

CHAPTER 3
ISSUES, CONCERNS, CONSTRAINTS AND
OPPORTUNITIES

3.1 URBAN STREAMS: RECLAIMING A LOST GREATNESS

The study of urban streams in American cities is a dichotomy between a glorious past and a largely forgotten present. One would be hard pressed to name a major American city that did not owe a great debt to the rivers and streams that flow through them. Indeed, in almost every city, urban streams have played a critical role in paving the way for economic development—providing power for new industries, water for growing towns and cities, and a means of moving raw materials and finished goods to and from market.

Paradoxically, it is the heavy hand of growth and prosperity that has left many of our urban streams in shambles. Today, in many cases, our urban streams have become forgotten arteries; receptacles for trash, sewage and stormwater; captured, buried, and straightened by the cities they once helped to build. Only when heavy rains come are we reminded of our streams as they flood our homes, businesses, and roadways.

But in some places, where foresight or good fortune has preserved our city streams, we see their great potential. They are places where the rush of water can whisk one away from the rigors of urban life, where children can learn to fish or discover a new world teeming with life. Our streams are green ribbons of life that weave and connect distant communities and serve as a rallying point that can provide a new breath of hope for troubled neighborhoods. They are portals into the exploits and undertakings of past generations. They can provide food or refreshment on a summer day, or provide the perfect backdrop for a romantic walk or a family picnic.

Restoring our urban streams involves first reinventing our concepts of how these streams can make our cities better places to live. Many urban streams no longer play the central role in commerce, navigation or power generation they once did (although some do), but still play critical roles in providing safe drinking water, stormwater conveyance, recreation opportunities, and natural habitats for an array of aquatic life. To this end, managing our city streams is as much about getting people excited about the potential as it is about cleaning up pollution. It is about learning to see our streams in a new way - different, but no less great than when they once helped cities rise. Apathy is indeed the enemy.

Starting with the premise that every city stream can be a resource to the people that live near it, we can begin to take aim at the problems that plague our city streams. Before we can do this however, we must begin to understand how the mere presence of a city landscape surrounding a stream begins to disrupt and alter a stream's delicate ecological balance.

The History of Impact

As many American cities developed, both direct use of stream channels for industry and commerce (e.g., dredging for navigation, damming of streams for milling, etc.), landscape changes (e.g., paving of roads, replacement of natural drainage ways with storm sewers, construction of bridges, etc.), and disposal of human and industrial waste products combined to negatively impact nearby streams and rivers. In many cases, these and other factors drastically diminished the ability of urban streams to sustain aquatic life and provide the full suite of uses and benefits to urban residents.

Many urban streams in the United States have a disturbance history that extends hundreds of years. During this time, many of these streams have been straightened, filled, dredged, and/or piped to accommodate new development or to facilitate drainage. Other streams have been dammed to provide flood control, hydroelectric power, and recreational benefits. In the

northeastern United States, the predominance of milling operations in the 1700s and 1800s placed hundreds of small mill dams on small-to-medium sized streams. Many of these structures remain today. Bridges that traverse streams often produce local scale instability and bank erosion problems and can exacerbate flooding problems. Much of the riparian, or streamside, forest and vegetation that surrounds natural streams is removed along urban streams, resulting in banks that are more susceptible to erosion. Removal of riparian forests also results in increased warming of stream water by sunlight and a reduction in woody debris inputs, which are a fundamental habitat feature of urban streams.

Because the physical form of a stream channel (e.g., width, depth, meander pattern) is calibrated to handle the amount of water and sediment delivered to the channel, modifications to landscapes that alter water and sediment transport can produce stream systems that are geomorphically unstable. Actively adjusting streams often widen and downcut, introducing large volumes of sediment into the stream channel. This process can further destabilize or degrade downstream reaches. Unstable streams often lack the physical habitat diversity and year-round flow required to support a diverse assemblage of biological organisms.

Physical changes to streams within urban landscapes are accompanied by equally damaging changes to water chemistry. Pollutants including nutrients, sediment, pathogens, hydrocarbons, and heavy metals are generated within urban landscapes and transported readily via stormwater drainage systems to urban streams.

Water withdrawals for drinking water, commercial and industrial use, and irrigation also alter the timing, volume, and quality of water delivered to urban streams. Effluent from wastewater treatment plants, industrial facilities and construction sites carry additional sources of pollution. Although many of these discharges are now regulated under the Clean Water Act, there are many illegal and illicit discharges, as well as permitted discharges that are in frequent violation of water quality standards.

In many cities, stream water and habitat quality decreased to the point where many streams became viewed as extensions of the man-made city infrastructure rather than as natural ecological systems – mere conduits for the elimination of wastewater or canals for the movement of materials. The management of stream systems reflected this limited view of the purpose and function of urban streams. Often, stream systems were modified to enhance a specific purpose, or to eliminate a particular ill to the detriment of many other potential functions. For instance, many urban streams that functioned as wastewater conduits were buried and converted into underground sewers. Streams that played important navigational roles were straightened, lined, or fitted with navigational locks and dams to enhance their ability to convey large cargo ships. In this and other ways, the early “management” of stream channels further impeded the ability of the stream system to support even the most basic level of aquatic life.

Many of these outcomes are the result of a development policy that failed to recognize the innate and intimate connection between land management and water resource quality, that maximized short-term use of water resources for specific purposes while failing to provide long-term sustainability, and that sought to control the negative effects of flooding streams primarily through structural engineering.

3.2 MOVING FORWARD – A NEW PARADIGM FOR URBAN STREAM MANAGEMENT

Today, we are developing new ways to approach urban streams that are based on a paradigm of integrated, sustainable, watershed-based water resources management. Watershed-based management recognizes the profound linkage between landscape processes and stream resources and therefore concentrates on land management as the principle vehicle for attaining and maintaining healthy streams. Integrated management seeks to create natural-like stream systems that offer the fullest range of uses and benefits to the largest possible range of user groups. Sustainable management means that managers provide these uses and benefits over time with a minimum amount of active interference.

Urban streams are used and valued by a number of different groups in sometimes widely differing ways. Common uses and values of urban streams include:

Active Recreation – use of a stream or stream corridor for boating, watersports, swimming, biking, fishing or similar activity

Passive Recreation – use of a stream or stream corridor for streamside walking, natural observation, meditation or similar activity

Power Generation – the use of streamwater for cooling or heat rejection

Navigation – movement of cargo to upstream and downstream destinations

Potable Water – use of stream water for drinking and bathing

Non Potable Water – use of stream water for irrigation, cleaning, and other non-potable uses

Property Values – the influence of a stream on the resale value of a home or business

Flood conveyance – the ability of a stream to transmit flood waters from source to mouth

Waste disposal – the ability of a stream to dilute, degrade, and transport industrial, residential, and commercial waste products

Urban streams that emulate the form and physical processes of natural stream channels will provide the most benefits to the widest range of groups for the lowest cost over time. Some of these fundamental attributes include:

- **Water quality** – stream water that is free of pollutants (including elevated temperatures) that diminish the ability of aquatic organisms to live and reproduce
- **Geomorphic stability** – a stream channel that does not rapidly change its width, depth, slope, or pattern over time
- **Longitudinal and lateral connectivity** – a stream channel that permits the free movement of aquatic and riparian organisms upstream and downstream along the stream channel and adjacent riparian areas, and which is hydrologically connected to its floodplain
- **Habitat diversity** – a stream channel that contains the full range of in-stream, riparian and benthic (bottom) habitats and a variety of water depths and velocities; in forested areas – a supply of in-stream woody debris
- **In-stream flows** – a stream channel that supports sufficient year-round flow to permit the persistence of diverse aquatic communities
- **Flood conveyance** – a stream channel and floodplain that is capable of transmitting flood waters without excessive damage or flooding

In urban environments, a set of stressors diminish the ability of a stream system to maintain these fundamental attributes. In many cases, multiple stressors act in concert over time to diminish multiple attributes. Urban stressors can be roughly divided into three categories: Point Source Discharges, Landscape Change Stressors, and Stream Corridor Stressors.

- **Point Source Discharges:** This set of stressors includes point discharge of pollutants and waste materials from residential, commercial, and industrial areas. Common examples of point source discharges include industrial waste discharges and wastewater treatment plant discharges.
- **Landscape Change Stressors:** This set of stressors includes modifications to the natural landscape including changes in topography, removal of vegetation, alterations to native soils, paving, and installation of artificial drainage systems that result in alterations to natural drainage patterns and/or transmission of non-point source pollution.
- **Stream Corridor Change Stressors:** This set of stressors includes alterations to stream corridors including the removal of riparian vegetation; the constriction of bridges, dams and other structures that restrict, constrict, or otherwise alter streamflow; and the straightening, burying, or lining of stream channels.

It is important to realize that impacts to urban systems often occur through a sequence of stress causing events that starts within an Ultimate Stressor (e.g., the ultimate or root cause of the problem, etc.) which in turn produces Intermediate Stressors and finally Proximate Stressors (e.g., the apparent or obvious cause of the problem, etc.). Stressor analysis involves understanding the complex chain of stressors that ultimately negatively influence natural functions and attributes. Such analysis often illustrates the linkages between stream management and larger socio-economic patterns and trends. For this reason, sustainable stream management often involves working with a larger set of groups and institutions working to effect large-scale socio-economic changes in urban environments.

Effective and sustainable management of urban stream systems involves a participatory, iterative process that involves many steps including:

- Understanding how various groups use and value or could **potentially** use and value a stream,
- Understanding the linkages between uses and values and the functions and attributes that make these uses and values possible,
- Evaluating the stream's current condition in terms of functions and attributes,
- Understanding how various stressors are combining to undermine functions and attributes,
- Developing a cohesive management plan that uses available resources to increase uses and values by enhancing natural functioning,
- Developing organizational, public relations, political, financial, and technical resources to implement the management plan,
- Developing a plan for on-going monitoring and evaluation, and
- Building awareness, excitement, and momentum through educational and outreach programs

In the following Chapters, this report will explore how the Pennypack Creek is used and valued by various watershed stakeholders. The collection and analysis of public participation data collected during the two-year RCP process, including citizen surveys, key person interviews, and feedback obtained during neighborhood and public meetings, played a key role in our ability to understand how the Creek is used and valued. We will also explore ways in which the uses and values of the Creek might be enhanced through actively managing the creek's watershed and corridor.

We will also spend considerable time exploring ways in which various stressors (i.e., entities or actions that stress or negatively affect the value or uses of a natural resource) alter the natural functioning of the creek and thus the ability of the creek to provide for existing or potential uses and values.

Finally, we will explore ways in which various actions including monitoring, educational programs, stream restoration projects, and landscape restoration might be used to improve the natural functioning of the Pennypack Creek and ultimately the uses and values of the Creek.

3.3 URBAN STREAM MANAGEMENT CHALLENGES

Before we proceed with the development of a Rivers Conservation Plan, let us consider some of the unique management challenges associated with urban streams in general, and the Pennypack Creek in particular. Keep these ideas in mind as you read through the rest of the report chapters.

Developing a Common Vision

Urban streams mean many things to many different groups of people and it is nearly impossible for one resource to meet all needs. One example of how various groups value the Pennypack Creek differently involves perceptions of the creek between city and suburban residents. Within the City of Philadelphia, the Pennypack Creek flows through Pennypack Creek Park, which is extensively used as a recreational resource by area residents. The wide, natural areas surrounding the creek protect nearby residences from flooding. The Creek is also much larger in these areas and is capable of supporting many species of game fish. By contrast, reaches of the Pennypack Creek in the Hatboro area are much smaller, support limited recreational use, lack recreational access or significant natural buffers, and have routinely caused flooding problems. Naturally, residents within the City of Philadelphia are more likely to use and value the Pennypack Creek as a resource than residents near and in the Borough of Hatboro. The results of the RCP Citizen Survey reinforce this conclusion. Survey results showed that City of Philadelphia residents were almost three times as likely as suburban residents to visit the creek daily or weekly.

Developing a common vision for an urban stream is a difficult and demanding undertaking. However, while the uses and values provided by urban streams may sometimes be in opposition, often the needs of many groups can be accommodated by restoring natural form and function to the stream system. In the Pennypack Creek Watershed, developing a common vision for the future of the creek is a key challenge.

50,000 Pounds of Cure

Often, the management of urban stream systems is hampered and restricted by severe physical, financial, and political constraints. In highly developed watersheds, large-scale restoration efforts can be extremely costly because they require retrofitting of existing facilities, disturbance of existing buildings and utilities, extensive permitting, and public buy-in. For example, large portions of the Sandy Run, a major tributary of the Pennypack Creek that flows through the Rhawnhurst section of Philadelphia, have been buried and piped in large combined sewers. While daylighting Sandy Run would dramatically improve the natural functioning of that stream, the feasibility of this management option is limited by virtually insurmountable financial, technical, and political challenges.

Finding creative ways to work with regulatory authorities, funding agencies and local watershed groups to find cost-effective restoration approaches continues to be a critical challenge in many urban watersheds including the Pennypack.

Finding Ways to Reach People

Watershed management is based on the concept that what happens on the landscape affects our streams and waterways. In urban environments, this means that meaningful improvements in water quality can require widespread voluntary behavior changes among tens of thousands of watershed residents. Watershed management and stream health are important, but secondary issues to many urban residents. Many folks do not know what a watershed is, and

for those who live on the outskirts of the watershed, making the connection between their actions and a stream that is many miles away is difficult.

Making the real connection between water resource quality and people's quality of life is also a fundamental challenge for urban watershed managers. Drinking water quality and recreation value are two issues that resonate with urban residents, because they provide a tangible use and benefit for the average person. Finding creative, effective ways to raise awareness about watershed issues in a media saturated world is also a challenge. Often watershed groups rely on "low cost" methods of advertising including flyers, newsletters, and piggybacking onto existing events (e.g., local community fairs, community group meetings). Finally, effectively engaging various minority groups in watershed restoration efforts is an emerging challenge.

What Do We Do Next?

Most of the potential for new open spaces is gone. There is pavement as far as the eye can see. Most of the developments were built with minimal or no stormwater control. Streams are eroding and downcutting, not to mention flooding. What do we do next? Do we invest more funds into monitoring the stream to figure out exactly what is wrong with the stream? What about an intensive public outreach campaign? Will that really make a difference? Maybe we should conduct a stormwater retrofit at the local church. Developing a cohesive management strategy that balances the concept of prioritization (figuring out which management options among many will be most effective), with the concept of opportunity (which management options may be most possible because of public acceptance, political momentum, funding, etc.), is a critical, often overlooked, step in watershed restoration efforts.

There are highly technical methods for prioritizing restoration sites based on risk analysis, cost/benefit analysis and other methods. However, the technical merit of a particular project (e.g., pounds of pollutant removed) compared with project cost should not be the sole determinant of a project's priority. Other factors that should be considered include landowner cooperation, public relations potential, and educational benefit. For instance, a particular project may be a priority because it forges an alliance with a particular landowner, or result in a high-profile media coverage of watershed issues. These projects may be just as, if not more important than, projects that are low cost/high benefit from a purely technical perspective.

Geographic information systems (GIS) can be an invaluable tool for collecting, analyzing, and managing site data that can be used to prioritize restoration efforts.

The Upstream/Downstream Conundrum

Most of the obvious, tangible benefits associated with streams occur when streams reach a certain critical size. Larger streams can support diverse recreational and commercial fisheries; can be used for navigation, power generation, and a source of drinking water; and can support a variety of recreation uses. Larger streams also are more likely to negatively affect communities, principally through flooding. Either way, residents living adjacent to or near larger streams are more likely to have a strong opinion about their local stream. Paradoxically, people living adjacent to and near larger rivers exert a proportionally small influence on the quality of the river system.

Small streams, by contrast, offer little in the way of tangible societal benefits. Residents living adjacent to or near these small streams, in headwater reaches of a watershed, are often not even aware of the stream's existence, and if they are aware, they are unlikely to value the stream in any strong way. These residents tend to live tens of miles from the larger, more actively valued and used stream segments. Paradoxically, it is these upstream watershed

residents that exert a disproportionately large influence on the quality of the entire stream system.

The spatial disconnect between those who most acutely influence streams (upstream residents) and those who most intensively use and value streams (downstream residents) is an important paradox to recognize when managing urban stream systems.

Getting Real

Setting realistic management goals for urban stream management is important. Most urban streams cannot attain water quality, habitat quality, or aquatic diversity equivalent to that of a pristine stream draining an undisturbed landscape. However, many urban streams can support a diverse array of aquatic life, provide exceptional recreational opportunities, and can strive to achieve water quality sufficient to support swimming and to provide sources for drinking water.

Setting achievable goals is a critical aspect of effectively managing urban water resources including the Pennypack Creek.

Thinking Watershed, Reacting Locally

Watersheds range in size from small headwater drainages to the massive land areas that drain to our largest rivers. Because smaller watersheds are almost always a part of one or more larger watersheds, management of these smaller watersheds should and must advance the management of the larger watersheds to which they contribute. Incorporating management goals of larger watersheds may significantly change the way a smaller watershed is managed. For instance, in many smaller streams nutrient enrichment is not a serious problem. However, nutrient enrichment (and therefore nutrient management) is often of paramount concern in larger rivers and estuaries. Often, the management of nutrient loads in smaller streams is critical to managing the quality of the larger downstream resource. Therefore, the explicit inclusion of nutrient reduction strategies in management plans for smaller watersheds is critical for the management of nutrient pollution in large rivers and estuaries. The recognition that a smaller watershed is not a self contained unit, but is often part of a larger management effort, is critical to the success of large-scale watershed management efforts.

The Pennypack Creek drains into the Delaware River Estuary. As such, the management of the Pennypack Creek and its watershed must address not only the uses and values associated with the Pennypack Creek, but also the management goals and objectives that have been developed for the Delaware River and the Delaware Estuary. In particular, the Pennypack Creek Rivers Conservation Plan should advance the goals and objectives of the Delaware River Basin Commission's *Comprehensive Plan for the Delaware River Basin* and the Partnership for the Delaware Estuary's *Comprehensive Conservation and Management Plan*.

Active vs. Passive Management

Historical approaches to stream "management" have typically involved engineering-intensive attempts to control and regulate streams. Today, we are realizing that certain natural stream processes including flooding and natural rates of erosion are characteristic of healthy stream systems and do not need to be regulated. Rather, we are beginning to take a more passive approach to stream corridor management. For instance, rather than building flood control structures to prevent the flooding of homes and businesses located with the floodplain, we are taking steps to remove development from the floodplain and to strongly regulate new development in active floodplains.

Reaching Across Boundaries

Approaches to minimizing the scope and intensity of future landscape and stream corridor changes involves regulating land use. In Pennsylvania, the Commonwealth devolves statutory authority to regulate land uses to individual municipal governments. This statutory authority is defined and regulated by the Municipal Planning Code (MPC). Within the limits of the MPC, each municipality in the Commonwealth can adopt and enforce a set of land use regulations.

From a watershed perspective, locally-based land use regulation presents difficult challenges. First, locally-based land use regulation simply means that the lands within a single watershed are subject to many different sets of laws. Affecting change in land use regulation to improve watershed protection throughout a watershed therefore means that watershed managers must work with many jurisdictions independently. Achieving uniformity in land use regulation across a watershed is exceedingly difficult. The RCP considers challenges associated with effective land use regulation in the Pennypack Creek Watershed in more detail in Chapter 4.

Reaching across boundaries also means breaching racial, cultural, and social boundaries. A successful urban watershed management effort must reach out to all watershed residents. In the Pennypack, minority residents are underrepresented in watershed management efforts and must be more effectively engaged in future efforts.

Working Together for Change

Managing an urban stream involves a great many endeavors including public relations; public education and outreach activities; fund raising; scientific data collection, management and analysis; engineering assessment and design; political advocacy; legal challenges; coalition building, and so forth. No one single group possesses the depth and breadth of human, financial, and organization resources to effectively accomplish all of the tasks associated with an effective watershed management effort. Even if they did, watershed management is essentially a team sport.

Working together for change means bringing a diverse suite of organizations and individuals together around a common banner. However, it is not enough to have a number of engaged groups working in a particular watershed. Implementing strategies to share data, equipment, and other resources among groups in a watershed enhances the effectiveness of each group as well as the watershed effort as a whole. Each group brings a particular set of skills, knowledge, and abilities to a watershed management effort. As such, part of an effective management plan is collectively figuring out how each group's contribution can be most effectively used to achieve management goals.

In the Pennypack Creek Watershed, there is no shortage of active groups working in various ways to improve the creek. These groups include the Philadelphia Water Department, Friends of Pennypack Park, Fairmount Park Commission, Temple University Center for Sustainable Communities, the Southeast Montgomery Chapter of Trout Unlimited, and the Pennypack Ecological Restoration Trust. The major challenge is to find ways for these groups to combine forces to achieve common goals, share knowledge, ideas, and input, and to develop synergies that will allow each group to better achieve its own mission within the context of a large watershed effort.

3.4 WATERSHED MANAGEMENT IN THE PENNYPACK CREEK WATERSHED

Humans have exerted both positive and negative influences on the Pennypack Creek Watershed since before the settlement of the region by Europeans. Native Americans cleared forested lands for agriculture, settlement and game management. Europeans brought more intensive land uses and dammed the Pennypack Creek in many places. More recently, efforts to restore and protect the Pennypack Creek have been implemented. Throughout the region's history, efforts to influence the nature of the creek have reflected the manner in which people view and value the Pennypack Creek as a resource.

Past Efforts

The most notable historical efforts to protect the Pennypack Creek and its watershed have been through the preservation and acquisition of natural landscapes. The three primary organizations responsible for the preservation of large areas of natural lands in the watershed have been the Fairmount Park Commission, Pennypack Ecological Restoration Trust and Montgomery County.

FAIRMOUNT PARK COMMISSION

Some of the earliest efforts to preserve natural lands in the watershed were implemented by the City of Philadelphia in order to provide protection for sources of drinking water and preserve open space opportunities for city residents. The Fairmount Park Commission was established by an act of the city assembly in 1867. Today the Commission is responsible for the 63 neighborhood and regional parks that comprise Fairmount Park.

The commission began purchasing land that would become Pennypack Park in 1905. By 1929, the commission had acquired most of the 1,600 acres of open space that is Pennypack Park today.

In 1996, the commission received a grant from the William Penn Foundation to restore the natural lands in its charge and enhance or create environmental education programs within the park system. Fairmount Park Commission's Natural Lands Restoration and Environmental Education Program (NLREEP) was created within the commission to administer the grant and promote this mission. NLREEP contracted with the Academy of Natural Sciences in 1997 to formulate restoration plans for the natural areas in Wissahickon, Cobbs Creek, Fairmount, Franklin Delano Roosevelt, Tacony Creek, Pennypack Creek and Poquessing Creek Parks. These plans have been the basis for ongoing restoration efforts in the city portion of the Pennypack Creek Watershed. Examples of NLREEP restoration projects in the watershed include the creation of intertidal wetlands at the mouth of the creek, invasive plant species control and riparian buffer restorations.

Following the completion of the grant, NLREEP was transformed to the Environment, Stewardship and Education Division. The ESED program continues to implement restoration projects identified in their park management plans as well as assuming new project objectives. The program has become a regional example of ecologically sound land management and restoration efforts and continues to exert positive influences on the Pennypack Creek Watershed.

PENNYPACK ECOLOGICAL RESTORATION TRUST

The Pennypack Ecological Restoration Trust (Trust) was founded in 1970 to preserve natural lands in the rapidly developing portion of eastern Montgomery County. The Trust protects

natural lands through land donations, purchase and acquisition of conservation easements. Today the Trust has assembled 720 acres of meadows and woodlands in the Pennypack Creek Watershed, making the Pennypack Preserve the largest privately owned nature preserve in Montgomery County that is open to the public.

The Trust enhances its land preservation goals through environmental education, ecological restoration, research projects and environmental stewardship. The Trust sponsors annual stream clean-ups and volunteers are involved in invasive species control efforts. The Trust plays a major role in restoring and enhancing existing protected lands in the watershed and develops innovative land management techniques that promote biodiversity through the region.

MONTGOMERY COUNTY

The Montgomery County Open Space Program has provided funds to facilitate the preservation of approximately 240 acres of natural lands, parks and open space in the Pennypack Creek Watershed since 1993. The program has provided almost \$3 million dollars in grant monies to leverage other sources of funding to preserve critical open spaces.

Montgomery County Department of Parks also owns and maintains the 250-acre Lorimer Park, in Abington Township, which serves as an important greenway link along the Pennypack Creek to protected parks lands within the City of Philadelphia.

In 2004, Montgomery County passed an additional \$150 million open space bond referendum. This bond will help the county to continue to support open space preservation efforts in the county and Pennypack Creek Watershed.

Current Efforts

All of the organizations mentioned in the previous sections are participating in on-going efforts to protect the environment of the Pennypack Creek. These groups continue to be a source of inspiration for current and future efforts to protect the Pennypack Creek Watershed.

Currently, major efforts to enhance the water quality and environment of the Pennypack Creek Watershed have been undertaken by the Philadelphia Water Department (PWD) and Temple University Center for Sustainable Communities.

PHILADELPHIA WATER DEPARTMENT OFFICE OF WATERSHEDS

PWD Office of Watersheds is a major force working for the improvement of the entire Pennypack Creek Watershed. In addition to sponsoring this River Conservation Plan, PWD's efforts include diverse projects and studies ranging from urban watershed management seminars to stream restoration projects to watershed management plans.

The PWD implemented a five-year biomonitoring program in 2002 to assess the water and habitat quality in the streams that flow through the city and ultimately influence the water quality of the City's sources of drinking water. PWD also monitors the creek for chemical and other water quality parameters. Initial monitoring efforts established baseline data for the department to compare future monitoring data. PWD has been using these data to support water quality enhancement projects that have also exhibited benefits for the habitat and environment of the watershed.

PWD has commissioned a study of all of the wetlands in the watersheds in the city. The study will map wetlands throughout the watershed and will identify candidate sites for wetland creation to treat stormwater run-off. This study will be a valuable tool in identifying and protecting existing wetlands and promoting good use of created wetlands for stormwater management in the future.

In addition to these studies, the PWD has been participating in other watershed protection efforts with partner organizations. The department has joined efforts with the ESED program to sponsor the removal of the Frankford Avenue and Rhawn Street dams to enhance stream habitat, allow anadromous fish passage and restore the free flowing Pennypack Creek. The department sponsors countless educational programs regarding watersheds and watershed management throughout the city as well as supporting habitat restoration and water quality projects throughout the Pennypack Creek Watershed.

TEMPLE UNIVERSITY CENTER FOR SUSTAINABLE COMMUNITIES

The Temple University Center for Sustainable Communities is currently conducting two significant flooding and environmental assessment studies in the Pennypack Creek Watershed; a Pennypack Floodplain Analysis Study and a Regional Environmental Vulnerability Analysis (REVA). The floodplain analysis study will result in the updating of hydrologic and hydraulic models for different rainfall events in the watershed. These models can be used to update Federal Emergency Management Agency (FEMA) floodplain maps and help to identify areas that may be vulnerable to flooding and flood damage. The results of this study will have a tangible impact on the manner in which municipalities in the watershed manage stormwater, and presents a glimpse into future flow conditions of the Pennypack Creek if stormwater management techniques are not improved as the headwaters of the watershed are developed.

The REVA study will use ecological assessment, indicators, modeling, and GIS analysis to evaluate the effects of urbanization on the stream system, evaluate various scenarios for action and implications of these decisions and link the results to state-wide indicators of environmental quality. This study will be a pilot study used to determine the efficacy of the REVA process and its transferability to other watersheds.

ACTIVE GROUPS AND ORGANIZATIONS

There are a number of other volunteer groups and organizations that are working to preserve and maintain the quality of natural lands and habitats in the Pennypack Creek Watershed. Examples include:

The Friends of Pennypack Park: The Friends have been sponsoring stream clean-ups of the Pennypack Creek, assisting with trail maintenance and volunteering for natural area restorations since 1987. The organization supports historical and environmental education efforts and publishes a comprehensive map of the trails of Pennypack Park.

Southeastern Montgomery County Chapter of Trout Unlimited: The chapter organizes volunteer stream clean-ups, educational programs and habitat restoration projects. The Pennypack Creek is the Chapter's home creek and they have provided thousands of volunteer hours to enhance the environment of the creek since the 1990s. The chapter has applied for grant funding to remove the Huntingdon Pike Dam, on the Pennypack, and open the stream up to fish passage upstream from Lorimer Park.

Southampton Watershed Association: Founded in 2003, the association has sponsored educational efforts, stream visual assessments and a riparian buffer planting project in the Southampton Creek Watershed, a tributary to the Pennypack Creek.

PA Fish and Boat Commission: The Fish and Boat Commission stocks trout in the Pennypack Creek and has recently reintroduced hickory shad to the creek. The commission has provided funding for dam and stream obstruction mitigation to promote the return of shad and other anadromous fish to the Pennypack Creek Watershed.