working together to adopt Joint-Municipal Comprehensive Plans, as allowed under the Pennsylvania Municipalities Planning Code.
7. Municipalities should consider the use of environmental impact fees and requirements for environmental impact mitigation for major energy generation facilities and quarries.
8. Enhance the livability of the hamlets of Mechanicsville, Gardenville, Cottageville as village extension areas for appropriate, village style development. Enhance the livability of the villages of Carversville, and Lumberville through the use of stormwater management strategies.
9. Ensure that municipalities throughout the watershed adopt the full range of environmental protection ordinances, including those dealing with wetlands, floodplains, riparian buffers, steep slopes and grading.

MAJOR ISSUE #2

RIPARIAN FOREST BUFFER PROTECTION AND RESTORATION

GOAL

*Protection, restoration and management of a full riparian buffer extending 75 to 100 feet from each stream bank of streams throughout the **entire** Paunacussing Creek watershed. Where this width cannot be achieved, a sliding scale of buffer widths should be considered. The majority of these buffers should consist of native floodplain forest vegetation, however, existing herbaceous wetland vegetation, meadow, and shrub vegetation should be considered as alternatives where forest buffers are not feasible. In addition, historic settings should be respected.*

MANAGEMENT RECOMMENDATIONS

1. Establish an Paunacussing Riparian Buffer Initiative.
2. Municipalities throughout the watershed should consider adoption of a Riparian Buffer Ordinance as an overlay district with consistent standards.
3. Provide Riparian Forest Buffer protection/restoration funding assistance to landowners.
- 4) Develop riparian habitat restoration and interpretive projects at locations throughout the watershed.
 - a) Establish riparian restoration and natural landscaping demonstration projects at parks with stream frontage in Buckingham, Solebury and Plumstead Townships, NLT's Paunacussing Preserve and other suitable sites in the watershed.
 - b) Additional riparian habitat restoration and interpretive projects should be continued in conjunction with the Delaware Riverkeeper assessment.
 - c) Protect land along the main stem of Paunacussing Creek adjacent to Fleecydale Road between Carversville and Lumberville.
 - d) Restore buffers, remove invasive vegetation, develop trails and provide signage and educational programs in public open space.
 - e) Restore streambanks along the non-forested sections of the North Branch, Middle Branch and South Branch of Paunacussing Creek.
 - f) Conduct educational outreach programs on riparian buffers for streamside landowners.

MAJOR ISSUE #3

CONSERVATION OF MAJOR WOODLANDS

GOAL

Large, contiguous blocks of “deep woods” (or forest-interior habitat) should be identified and targeted as a top priority for conservation, in order to limit the impact from clearing and development.

MANAGEMENT RECOMMENDATIONS

- 1) Establish a Paunacussing Woodland Conservation and Restoration Initiative.
- 2) Identify the largest blocks of contiguous forest in the watershed for conservation.
- 3) Utilize the full range of conservation options for parcels containing key woodlands.
- 4) Promote the adoption of municipal woodland conservation ordinances.
- 5) **Develop a Paunacussing Biodiversity Management Plan with a strategy to restore and maintain native species and reduce exotic invasive plants.**

MAJOR ISSUE #4

PROTECTION AND RESTORATION OF WETLANDS

GOALS

- *Permanently protect existing wetlands throughout the Paunacussing Creek watershed from excavation, filling and clearing of native vegetation.*
- *Provide adequate open space buffers between all wetlands and adjacent land uses and structures to minimize non-point source pollution and alteration of natural hydrology.*
- *Restore previously drained, filled or cleared wetlands wherever possible.*

MANAGEMENT RECOMMENDATIONS

- 1) Identify and characterize all existing wetlands within the Watershed.
- 2) Establish a Wetland Conservation Initiative in the watershed.
- 3) Establish a Wetland Restoration Initiative in the watershed.
- 4) Protect and restore those wetlands listed as “high priority sites” in *Natural Areas Inventory of Bucks County, Pennsylvania, 1999.*
- 5) Adopt wetland protection ordinances in municipalities throughout the watershed.
- 6) Utilize the full range of conservation options for parcels containing important wetlands.
- 7) A wetland assessment service should be considered. Perhaps this could be initiated by the Paunacussing Watershed Association. This service should provide professional wetland delineation expertise to local groups, landowners or municipalities.

MAJOR ISSUE #5

Protection, Conservation and Prudent Use of the Local Aquifer

GOALS

- *To protect the Paunacussing Watershed water supply by maximizing groundwater recharge of the local aquifer, and monitoring the “water budget”, a scientific, GIS-based assessment of water use based on future growth projections.*
- *To base land use regulations and conservation actions on the water budget.*

MANAGEMENT RECOMMENDATIONS

1. Enact Multi-municipal Water-based Land Use Regulations to guide development of the Paunacussing Watershed.
2. Several Water-based Land Use Regulations targeting specific problems should be considered.
 - a. *Innovative Stormwater Management Ordinance and Retrofits*
 - b. *Riparian Forest and Wetland Buffer Ordinances*
 - c. *Groundwater Recharge Protection Area Ordinance – Critical*
 - d. *Wellhead Protection Ordinance*
 - e. *Open Space Management Standards*
 - f. *Natural Landscaping Ordinance*
 - g. *Septic Maintenance Programs*
3. Initiate public education programs targeting individual homeowners to help them understand the importance of preserving their local watershed.

MAJOR ISSUE #6

Stream and Groundwater Monitoring

GOALS

- *To have available consistent, reliable data on the quality of the stream water and the ground water of the Paunacussing Watershed.*
- *To be able to identify any degradation to the stream or ground water as early as possible, so that remedial action can be taken.*

MANAGEMENT RECOMMENDATIONS

1. The Stream Sampling Program conducted for the NPS Pollution Assessment study should be refined and continued. Stream sampling for water quality has been conducted by the Paunacussing Watershed Association twice a year since 1990. It is recommended that the two groups (PWA and PLUM) combine forces to continue joint sampling of the stream.
2. Expanding the Stream Sampling Program effort to include monitoring of individual wells for water quality and levels will provide a better understanding of the connection between groundwater and streams in the watershed. Biological assessment could be expanded to include sampling of fish species present in the watershed (generally done by electro-shocking) and surveys of amphibians (frogs, salamanders) and reptiles (turtles, snakes).

MAJOR ISSUE #7

LANDSCAPE CONSERVATION PRIORITIES

GOALS

- *Identify and prioritize those properties that are most critical to preserving the overall health and well-being of the Paunacussing Watershed, including Hickory Run.*
- *Develop a strategy that each township can use to conserve the identified properties.*

MANAGEMENT RECOMMENDATIONS

1. Large parcels that include major woodland areas or large blocks of contiguous open space acreage adjoining stream corridors should be targeted for conservation.
2. Given the conservation importance of the Paunacussing area, all parcels over 10 acres in size may be considered as priorities providing significant conservation benefit.
3. As the Landscape Conservation Priorities properties are identified, the relevant township will be provided with a list of properties that are located in their township, with a description of the important features and potential conservation status of individual properties where possible.