

PENNYPACK CREEK WATERSHED RIVER CONSERVATION PLAN EXECUTIVE SUMMARY

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Prepared for:

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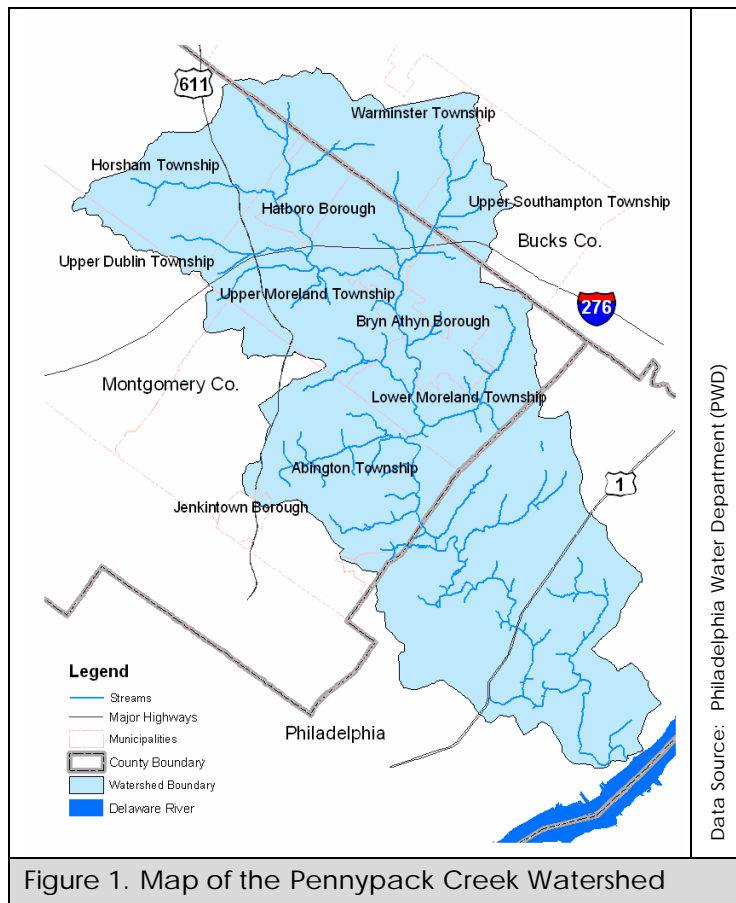
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EXECUTIVE SUMMARY

PROJECT DESCRIPTION

The Pennypack Creek River Conservation Plan is one component of ongoing efforts being conducted by the Philadelphia Water Department and the Pennypack Watershed Partnership to improve water quality, the environment and the quality of life of watershed residents. The principle goal of the conservation plan is to reconnect people to the Pennypack Creek through a two year, community based planning process. The planning process includes forming a diverse group of watershed stakeholders to act as a steering committee for the plan, engaging the public in the planning process through outreach and educational events and researching current and projected environmental and cultural conditions in the watershed. The project team will then compile all of this information into a document that provides a work plan to improve the watershed environment and promote the enjoyment of the Pennypack Creek.



The Pennypack Creek has historically meant many different things to different people. The creek has been a faithful partner in our region's economic growth, creating wealth by powering mills and facilitating settlement by providing water and carrying away waste. The creek has also served as a recreation destination for thousands of people who come to streamside parks to fish, picnic or simply contemplate nature. Paradoxically, the Pennypack Creek has also served as an instrument of destruction as flood waters have claimed property and even lives. The Pennypack Creek River Conservation Plan attempts to consider the watershed's complex evolution and develop goals that will provide benefits for everyone who values the creek and its watershed. The goals of River Conservation Plans reflect the diverse interests, concerns and needs of the watershed residents, and will serve as a rallying point for a watershed community to improve their

watershed. This River Conservation Plan is the first step in a comprehensive assessment of the Pennypack Creek Watershed that will culminate in a watershed management plan conducted by the Philadelphia Water Department in 2006 and 2007. Figure 1 shows the Pennypack Creek Watershed and its municipalities.

Information contained in this plan was gathered from existing studies as well as input from community members, key person interviews, a public survey and a number of workshops and neighborhood meetings. Analysis of Geographic Information System (GIS) data played a major role in the development of this plan and many GIS maps are included to enhance the understanding of the spatial relationships between watershed resources, opportunities and concerns. The fruits of existing planning efforts were also important to the development of the River Conservation Plan. Public participation from the Pennypack Park Master Plan, as well as the suburban community comprehensive plans, provides additional connections between this plan and the planning goals of the watershed stakeholders.

There are many opportunities to have a positive impact on the Pennypack Creek and its watershed and there are many organizations doing work to improve the watershed environment. Long term improvement, however, requires that anyone who lives, works or recreates within the watershed does their part to reduce negative impacts on the natural resources of the watershed while creating the momentum to improve the watershed community. This is the ultimate goal of the River Conservation Plan – to get people involved as a positive force to improve the watershed. This document and planning effort will serve as a guide to continue working toward that ultimate goal.



Dam on the Pennypack Creek

The River Conservation Planning process is funded in part by the Pennsylvania Department of Conservation and Natural Resource's (PA DCNR) Community Partnership Conservation Program. In 2003, the Philadelphia Water Department received a grant from the PA DCNR to conduct the plan. Other funding and in-kind services to conduct this plan have been provided by the Philadelphia Water Department, Fairmount Park Commission, Friends of Fox Chase Farm, Friends of Pennypack Park, Montgomery County Planning Commission, and the Pennypack Ecological Restoration Trust.

PUBLIC OUTREACH EFFORTS

The Pennypack Watershed Partnership conducted a number of public participation and outreach events throughout the two-year River Conservation Plan process. Public participation is central to accomplishing the goals of the plan. The following sections summarize the public outreach and education efforts.

Neighborhood and Community Meetings

F. X. Browne, Inc., the Partnership’s consultant for the River Conservation Plan, presented information concerning the Pennypack Creek River Conservation Plan at twenty community, civic association, school, municipal and environmental organization meetings between January 2004 and July 2005. Presentations included an introduction to the River Conservation Planning process and detailed ways that watershed residents could become involved in the development of plan goals and implementation projects.

Community presentations were given throughout the watershed from headwaters areas in Warminster and Horsham to the lower portions of the watershed in the Bustleton and Holmesburg neighborhoods of the city. These outreach efforts were successful at reaching watershed residents that may not typically be exposed to information regarding watershed planning. Table 1. is a list of the neighborhood and community groups which hosted conservation plan presentations.

Table 1. Neighborhood and Community Groups Hosting Conservation Plan Presentations	
Abington Environmental Advisory Committee	Pennypack Farm
Bucks County Trout Unlimited	Philadelphia Canoe Club
Bryn Athyn Borough Council	Rockledge Borough Council
Boys Scouts of America Council Round Table	Southeastern Montgomery County Trout Unlimited
Fox Chase Civic Association	Southampton Watershed Association
Friends of Fox Chase Farm	Upper Moreland Township Board of Supervisors
Friends of Pennypack Park	Upper Southampton Board of Supervisors
Greater Bustleton Civic League	William Tenent High School Environmental Science Classes
Holmesburg Civic League	William Tenent High School Biology Class
Horsham Township Board of Supervisors	Willow Grove Senior Center

Public Meetings

As part of the River Conservation Planning process, the Pennypack Partnership conducted four public meetings to inform the public about the River Conservation Plan and gather public input regarding planning efforts. The first public meeting for the Pennypack Creek River Conservation Plan was held in conjunction with the regular meeting of the Bucks County Chapter of Trout Unlimited in November 2004. The second public meeting was held in March 2005 at the Pennypack Environmental Center and featured a presentation



Watershed walk at Pennypack Preserve

by a Historical Consultant to the Philadelphia Water Department, Adam Levine. Mr. Levine presented information on the changing landscapes of the Pennypack Creek Watershed and how these changes affect the Pennypack Creek.

The Draft River Conservation Plan document was presented at a series of public meetings in September and October of 2005. The final River Conservation Plan document will be presented at the fourth meeting in December of 2005.

The public meetings have been well attended by people involved in the Pennypack River Conservation Plan process along with members of the general public. Approximately 20-30 people attended each meeting. Feedback regarding the planning efforts was positive and members of the public provided useful suggestions for the improvement of the plan document and public engagement process.

Workshops and Watershed Walks

The Pennypack Partnership conducted a series of watershed workshops and walks between September 2004 and May 2005. Educational efforts provided attendees an opportunity to learn about their watershed and encouraged citizens to participate in the River Conservation Plan process. The following is a list of watershed walks and seminars that were conducted:

Pennypack Watershed Walk, Fox Chase Farm, **July 13, 2004**

Watershed Wonders Festival, Pennypack Environmental Education Center, **September 18, 2004**

Volunteer Stream Monitoring Presentation, Pennypack Environmental Education Center, **September 21, 2004**

Homeowner Presentation on Watershed Protection, Pennypack Ecological Restoration Trust, **November 16, 2004 and April 26, 2005**

Stream Restoration Presentation, Pennypack Ecological Restoration Trust, **April 7, 2005**

Citizen Survey

F. X. Browne, Inc. conducted a statistically valid survey of watershed residents in Montgomery and Philadelphia Counties inquiring about the level of watershed awareness, park usage and environmental priorities of survey respondents. Two-thousand surveys were mailed to random addresses throughout the two county area of the watershed. The Bucks County portion of the watershed was not surveyed due to a lack of parcel data for Bucks County at the time the survey was conducted.

One-hundred and forty eight responses were returned. This equals a 7.5 percent survey return rate which is a typical response rate for a random survey of this kind. Survey results indicated that many respondents felt that water quality in the Pennypack Creek has improved over time (83% of respondents) and that water quality and conservation was an important issue affecting their quality of life (88% of respondents). Only 10 percent of respondents participate in

watershed protection activities. Complete survey results are detailed in the Public Outreach and Participation report which accompanies the complete plan document.

Key Person Interviews

F. X. Browne, Inc. conducted 25 key person interviews during the River Conservation Planning Process. The goal of the Key Person Interviews was to capture in-depth observations and perceptions of watershed conditions and values from a diverse group of stakeholders. Interviewees were asked a series of questions regarding how they or their congregations, constituents, employees or organization members view and use the Pennypack Creek. Interviewees were also asked to identify needs for watershed improvement or valuable watershed resources. The interviews provided opportunities for a level of detailed input from stakeholders that may have been difficult to obtain through public meetings or other outreach events.

A number of prospective interviewees were selected from outside of the traditional pool of participants in watershed conservation activities and thus gave a more diverse view of the watershed. Interviewees included religious leaders, businesspersons, political leaders and public servants as well as environmental leaders.

Neighborhood and Block Interviews

F. X. Browne, Inc. scheduled ten work days to interview pedestrians in neighborhoods and shopping centers throughout the watershed. Pedestrians were asked brief questions about their perceptions of the Pennypack Creek and their usage of watershed open spaces and amenities. Interview results echoed many of the responses to the citizen survey.

Many respondents indicated that they were unaware of efforts being conducted to improve the watershed but would be interested in participating in watershed protection efforts if they knew more about the efforts and if these activities were appropriate for children. A number of respondents indicated they would be interested in activities that cleaned up the parks in the watershed. The majority of interviewees felt that the creek was not safe for swimming and many felt that there has been an increase in the amount of trash and litter in the parks and stream itself.

The neighborhood and block interviews collected information from a random and diverse pool of respondents. This effort ensured that input and concerns of the general public are included in the final River Conservation Plan document.

ISSUES, CONCERNS AND CONSTRAINTS

The Pennypack Creek Watershed, is home to many natural wonders and historic resources important to our region. Pennypack Park consists of 1,600 acres of natural and recreation lands that provide a green ribbon from the City's border with Montgomery County to the Delaware River. This park hosts a diversity of plant and animal species and affords residents a respite from urban life. Further upstream the Pennypack Preserve, owned and managed by the Pennypack Ecological Restoration Trust, is an example of the power of private citizens' efforts to protect the resources they care about. The preserve is the largest publicly accessible, private

nature preserve in Montgomery County. Future plans to expand the greenways along the Pennypack Creek into the headwaters of the watershed and beyond are included in the Montgomery County Open Space plan. These are just some examples of the many active groups and efforts underway to improve the Pennypack Creek Watershed for everyone.

The relative health and condition of the Pennypack Creek Watershed is a reflection of the manner in which people use, develop and steward the land. Water quality, environmental, and even recreational conditions, are a result of historic and current land uses. Throughout the public outreach and participation process, and with critical input from the River Conservation Plan steering committee, common themes continually recur when people consider the Pennypack Creek.

Rapid conversion of the Pennypack Creek Watershed from agricultural lands to predominantly residential land uses, with the attendant construction of transportation infrastructure and commercial centers, is an often identified explanation for many of the Pennypack's ills. This rapid residential development is cited as the cause of stormwater management issues, flooding problems, water quality degradation as well as loss of biodiversity and open space. New federal, state and municipal regulations are attempting to stem the negative impacts of the land development process on the environment. Current planning efforts, such as the Montgomery County Open Space Plan and Open Space Bond issue, are working towards creating greenways throughout the watershed while protecting existing green fields.

Reducing the impacts of stormwater flows from existing development is another recurring theme encountered when discussing the Pennypack Creek. The creek shows many of the symptoms of a degrading urban stream: severe bank erosion, disconnection from its floodplain, low base flow followed by high storm flows and poor aquatic biodiversity. Many efforts are underway to address stormwater management ranging from homeowner education to university research studies. This conservation plan can play a major role in changing people's habits and attitudes about stormwater management.



Trout Unlimited Restoration Project In Lorimer Park

Photo: Mike Wilson

Historic schools, religious buildings and commercial sites are scattered throughout the watershed as a testament to the region's settlement and history of growth and commerce. These historic resources, along with evidence of Native American settlements, reinforce the notion that the Pennypack Creek Watershed, with its temperate climate, rolling topography, natural beauty and economic opportunities, is a great place to live, work and play.

WATERSHED CHARACTERISTICS

Home to more than 250,000 residents, the Pennypack Creek Watershed encompasses a 56-square mile region in southeastern Pennsylvania, an area dominated by the urban and suburban landscapes of northeast and suburban Philadelphia. Much of the watershed lies within the Piedmont region, a broad swath of land extending from Georgia to Massachusetts that separates the flat Atlantic Coastal Plain from the Appalachian Mountains. This is a land of transition; a pastoral landscape of narrow valleys, woodland streams, and forest-covered hills. It is also a land that has been heavily altered by sprawling cities, agriculture, and industry.

Like much of the northeastern United States, the climate in the Pennypack Creek Watershed is characterized by four distinct seasons with moderately cold winters and long humid summers. Although much of the forest within the Pennypack Creek Watershed has been removed to support agriculture and residential and commercial development, or altered by invasive species and nuisance deer, remnants of the hardwood forests that once covered the entire watershed can be found in places such as Lorimer and Pennypack Parks and the Pennypack Preserve.

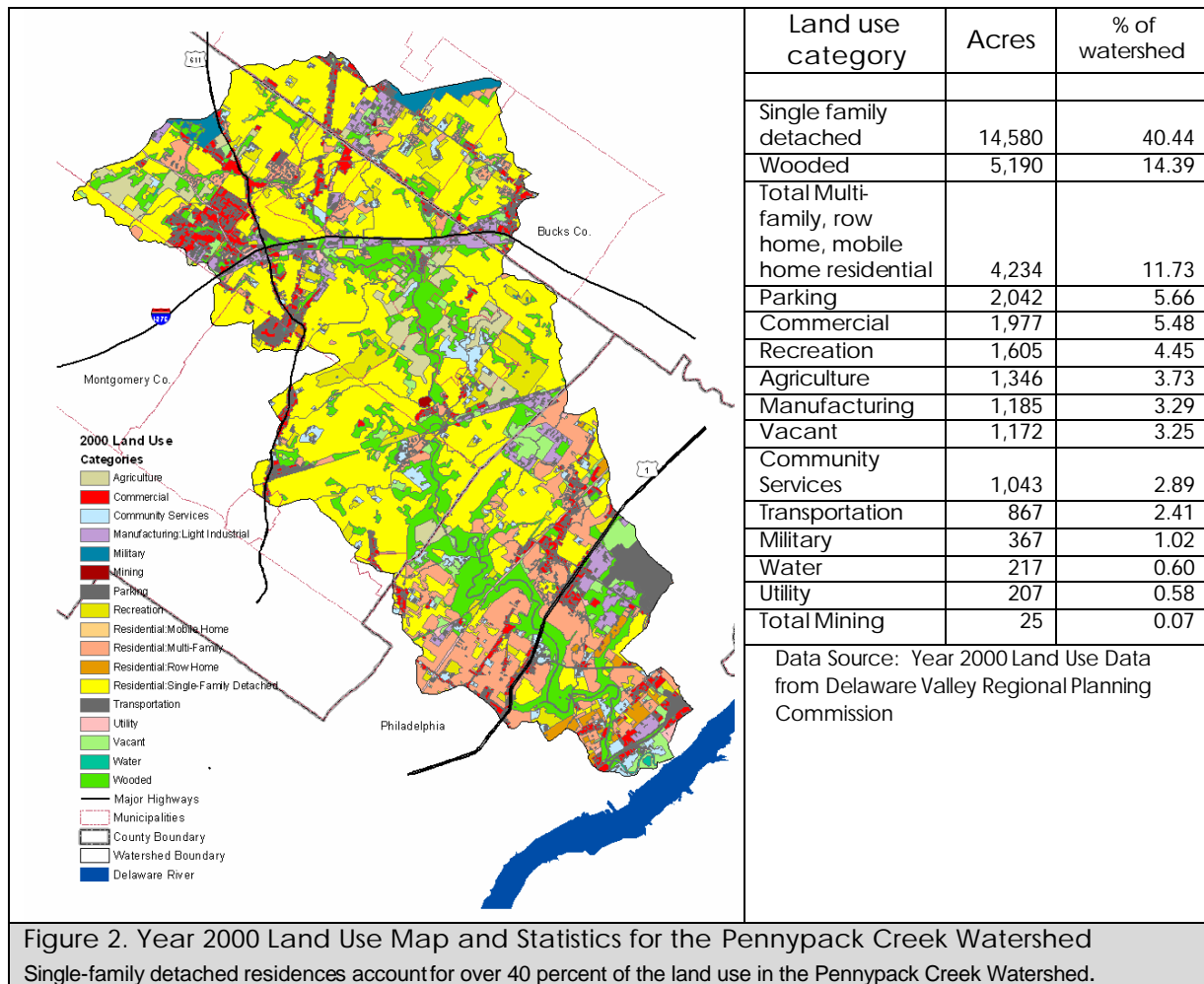


The upper portions of the watershed are located in the northern suburbs of Philadelphia within Montgomery and Bucks Counties. Here, Pennypack Creek flows through several boroughs and residential communities including Willow Grove, Hatboro, Southampton, Horsham, Abington, and Bryn Athyn. Moving downstream, the main stem of the Pennypack Creek flows southeast through the Fox Chase, Bustleton, Rhawnhurst, and Holmesburg sections of Northeast Philadelphia before entering the Delaware River.

While sections of the watershed are covered by urban land uses including industrial and business parks, commercial shopping areas and suburban residential communities, much of the lower section of the Pennypack Creek is shielded from development by an interconnected greenway of forested lands, protected farms, and park land. This greenway includes more than 700 acres of protected lands managed by the Pennypack Ecological Restoration Trust; Lorimer Park, a 250-acre Montgomery County Park; and Pennypack Park, which is part of the renowned Fairmount Park System in the City of Philadelphia.

LAND USE

Land use in the Pennypack Creek Watershed is predominantly residential, characterized by single family detached residences in the upper and middle portions of the watershed and multi-family and row home areas in the lower section of the watershed. The majority of this development occurred in the suburban expansion after World War II but considerable suburban development has occurred in the headwaters and upper portions of the watershed over the last 20 years. Figure 2 presents land use within the Pennypack Creek Watershed as of 2000. The large areas of yellow on the map are indicative of the preponderance of residential land uses in the watershed.



The second largest land use category in the watershed is wooded land (14 percent of watershed land). These wooded areas can be seen in Figure 2 as a green spine of parks and preserved land along the creek corridor through the lower and middle sections of the watershed. Parking and commercial land uses (11 percent of the watershed) contribute to the overall area of impervious surface in the watershed.

PARKS, RECREATION AND OPEN SPACE

There are 2,650 acres of public park, recreation, and open space land in the Pennypack Creek Watershed. This equates to approximately 10 acres of recreational and open space land for every one thousand watershed residents. The distribution of regional open spaces and recreational lands, however, is largely in the middle and lower sections of the watershed, with Pennypack Park being the largest and most notable park at 1,600 acres. Figure 3 shows the municipal and county parks and recreation facilities in the watershed. It is important to note that the municipalities that are only partly in this watershed have other facilities, not presented in this table, that are available for residents' use. The lands of the Pennypack Preserve are also not included on this map even though it is open to public use. The preserve is privately owned by the Pennypack Ecological Restoration Trust and is not officially part of county or municipal park systems.

In addition to large areas dedicated to passive recreation (e.g., Pennypack Park and Lorimer Park, etc.) each municipality has neighborhood and community parks and schools that provide playgrounds, ball fields and courts to meet the active recreation needs of their residents. Each municipality also has recreation programs that provide recreational and cultural programming for residents. The City of Philadelphia offers the widest range of recreational programming of any municipality in the watershed through the 12 recreation centers operated by the Philadelphia Department of Recreation.



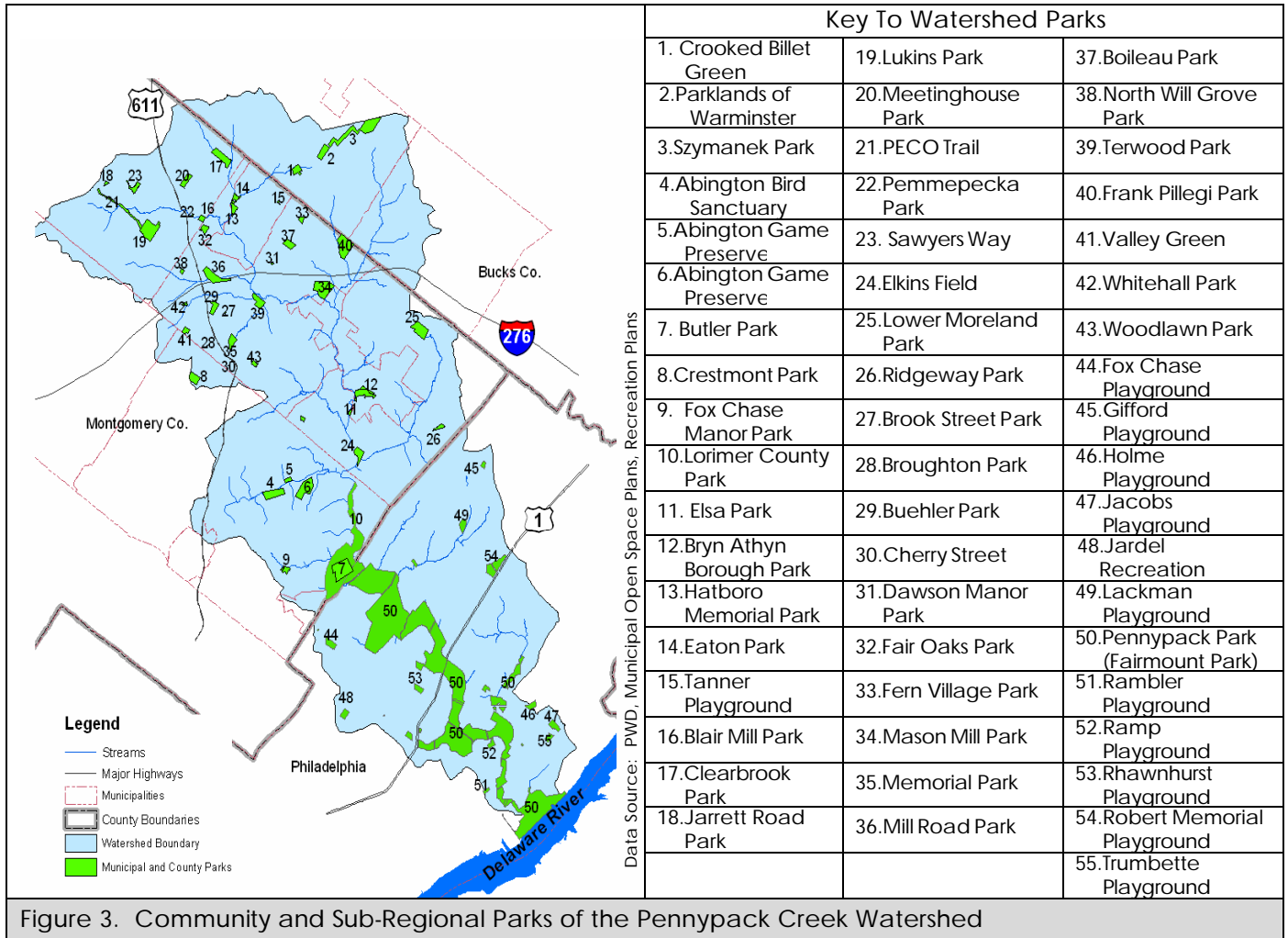


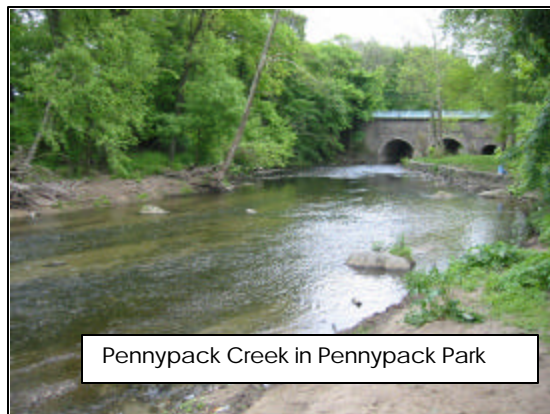
Figure 3. Community and Sub-Regional Parks of the Pennypack Creek Watershed

BIOLOGICAL RESOURCES

The biological communities of the Pennypack Creek Watershed, be they aquatic or terrestrial, flora or fauna, reflect the predominance of urban and suburban development throughout the watershed. Even large natural areas such as Pennypack Park and the Pennypack Preserve suffer from some degree of habitat disturbance either from encroachment of human uses, upstream water quality and habitat degradation or nuisance or invasive plants and animals.

Low aquatic macroinvertebrate diversity has been noted in the Pennypack Creek Watershed for at least 35 years and is an indicator of water quality and habitat stressors on the creek. More recently, non-native, invasive plant species, such as Japanese knotweed (*Polygonum cuspidatum*), multiflora rose (*Rosa multiflora*) and porcelainberry (*Ampelopsis brevipedunculata*) among others, have been claiming large areas of natural lands in the watershed and contributing to declines in native plant and animal biodiversity in the watershed.

Large populations of white-tailed deer (*Odocoileus virginianus*) have also contributed to declines in native biodiversity in the watershed by denuding forests of understory vegetation and tree seedlings. Deer browsing on tree seedlings is preventing recruitment of new trees in woodlands. The removal of understory plant species by deer browsing reduces food sources and cover for a large number of native insects, birds and mammals.



Pennypack Creek in Pennypack Park

The PA Fish and Boat Commission is leading an effort to restore populations of native fish species to the watershed. In 2004 the commission released 667,000 hickory shad fry into the creek in an effort to imprint the creek on these anadromous fish (fish that spend parts of their lives in the ocean and return to fresh water to spawn) so that they will return to the Pennypack Creek to spawn. The Fish Commission is supporting these stocking efforts with other cooperative efforts with the Fairmount Park Commission and the Southeast Montgomery County Chapter of Trout Unlimited to remove or mitigate obstacles to fish passage along the length of the Pennypack Creek.

WATER RESOURCES

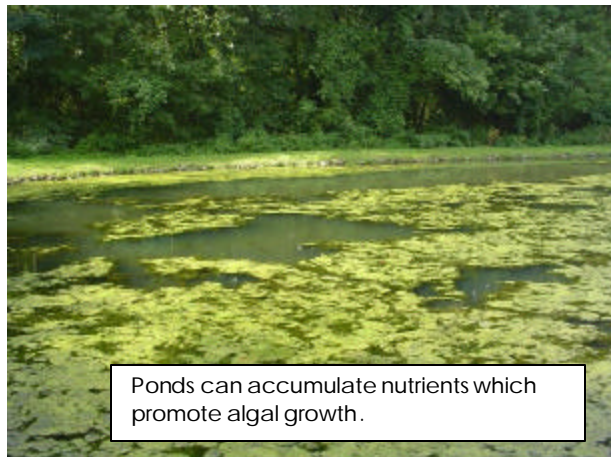
Water resources include both surface and ground water resources. Surface water resources include lakes, ponds, streams, and wetlands, while groundwater resources consist of water stored within porous bedrock called aquifers.

Sustainable water resources are essential for the success of all human societies and provide a nearly endless potential suite of uses ranging from active and passive recreation, industrial cooling and production, food production, irrigation, power generation, flood conveyance, and drinking water. Watershed residents and other users value water resources for the direct and indirect uses they provide. As a society, we also value water resources for their inherent ecological value, their mysterious beauty and for the tremendous variety of life they support. The beauty of a free flowing stream or still fog on a glacial lake has been captured in picture and song for centuries. Many of the world's great scenic landmarks (the Grand Canyon, Crater Lake, Niagra Falls) are either the result of or center around water resources. Even the term water resources, for all its utility, somewhat undermines the true value of rivers, lakes, and wetlands.

Surface Water Resources

The Pennypack Creek Watershed covers 56 square miles and contains 79 miles of surface water streams. The Pennypack Creek's headwaters lie in Horsham Township in Montgomery County and in Warminster Township, Bucks County. The watershed includes approximately 61 ponds occupying 38 acres of land and 502 acres of wetlands. Figure 4 is a map of the ponds and wetlands in the watershed.

A Philadelphia Water Department and Temple University study of ponds in the watershed revealed that 90 percent of the first order streams in the Montgomery County portion of the watershed contain ponds. This statistic indicates that dammed or altered first order streams are the norm in the Pennypack Creek Watershed. These ponds affect water quality and natural stream flows by concentrating nutrients, promoting the growth of algae, and raising water temperatures.



According to the National Wetlands Inventory, the Pennypack Creek Watershed contains approximately 502 acres of wetlands. The National Wetlands Inventory is a service of the U. S. Fish and Wildlife Service that identifies wetlands from aerial photographs. These wetlands are not field verified and may contain data errors or inaccuracies. Field verifications are necessary for determination of jurisdictional wetlands. The large majority of wetlands in the watershed are riverine or riparian wetlands found along the mainstem of the Pennypack Creek. Important areas of wetlands can be found on the Pennypack Preserve, in Pennypack Park, and at the confluence of Meadow Brook with the Pennypack Creek in Abington Township.

Water Quality

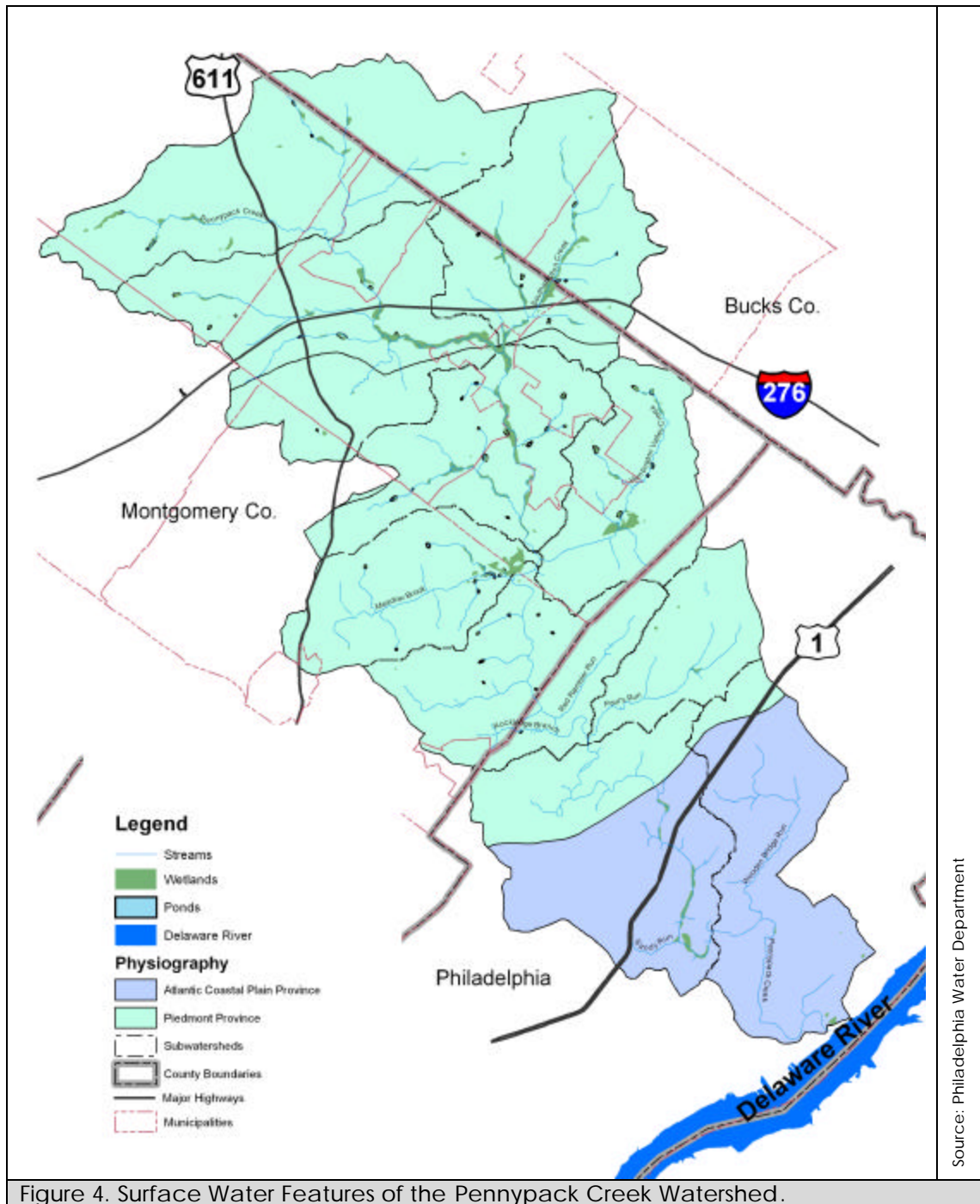
A number of biological assessments and water quality studies have been performed on the Pennypack Creek since the 1960s. Major studies include monitoring by the Pennsylvania Department of Health and the PA Department of Environmental Protection (PA DEP) in the 1960s and 70s, habitat assessments conducted as part of the Pennypack Park Master Plan, and ongoing biological and water quality monitoring by the Philadelphia Water Department and the PA DEP.

PA DEP monitoring has determined that approximately 82 percent of the Pennypack Creek's stream miles are impaired and have subsequently been listed on the Pennsylvania 303d list of impaired waters. According to the DEP *Watershed Restoration Action Strategy for the Poquessing and Pennypack Creek Watersheds*, 66 of the 79 stream miles do not support the biological communities protected by the Clean Water Act. The report indicates that the majority of impairment is due to urban stormwater run-off, water flow variability and flow and habitat alterations. Other recent studies of the creek echo the PA DEP's findings and identify stormwater runoff and fluctuations in stream flow as the primary challenge to protecting and restoring the stream's ecosystem.

The Pennypack Creek, although much improved as a result of the implementation of the Clean Water Act, is still challenged by nutrient contributions from wastewater treatment plant discharges and from non-point source pollution. Watershed residents, in their goal to improve water quality and stream biology, need to take a holistic approach to achieving these improvements by working closely with municipal officials to ensure that all point sources are meeting their permit requirements (and that the funding is there to support plant operators in this endeavor) in addition to educating citizens on the causes and effects of stormwater runoff pollution and the measures that citizens can take to minimize polluted runoff.



Visitors to Pennypack Park near Rhawn Street



CULTURAL AND HISTORIC RESOURCES

The Pennypack Creek Watershed is rich in historic, archaeological and cultural resources. There are 43 buildings and structures either listed or determined to be eligible for listing on the National Register of Historic Places as well as 19 archaeological sites with completed Pennsylvania Archaeological Site Surveys. These sites document Native American habitation, diverse religious groups that settled the area and important milestones in the region's commercial and industrial past. Many cultural resources become threatened by development, redevelopment or infrastructure improvement projects. Cultural and historic sites reveal the importance of the Pennypack Creek and its resources to prehistoric and contemporary residents of the watershed alike and as such, attempts to preserve these unique resources should be included in conservation efforts.



Photo: PHMC

Cairnwood

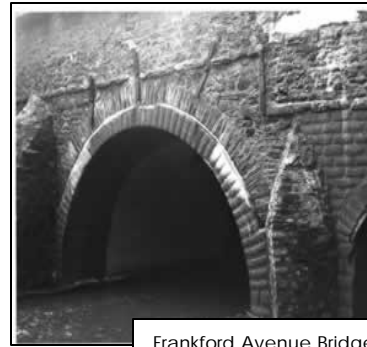


Photo: PHMC

Frankford Avenue Bridge



Photo: PHMC

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GOALS AND OBJECTIVES

The Goals and Objectives of the River Conservation Plan were developed by the plan steering committee, collected from public input and culled from existing and ongoing planning and restoration efforts. Goals and Objectives will continue to be developed through the public meeting process and will reflect public comment and reaction to the draft plan documents.

The following is a list of the goals of the Pennypack Creek River Conservation Plan. These goals will serve as a framework for the development of management options that can be implemented by watershed stakeholders, in order to improve the Pennypack Creek Watershed.

- Improve stream habitats and aquatic resources
- Improve in-stream flow conditions
- Improve water quality and reduce pollutant loads
- Improve and protect stream corridors
- Address flooding
- Enhance and improve recreational opportunities
- Enhance quality of life for watershed residents
- Improve stewardship, communication and coordination among watershed stakeholders and residents

MANAGEMENT OPTIONS

The management options for the Pennypack Creek River Conservation Plan are being developed by the plan steering committee and through input from watershed stakeholders and participants in the public outreach and education efforts. The purpose of the management options is to develop a list of positive actions that watershed stakeholders can implement to improve the health, environment, historical, cultural and economic resources of the Pennypack Creek Watershed. Table 1 is a Preliminary Management Option Matrix that presents the action items that have been developed to date. The management options will be further developed through the River Conservation Planning process and public input.

The River Conservation Planning Team continued to accept input regarding management options until the publication of the Final River Conservation Plan. Through the course of the planning process, the steering committee will prioritize these options and identify primary and supporting partners to implement these action items.

Many of the identified Management Options will support more than one of the Plan's Goals. In these cases the Management Options are included under the most appropriate goal.

Table 1 Pennypack Creek River Conservation Plan Management Option Matrix				
Issues and Concerns	Conservation Action	Specific Locations	Primary Partners	Project Implementation
Goal 1. Improve Stream Habitat and Protect Aquatic Resources				
Planning & Data Gaps	<ul style="list-style-type: none"> Develop comprehensive stream bank and stream channel stability assessment Adopt consistent natural resource protection ordinances for all watershed municipalities 	<ul style="list-style-type: none"> Work with Meadowbrook Country Club to improve natural riparian corridor 	PWD, SEMCTU, TU Municipalities, CPC, PEC	<ul style="list-style-type: none"> 2005-2006
Implementation	<ul style="list-style-type: none"> Improve in-stream habitats through dam removal and habitat enhancement projects Daylight buried and piped stream channels where feasible Restore geomorphic stability through active channel restoration Implement stream and riparian restoration recommendations of FPC Pennypack Park Master Plan 	<ul style="list-style-type: none"> Huntingdon Pike Dam Restore day-lighted section of the Sandy Run Lorimer Park Adopt-A- Stream project 	FOPP, FPC, PAFBC, PERT, PWD, SEMCTU	<ul style="list-style-type: none"> On-going habitat restoration projects
Monitoring	<ul style="list-style-type: none"> Monitor successes of habitat and species restoration efforts through agencies, volunteers and non-profit organizations 	<ul style="list-style-type: none"> Monitor success of PAFish and Boat Commission Shad restoration and dam removal program Continue PWD Biomonitoring efforts 	DRKN, FOPP, FPC, PAFBC, PWD, SEMCTU	<ul style="list-style-type: none"> On-going
Education	<ul style="list-style-type: none"> Work with PA DOT and municipalities to ensure proper bridge and culvert design for new and redevelopment 	<ul style="list-style-type: none"> PA Turnpike repairs 	DVRPC, Municipalities, PA DOT, PEC, PWD	<ul style="list-style-type: none"> 2006-2007
Goal 2. Improve In-stream Flow Conditions				
Planning & Data Gaps	<ul style="list-style-type: none"> Develop headwater protection ordinance to assist municipalities with protection of headwater streams Ensure enforcement of municipal natural resource protection ordinances Identify and prioritize stormwater BMPs for retrofits that promote infiltration and reduce stream flow variation during storm events 	<ul style="list-style-type: none"> All municipalities 	PEMA, CCD, CPC, Municipalities	<ul style="list-style-type: none"> 2006-2008

Table 1 Pennypack Creek River Conservation Plan Management Option Matrix				
Issues and Concerns	Conservation Action	Specific Locations	Primary Partners	Project Implementation
Implementation	<ul style="list-style-type: none"> Encourage large institutional landowners to implement porous pavement, infiltration trench and other on-site infiltration demonstration projects Retrofit stormwater BMPs for biological water treatment and longer detention times Remove headwater ponds 	<ul style="list-style-type: none"> Willow Grove Mall 	SEMCTU, PAFBC, Korman Corp. Municipalities, PEC, PWD, TU	<ul style="list-style-type: none"> 2005-2006 On-going
Monitoring	<ul style="list-style-type: none"> Establish additional flow monitoring stations on the creek 	<ul style="list-style-type: none"> Establish flow monitoring stations in rapidly changing sub-watersheds such as the Pennypack Headwaters 	SEMCTU	<ul style="list-style-type: none"> 2006-2008
Education	<ul style="list-style-type: none"> Work with county conservation districts and municipal EACs to implement rain barrel, rain garden and green roof workshops Develop and present stormwater management workshops for homeowners, builders and municipal officials 		CCD, Municipalities, PWD	<ul style="list-style-type: none"> On-going
Goal 3. Improve Water Quality and Reduce Pollutant Loads				
Planning & Data Gaps	<ul style="list-style-type: none"> Develop Act 167 Plan Adopt and implement NPDES Phase II Regulations Collect fecal coliform monitoring data to characterize sources of coliform, including wet weather sampling Develop BMP database, including location, ownership and maintenance needs Develop long term monitoring and maintenance plans for new and existing stormwater BMPs in the watershed 		CCD, CPC, Municipalities, PWD, TU	<ul style="list-style-type: none"> On-going
Implementation	<ul style="list-style-type: none"> Institute stormwater BMP maintenance and monitoring program Continue to take actions to reduce the occurrence of combined sewer overflows 	<ul style="list-style-type: none"> All municipalities and City of Philadelphia 	CPC, Municipalities, PWD, TU	<ul style="list-style-type: none"> On-going

Table 1 Pennypack Creek River Conservation Plan Management Option Matrix				
Issues and Concerns	Conservation Action	Specific Locations	Primary Partners	Project Implementation
Monitoring	<ul style="list-style-type: none"> Implement aggressive monitoring program to track sewer infrastructure leaks and illegal cross connections Conduct additional water quality monitoring on the watershed to characterize pollutant loading sources Monitor water quality changes in BMP retrofits 	<ul style="list-style-type: none"> City of Philadelphia All municipalities 	CHE, DRKN Municipalities, PWD, Utilities	<ul style="list-style-type: none"> 2006-2008
Education	<ul style="list-style-type: none"> Develop homeowner's manual for pond owners in headwaters to improve water quality Develop BMP demonstration site map and informational materials for municipalities and developers 		CPC, CCD, DRKN Municipalities, PWD, TU	<ul style="list-style-type: none"> 2006
Goal 4. Improve and Protect Stream Corridors				
Planning & Data Gaps	<ul style="list-style-type: none"> Develop and implement deer management plans for natural areas Develop invasive species management plans for natural areas and parks Develop watershed wide open space/riparian corridor protection plan Create inventory database of riparian landowners to be used for outreach and education and research Adopt woodland protection ordinances, in watershed municipalities, that limit removal of existing vegetation and update standards for tree replacement with species that were removed from the development site Develop tree protection standards to be used by municipalities to protect existing trees and woodlands on development sites 	<ul style="list-style-type: none"> Lorimer Park, municipal parks and open spaces 	FPC, CPC, CPD, PERT, NLT, PEC, Municipalities	<ul style="list-style-type: none"> On-going
Implementation	<ul style="list-style-type: none"> Conduct landowner outreach and education programs to promote better riparian land management Improve upstream/downstream connectivity by protecting existing green corridors and promote new green corridors through easements, land acquisition and donations Actively remove non-native invasive plant species from riparian areas and restore riparian habitats by revegetating with native plant species 	<ul style="list-style-type: none"> All along Pennypack Creek and tributaries 	CCD, FPC, PAFBC, PWD	<ul style="list-style-type: none"> 2007-2010

Table 1 Pennypack Creek River Conservation Plan Management Option Matrix				
Issues and Concerns	Conservation Action	Specific Locations	Primary Partners	Project Implementation
Monitoring	<ul style="list-style-type: none"> Track annual statistics of open space acquired, easements donated and acres of land preserved in a common database 		GSA, CPC	<ul style="list-style-type: none"> On-going
Education	<ul style="list-style-type: none"> Hold workshop for golf courses, homeowners, corporations and apartment building managers and other large riparian landowners on stream and riparian management. 		CCD, CPC, Municipalities, PEC	<ul style="list-style-type: none"> Immediately
Goal 5. Address Flooding				
Planning & Data Gaps	<ul style="list-style-type: none"> Update flood emergency management plans Develop mechanism for the removal or reconfiguration of log and woody debris jams to reduce erosion and flooding 		FEMA, Municipalities, PEMA	<ul style="list-style-type: none"> Immediately
Implementation	<ul style="list-style-type: none"> Buy out flood prone properties to promote green river corridors Enforce floodplain protection ordinances Implement recommendations of Temple University Floodplain Study 		FEMA, Municipalities, PEMA, PADOT	<ul style="list-style-type: none"> On-going
Monitoring	<ul style="list-style-type: none"> Track permitted floodplain encroachments and variances granted to allow development in the floodplain 		CPC, Municipalities	<ul style="list-style-type: none"> 2006
Education	<ul style="list-style-type: none"> Create clearinghouse of municipal information for repairing flood damage, protecting floodplains and floodplain best management techniques 		CPC, PEMA	<ul style="list-style-type: none"> 2006
Goal 6. Enhance and Improve Recreational Opportunities				
Planning & Data Gaps	<ul style="list-style-type: none"> Develop maintenance and management plans for existing recreational facilities and open spaces Investigate opportunities for new active and passive recreational facilities in the watershed Update recreation plans to reflect demographic changes 	<ul style="list-style-type: none"> Investigate further development of park at the mouth of the Pennypack Creek for interpretive center and environmental education 	CPC, CPRD, FPC, GSA, Municipalities, PDR	<ul style="list-style-type: none"> 2006-2009

Table 1 Pennypack Creek River Conservation Plan Management Option Matrix				
Issues and Concerns	Conservation Action	Specific Locations	Primary Partners	Project Implementation
Implementation	<ul style="list-style-type: none"> Implement access and trail improvement recommendations of FPC Pennypack Master Plan Continue recreational facility upgrades and maintenance Acquire additional community open space 	<ul style="list-style-type: none"> Implement Newtown Rail Trail and other identified trail linkages Significantly upgrade Pennypack Valley Park between Torresdale Ave. and State Road to reconnect park to Delaware River 	CPC, CPRD, FPC, GSA, Municipalities, SEPTA CPC, CDC, CPRD, FPC, Municipalities, PDR	<ul style="list-style-type: none"> 2006-2010 On-going
Monitoring	<ul style="list-style-type: none"> Conduct surveys to gauge public interest in proposed trail networks and connections 	<ul style="list-style-type: none"> Bucks and Montgomery Counties 	GSA, CPC	<ul style="list-style-type: none"> 2006
Education	<ul style="list-style-type: none"> Market watershed's recreational amenities through development of brochures, maps and other educational materials 		CPC, CDC, CPRD, FPC, Municipalities, PDR	<ul style="list-style-type: none"> On-going
Goal 7. Enhance Quality of Life for Watershed Residents				
Planning & Data Gaps	<ul style="list-style-type: none"> Identify opportunities to improve stream access, especially in upper watershed where connection to stream is lost 		GSA, CPC, Municipalities	<ul style="list-style-type: none"> On-going
Implementation	<ul style="list-style-type: none"> Conduct regular stream clean-ups Conduct regular trail maintenance activities Ensure environmentally sensitive redevelopment of Willow Grove Naval Air Base, should it close <ul style="list-style-type: none"> Set aside land for recreation Protect natural communities identified in the Natural Areas inventory Use innovative BMPs for stormwater management 	<ul style="list-style-type: none"> Coordinate watershed wide clean-up day Develop Adopt-A-Stream Program 	SEMCTU, PERT, FOPP, PWD CPC, Municipalities, DCED	<ul style="list-style-type: none"> 2006 On-going
Monitoring	<ul style="list-style-type: none"> Conduct series of surveys and public outreach events to evaluate success of River Conservation Plan implementation projects 		PP	<ul style="list-style-type: none"> 2009

Table 1 Pennypack Creek River Conservation Plan Management Option Matrix				
Issues and Concerns	Conservation Action	Specific Locations	Primary Partners	Project Implementation
Education	<ul style="list-style-type: none"> Implement environmental education and program outreach to minority and immigrant groups Implement program similar to National Institute of Health, educating people about health benefits of walking, running and bike riding in a natural setting 	<ul style="list-style-type: none"> Northeast Philadelphia and other areas with large immigrant populations 	CHD, CPRD, FPC, PERT	<ul style="list-style-type: none"> 2006-2009
Goal 8. Improve Stewardship, Communication and Coordination Among Watershed Stakeholders and Residents				
Planning & data Gaps	<ul style="list-style-type: none"> Hold workshops to reduce municipal miscommunication and promote regional planning Create an organization or other mechanism for plan implementation Create a watershed information clearing house or web site that promotes and coordinates stewardship activities 		CPC, FPC, PEC, PWD, PP	<ul style="list-style-type: none"> 2006
Implementation	<ul style="list-style-type: none"> Promote education about buried segments of Sandy Run—similar to Wingohocking Mystery tour in Germantown Develop a small scale map, brochure, or tour booklet to educate populace about watershed and reconnect headwater communities to the stream Develop or implement accredited stewardship program or curriculum that meets state education standards Target developers for education programs Name unnamed tributaries in the watershed Implement education program for residents about location, function and value of streams in their communities Hold annual event to promote watershed issues Present open space preservation education programs <ul style="list-style-type: none"> Tax benefits Tools for municipalities Benefits and methods 	<ul style="list-style-type: none"> Implement Adopt-A-Stream Program 	CPC, CCD, PP, PWD, PEC	<ul style="list-style-type: none"> On-going
Monitoring	<ul style="list-style-type: none"> Create recognition program such as municipal ecology awards to promote environmental stewardship and good ordinance development Review accomplishments of plan in 5 years for <ul style="list-style-type: none"> Watershed Impact Implementation 		CPC, CCD, GSA, PP, PWD, PEC PP, PWD, PPSC	<ul style="list-style-type: none"> 2006 2010

Issues and Concerns	Conservation Action	Specific Locations	Primary Partners	Project Implementation
Education	<ul style="list-style-type: none"> • Develop and distribute education materials • Implement "Rediscover Your Watershed" Program (history, connections to natural environment) 		CPC, CCD, PP, PWD, PEC	<ul style="list-style-type: none"> • On-going

Abbreviations: CCD, County Conservation Districts ; CDC, Community Development Corporations; CHD, County Health Departments; CPC, County Planning Commissions; CPRD, County Parks & Recreation Departments; DCED, Department of Community and Economic Development; DRKN, Delaware River Keeper Network, FEMA, Federal Emergency Management Agency; FPC, Fairmount Park Commission; FOPP, Friends of Pennypack Park; GSA, Green Space Alliance; NLT, Natural Lands Trust; PA DOT, PA Department of Transportation; PAFBC, PA Fish & Boat Commission; PEC, Pennsylvania Environmental Council; PEMA, PA Emergency Management Agency; PERT, Pennypack Ecological Restoration Trust; PP, Pennypack Partnership; PPSC, Pennypack RCP Steering Committee; PRD, Philadelphia Department of Recreation; PWD, Philadelphia Water Department; SEMCTU, Southeast Montgomery County Trout Unlimited; SEPTA, Southeastern PA Transportation Authority; TU, Temple University