

Updated 12/2003

**Watershed Restoration Action Strategy (WRAS)
State Water Plan Subbasin 03F
Lower Schuylkill River Watershed
(Wissahickon Creek)
Montgomery, Philadelphia, Chester, and Delaware Counties**

Introduction

Subbasin 03F consists of the lower Schuylkill River and its tributaries from Valley Forge to the confluence with the Delaware River in southwest Philadelphia. The subbasin encompasses 228 square miles and contains a total of 309 miles flowing in 185 streams. The subbasin is included in **HUC Area 2040203**, Schuylkill River, a Category I, FY99/2000 Priority watershed.

The largest tributary in the basin is the Wissahickon Creek, which drains 64 square miles of lower Montgomery County and northwestern Philadelphia. Wissahickon Creek flows for twenty-three miles through the boroughs of Lansdale, North Wales, and Ambler in Montgomery County then into the city of Philadelphia through the scenic gorge in Wissahickon Park, part of the city owned Fairmount Park system. The Wissahickon Creek ends near the Queen Lane Reservoir drinking water intake on the bank of the Schuylkill River. More than 90% of the riparian zone of the Wissahickon Creek has been preserved in a natural state. The creek and adjoining parks receive extensive recreational use. The Wissahickon Creek also serves as one of the water supplies for Philadelphia.

Geology/ Soils

The majority of the basin is within the Northern Piedmont Ecoregion, Piedmont Uplands section (64c), comprised of mainly schist of the Wissahickon Formation, with some areas of serpentine and gneiss. This area is hilly with steeply sloped ravines along the major streams. The soils of the uplands have moderate rates of infiltration; slopes range from 15 to 20 percent.

The northeastern portion of the watershed is in the Northern Piedmont Ecoregion, Triassic Lowlands section (64a), which contains coarse gray sandstone and conglomerate and fine-grained red or brown sandstone and shale. Low ridges associated with diabase dikes and sheets interrupt this area of low, rolling topography. The soils of the Triassic Lowlands have slow infiltration rates and a high runoff potential.

The central and western portion of the watershed, which includes most of Valley Creek, lies in an eastern extending tongue of the Northern Piedmont Ecoregion Limestone/Dolomite Lowlands section (64d). Limestone strata and soils are present within this narrow east-west trending band through Valley Creek watershed and east through Conshohocken to Willow Grove. Creeks in this portion of the subbasin maintain a more consistent year round flow and cooler water temperatures than other streams. Several limestone quarries are in operation in this band; the most visible is the Warner Quarry near the PA turnpike in Valley Creek watershed.

The lower portion of the watershed bordering the Schuylkill River consists of unconsolidated sand and clay of the Middle Atlantic Coastal Plain Ecoregion, Delaware River Terraces and Uplands section (63a). Most of the original coastal plain within Philadelphia has been drained or paved over, severely altering and impeding water infiltration rates, resulting in a very high runoff potential.

Land Use

All but the upper end of the subbasin is highly urbanized. The lower subbasin is within the city of Philadelphia. The population was 817,000 in 1990 and is expected to decrease to 780,000 by the year 2040, as people continue to move out of the city and into suburbs outside the subbasin. The coastal plain

area adjacent to the Delaware River is highly industrialized. It contains the United States Naval Yard at the southern tip of Philadelphia, sand and gravel operations, part of the Philadelphia Airport, and a power generating plant. The high traffic volume Schuylkill Expressway (I-76), in a narrow corridor wedged between the Schuylkill River and a steep outcrop of Wissahickon Schist. The Blue Route (I-476) runs through the central part of the watershed and connects with the PA Turnpike at Norristown. The borough of Conshohocken and the Manyunk section of Philadelphia are on the steep slope on the opposite side of the river from the Schuylkill Expressway. I-95 parallels the Delaware River in the southern tip of the watershed.

Natural Resources

- Valley Forge National Historical Park in Montgomery County (includes lower Valley Creek)
- Fairmount (Wissahickon) Park in Philadelphia, the largest park entirely contained within a city and a Natural History Point of Interest
- Trout Run in Tredyffrin Township, Chester County has a limited reproducing brown trout population

PA Fish & Boat Commission Class A Trout Streams (highest biomass classification):

- Little Valley Creek, from the tributary at SR 0202 to the mouth (1.7 miles)
- Valley Creek, from SR0029 down to the mouth (7.0 miles)

Chapter 93 Exceptional Value (EV) and High-Quality (HQ) Stream Listings:

EV streams:

- Valley Creek watershed, including Little Valley Creek

HQ Streams:

- None

The Wissahickon Valley was placed on the National Registry of Natural Landmarks in 1964, one of the first sites in the nation to be so designated. The designation encourages the preservation of the best remaining examples of the major biotic communities and geologic features of the nation's natural landscape. Wissahickon Park preserves the widest riparian zone in the city of Philadelphia. In spite of this special status, the Wissahickon Valley is now on the Registry's list of damaged and threatened natural landmark sites. Because of the extensive paving in the upstream watershed, the creek is subject to extreme flow fluctuations and streambank erosion.

Water Quality Impairment

Urbanization/stormwater management has the most prominent effect on water quality in the subbasin. The Triassic Lowland region of the basin generally exhibits the highest variability in streamflow, with higher flood stage flows and lower low flows than other less urbanized portions of the basin. Flooding is also a serious problem on most of the major streams in the Piedmont Uplands and Coastal Plain, especially in the city of Philadelphia where the huge amount of paving has encroached or in some cases, covered the floodplains. Urbanization has caused severe water depletion to base flow in many of the stream channels. Most of the riparian zone of the Wissahickon Creek is protected in adjacent municipally owned parks; however, many of the greenways are narrow and severely eroded. In addition, the invasion of exotic plant species such as multiflora rose and Japanese knotweed (fleeceflower) and soil compaction from intense recreational use has taken their toll on the Wissahickon Creek watershed.

Urbanization and paving can have a severe effect on stream aquatic life. Studies by the Maryland Department of Natural Resources stated that a reduction in stream aquatic species diversity could begin with as little as 2% impervious cover. Maryland streams with above 15% impervious cover were rated fair to poor for aquatic species. When the impervious cover reached 25%, species diversity was significantly reduced. Riparian vegetation removal and paving affect both stream water temperature and

habitat for aquatic species. Organisms most affected include many species of reptiles and amphibians, brook trout, and stoneflies. Stormwater runoff from paved areas can also wash out oil and grease and other pollutants into streams. The paved areas also restrict replenishment of groundwater and contribute to flash flooding during storm events and extreme fluctuations in stream water levels. Extreme flow fluctuations cause difficulties in the attachment of bottom dwelling organisms to the stream substrate and also cause a scouring of the substrate. Retention of riparian vegetation in unnamed headwater tributaries, known as first order streams, which may comprise as much as 50% of the streams in a watershed, can be especially critical to the protection of organisms in the downstream watershed.

In the city of Philadelphia, stormwater runoff problems are compounded by the paving that was not only placed around the streams, but also where the streams themselves were paved over in the late 1800's and early 1900's. Many of these streams no longer exist. All of the tributaries that once entered the Schuylkill River downstream of the confluence of the Wissahickon Creek are gone. The largest and longest stream to be buried in this manner was Mill Creek a former tributary of the Schuylkill River in West Philadelphia. Sewers were laid in streambeds to capture and divert stream flow into the sewer system. Tributaries were added to the sewer system as spur lines. The sewers carry stream flow to the nearest large creek or river. The old streambeds and their floodplains were filled in, often with coal ash, cinders and incinerator waste. The steep slopes adjacent to the streams were filled in and houses were built over the old stream channels. In some cases the ground elevation over the old streambed is forty feet above the original stream level. Houses built over the old channels have settled over the years as the fill became saturated with water. Philadelphia has a total of 3,000 miles of sewer lines to maintain, many of which consist of old stream channels. A map of the buried streams can be found on the Philadelphia Inquirer web site in the July 11, 1999 issue, found at www.philly.com, under Archives.

The Wissahickon Creek watershed is degraded by point and nonpoint source pollution. The watershed contains 90 permitted discharges, 63 of which are stormwater outfalls, and may non-permitted discharges from urbanized area, housing developments, parks, farms, residential and commercial land and school, college and corporate campuses. These sources cause severe sedimentation, flooding and eutrophication and threaten the watershed's use as a drinking water supply, a recreational area and as wildlife habitat.

Monitoring/Evaluation:

DEP biologists evaluated the Wissahickon Creek watershed and some of remaining portion of the subbasin in 1998, 1999 and 2000 under the Unassessed Waters Program. Assessments have been completed for 236.41, 309.28 stream miles or 76% of these miles. Only 27.81 (11.8%) of the assessed miles are attaining their designated uses; 208.6 or 88.2 % of the assessed stream miles are biologically impaired by a variety of factors associated with urbanization, including siltation, turbidity, and water flow variability from channelization, vegetation removal, habitat modification, urban runoff/storm sewers, road runoff, golf courses, municipal point sources, and small residential development. Water flow variability severely impacts the colonization ability of stream macroinvertebrates.

The table below breaks down the probable sources of impairment, including fish consumption advisories that are in effect for 33.98 miles of the Valley Creek sub-basin and 33.02 miles of the main stem Schuylkill River due to Priority Organics (PCBs). PCBs were primarily introduced to the watershed prior to their ban in 1979. No lakes are listed as impaired in the subbasin.

Sources of Impairment in Subbasin 03F		
Probable Source of Impairment	Miles Impaired*	Percentage of Impairment**
Urban Runoff/Storm Sewers	105.38	45
Surface Mining	2.22	1

Source Unknown	43.6	18
Small Residential Runoff	30.64	13
Road Runoff	38.66	16
Removal of Vegetation	34.15	14
Other	32.85	14
Municipal Point Source	34.63	15
Industrial Point Source	35.39	15
PCBs	67.00	28
Hydromodification	2.29	1
Habitat Modification	79.5	34
Golf Courses	7.07	3
Channelization	12.28	5
Bank Modifications	3.97	2
Agriculture	1.4	<1

DEP biologists use a combination of habitat and biological assessments as the primary mechanism to evaluate Pennsylvania streams under the Unassessed Waters Program. This method requires selecting stream sites that would reflect impacts from surrounding land uses that are representative of the stream segment being assessed. The biologist selects as many sites as necessary to establish an accurate assessment for a stream segment. The length of the stream segment assessed can vary between sites. Several factors are used to determine site location and how long a segment can be, including distinct changes in stream characteristics, surface geology, riparian land use, and the pollutant causing impairment. Habitat surveys and a biological assessment are conducted at each site. Biological surveys include kick screen sampling of benthic macroinvertebrates, which are identified to family in the field, and an evaluation of their tolerances to pollution. Benthic macroinvertebrates are the organisms, mainly aquatic insects, that live on the stream bottom. Since they are short-lived (most have a one-year life cycle) and relatively immobile, they reflect the chemical and physical characteristics of a stream and chronic pollution sources or stresses. Habitat assessments evaluate how deeply the stream substrate is embedded, degree of streambank erosion, condition of riparian vegetation, and amount of sedimentation.

Sources of Pollutants:

Sources of pollution to surface water and groundwater are characterized as either point sources or non-point sources. Point source pollution usually enters waters through a specific point, such as a pipe. Groundwater can be contaminated by point source pollution through underground injection of waste. Non-point source pollution typically is carried in rainwater and snowmelt runoff over and through land to surface water, or in water that seeps through soils to underground aquifers. Major national accomplishments of the past several decades include controlling industrial discharges, providing adequate wastewater treatment to a growing population, improved waste storage and disposal methods, and protecting drinking water supplies from underground injection of waste. Regulations requiring corrosion, overflow, and spill prevention and leak detection for underground storage tanks should also help reduce a major source of water contamination.

Point Sources / Surface Water:

DEP regulates point source discharges by requiring such discharges to obtain a National Pollutant Discharge Elimination System (NPDES) permit. NPDES permits establish effluent limits, specify self-monitoring requirements, and require submission of periodic reports known as discharge monitoring reports (DMRs). The major point sources of pollution in the subbasin are sewage treatment plants, industrial facilities, and “wet weather” sources such as combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), and storm sewers. Sewage treatment plants treat and discharge wastewater from homes, public buildings, commercial establishments, some storm water sewers, and some industries.

Many industrial facilities treat and discharge their own wastewater, either directly to nearby waters, or to sewage treatment plants. Bridgeport and Norristown Boroughs have combined sewer overflows and many other municipalities with separate sanitary sewers experience overflows due to excessive infiltration and inflow of surface water and groundwater into the sewer lines.

Within the subbasin, there are approximately 81 facilities covered under an individual NPDES permit that can be classified as point sources in addition to 63 permitted storm water outfalls in the Wissahickon. Thirteen of the 81 facilities are municipal plants, or POTWs (publicly owned treatment works). Five of these are located in the Wissahickon Creek watershed and provide tertiary treatment. The other eight facilities discharge to the main stem of the Schuylkill River and provide secondary, and in some cases, advanced secondary, treatment. None of the facilities are designed to remove nutrients. An additional 18 facilities are discharges from non-municipal sewage treatment plants, serving mostly school districts, small developments and single-family dwellings. These municipal and non-municipal sewage discharges account for over 95 % of the total permitted flow for facilities that are covered under individual permits and located in the non-tidal portion of the watershed.

Although the permitted loads are higher than what is currently discharged to the subbasin, these discharges account for a significant amount of organic and nutrient loads within the basin. As growth continues within the region, several of the municipal plants will reach their capacity and expand as needed to accommodate future population projections. This will result in additional loadings to the watershed. In the Wissahickon Creek watershed, Upper Gwynedd Township will likely experience such growth which could exacerbate impairments in the upper portion of the watershed, which is already stressed due to other factors such as reduced base flow resulting from increases in groundwater withdrawals, and the reduced groundwater infiltration that accompanies land development.

The remaining discharges are categorized as industrial wastes. These range from small discharges of non-contact cooling water whose in stream impacts are indiscernible to discharges from groundwater remediation activities and manufacturing facilities whose wastewater characteristics can include significant organic loads, metals and other toxics, necessitating a high degree of treatment prior to discharge. Many approvals for coverage under a general NPDES permit have been granted for storm water discharges associated with industrial activities, such as industrial site runoff, construction site runoff, and petroleum groundwater cleanup.

Major sources of groundwater pollution in the subbasin include malfunctioning septic systems, leaking storage tanks and pipes, and spills resulting from improper chemical handling, storage, and disposal practices at industrial facilities and landfills. Petroleum compounds and solvents account for most of the contamination, while elevated levels of metals, inorganics, pesticides, and PCBs may also be present in groundwater. Methyl tertiary-butyl ether (MtBE), a gasoline additive, is of particular concern in the Blue Bell area since the discovery of a leaking fuel tank. In addition to their impact on drinking water supplies, groundwater contaminants can migrate to surface waters and threaten aquatic life.

The following streams were determined to be unimpaired (attaining water quality standards):

- Jug Hollow
- Valley Creek all but 1.4 miles of main stem
- Little Valley Creek all but 2.29 miles of main stem and 3.09 miles of 4 unnamed tributaries
- Crow Creek
- Arrowmink Creek at West Conshohocken
- Three unnamed tributaries to Wissahickon Creek
- Prophecy Creek at Ambler.
- Two small unnamed tributaries to the Schuylkill River

On-going Monitoring Activities:

United States Geologic Survey (USGS) Currently maintained gauges in the subbasin:

- USGS01473169, Valley Creek at Pennsylvania Turnpike Bridge near Valley Forge
- USGS01473900, Wissahickon Creek at Fort Washington, PA
- USGS01474000, Wissahickon Creek at mouth, Philadelphia, PA
- USGS01474500, Schuylkill River at Philadelphia, PA

Active Water Quality Network Stations:

- WQN110, Schuylkill River at Falls Bridge
- WQN115, Wissahickon at Ridge Ave. Bridge
- WQN154, Valley Creek at Wilson Rd. Bridge

Other Studies:

- Valley Creek: U.S. Geological Survey. Effects of Urbanization on stormwater runoff- volume and peak discharge of Valley Creek, eastern Chester County.
- National Park Service. An evaluation of the effects of change in land use on the peak flows, base flow, and flood frequency of a small Pennsylvania stream.
- Cahill Associates. Valley Creek stormwater management program with reduction and prevention of urban nonpoint source pollution
- National Institute for Environmental Renewal (NIER). Monitoring, modeling, and the development of a decision support tool to support TMDL development in the Wissahickon watershed.

Future threats to Water Quality:

The same water quality issues will likely continue to affect the subbasin. As public awareness increases through the efforts of the many citizens groups and the Fairmount Park Commission, the potential for restoration and water quality improvement should increase.

Restoration and Protection Initiatives:

Pennsylvania Growing Greener Grants:

- \$56,016 (FY2003) to Fairmont Park Commission to enhance wetland, riparian and lawn areas in Fairmont Park.
- \$140,000 (FY2003) to Norris Square Civic Association to install a green roof and rain garden.
- \$200,000 (FY2003) to Pennsylvania Horticultural Society to design and install storm water best management practices.
- \$109,829 (FY2003) to Wissahickon Charter School to construct and maintain an interactive outdoor environmental learning lab.
- \$200,000 (FY2003) to The Enterprise Center Community Development Corporation to implement best management practices addressing storm water currently flowing to the Mill Creek Combined Sewer.
- \$43,800 (FY2002) to Wissahickon Valley Watershed Association for restoration of riparian buffers in the watershed.
- \$330,258 (FY2002) to Philadelphia Water Department for Phase II of the Mill Creek watershed redevelopment project.
- \$100,000 (FY2002) to Schuylkill Center for Environmental Education for expansion of their water education and stewardship program.
- \$15,000 (FY2002) to Schuylkill Canal Association for the a hydrologic study of the canal.
- \$150,000 (FY2001) to Philadelphia Water Department-Office of Watersheds for construction of a stormwater wetland at Saylor's Grove.

- \$250,000 (FY2001) to the University of Pennsylvania for an innovative stormwater management demonstration project at an inner city public school.
- \$77,00 (FY2001) to the Valley Forge Chapter of Trout Unlimited for urban runoff management in a tributary to Valley Creek.
- \$34,985 (FY2001) to the Miquon School to restoration of riparian buffers in Crayfish Creek.
- \$56,415 (FY2000) to Manayunk Development Corporation for the Manayunk nonpoint source pollution education program.
- \$156,458 (FY2000) to Schuylkill Center for Environmental Education for watershed awareness throughout the Roxborough portion of the city of Philadelphia.
- \$20,000 (FY2000) to Friends of the Manayunk Canal for a community supported watershed restoration and protection plan for Manayunk.
- \$127,654 (FY2000) to the Chester County Water Resources Authority and Chester County Conservation District for an integrated stormwater assessment and watershed restoration plan for East Valley Creek.
- \$33,800 (FY2000) to The Conservation Fund for preparation of the State of the Schuylkill Watershed Report.
- \$75,000 (FY1999) to the Valley Creek Coalition for an educational outreach program to help landowners modify or replace existing stormwater facilities with designs to allow a better infiltration of groundwater.
- \$13,000 (FY1999) to Chester County Conservation District to develop a self-guided tour through the Christina River basin and Valley Creek watershed to showcase stormwater management practices.
- \$26,000 (FY1999) to the Wissahickon Restoration Volunteers for riparian reforestation and seed-to-tree projects on the Wissahickon Creek. Over 900 trees will be planted along streams and wetland areas. An educational and public awareness program on the benefits of riparian forests will be developed.
- \$24,515 (FY1999) to the Sustainable Society Action Project to reduce nonpoint pollutants to the Wissahickon Creek and provide a demonstration model for other communities. Data on nutrients and chemicals present in local stormwater runoff and shallow water discharges will be gathered before and after an intensive citizen education campaign.
- \$25,300 (FY1999) to the Fairmount Park Commission to correct degradation and enhance the ecological value of Concourse and Centennial Lakes in West Philadelphia. Plant and animal habitat will be improved. Park staff, local school and college students and volunteers from neighborhood communities will work with the project.

U.S. Environmental Protection Agency (EPA) Clean Water Act Section 319 Grants:

- \$85,500 (FY2002) to Villanova University- Institute for Environmental Engineering Research for a porous concrete site to demonstrate control of stormwater runoff.
- \$200,000 (FY2001) to the Philadelphia Water Department to construct a stormwater detention basin on the Sultzberger Middle School grounds in the Mill Creek watershed, a tributary of the Schuylkill River in west Philadelphia. The basin will enhance the science and environmental education curriculum at the school by creating an outdoor classroom and environmental study area for inter-city students. PWD will partner with local community members of the Mill Creek Coalition, the University of Pennsylvania School of Landscape Architecture, and the Philadelphia School District to develop a prototype for turning vacant city land into a community asset.
- \$53,500 (FY2001) to Whippen Township and the Wissahickon Valley Watershed Association to protect riparian land, establish riparian buffers, and educate the public about the importance of riparian buffers and how they affect the ecology of a creek. The project will be conducted on a 10-acre parcel along Prophecy Creek, which will be purchased by the township for development as a public park. Community volunteers and members of local Boy and Girl Scout troops will help with plantings and removal of non-native vegetation.

- \$76,250 (FY1999) and \$127,101 to Morris Arboretum for demonstration of best management practices in urban landscapes (Paper Mill Run) for nonpoint source pollution reduction through riparian corridor restoration and development of comprehensive plan and education and outreach programs.
- \$20,000 (FY1999) to the Wissahickon Valley Watershed Association for a watershed assessment of the Wissahickon Creek to develop a coordinated plan for future assessments of the watershed.

Pennsylvania Watershed Restoration Assistance Program WRAP Grants:

- \$49,000 (FY1998) to the Valley Creek Coalition for stormwater management, demonstration and retrofitting of existing facilities on Valley Creek
- \$25,000 (FY1999) to Lower Gwynedd Township for the Brights Lane Detention Basin Retrofit Demonstration Project on the Wissahickon Creek. This project will decrease peak discharge for rain event, improve wildlife habitat, and decrease maintenance requirements.

DEP Coastal Zone Nonpoint Source Pollution Grants

- \$48,278 (FY2002) to the Center in the Park for environmental education activities in the local community.
- \$30,000 (FY2002) to Trustees of the University of Pennsylvania Morris Arboretum for wetlands enhancement in the Wissahickon Creek watershed.
- \$20,500 (FY2002) to Philadelphia Water Department for their rain barrel project.
- \$20,500 (FY2002) to Montgomery County Conservation District for recycled rain barrels for stormwater education and management in sandy Run watershed.

Department of Conservation and Natural Resources DCNR River Conservation Grants:

- \$15,000 (2000) to the Fairmount Park Commission to create a native plant nursery at the Andorra Natural Area along the Wissahickon Creek.
- \$25,000 (1999) to Cheltenham Township to prepare a rivers conservation plan for Tookany Creek watershed from its headwaters to the Montgomery /Philadelphia County line.
- \$225,000 (1996) to the Natural Lands Trust and The Conservation Fund to develop a regionally based watershed conservation plan for the Schuylkill River basin that can be used to support and assist watershed groups in developing detailed plans at the subwatershed level.
- \$24,200 (1995) to the Schuylkill River Greenway Association to update the zoning and land use patterns along the Schuylkill River to assess opportunities for greenway development and river access.
- \$50,000 (1995) to the City of Philadelphia and the Fairmount Park Commission for Wissahickon Creek to develop a rivers conservation plan

Pennsylvania Stormwater Management Act 167:

- A stormwater management plan is being prepared for Sandy Run, a tributary of Wissahickon Creek in Montgomery County.
- A stormwater management plan has been approved for tributaries to the Schuylkill River in Lower Merion Township, Montgomery County, including Mill Creek, Arrowmink Creek, Rock Creek and Gulley Run.
- A stormwater management plan has been approved for Stony Creek and Saw Mill Creek, tributaries of the Schuylkill River in Montgomery County.

League of Women Voters (WREN) Mini-grants:

- \$2,906 to Manayunk Development Corporation to expand its cross-curricular environmental service learning program centered on water quality to another school in the Philadelphia School District and to develop protection recommendations and report them to the community.
- \$3,000 to the Philadelphia Water Department to complete Phase II of the Belmont Water Intake Protection Project by finishing the streambank restoration upstream and downstream of the completed project area. Revegetation of Peter's Island and temporary fencing were installed to deter geese from around the water intake.

Pennsylvania Fish and Boat Commission Aquatic Resource Conservation Grants:

- \$1,500 (2000) to Stony Creek Anglers for instream habitat restoration in Stony Creek, Montgomery County.

Other:

- The Fairmount Park Commission's Natural Lands Restoration and Environmental Education Program (NLREEP), funded by the William Penn Foundation, is an ongoing initiative. In addition, the Wissahickon Creek Conservation Program, the Morris Arboretum's Wissahickon Riparian Trail Link project, and initiatives by the Friends of the Wissahickon and Wissahickon Restoration Volunteers help restore and maintain the watershed.
- National Institute for Environmental Renewal (NIER) is working with the Academy of Natural Sciences of Philadelphia on a project on the Wissahickon Creek. Data was collected in summer 1998 and will be used as a watershed management tool to visually evaluate effects of changes in the watershed.

Citizen/Conservation Groups:

Many citizen/conservation groups and organizations are active in the Wissahickon Creek and lower Schuylkill River watersheds.

- The Valley Creek Coalition is comprised of members of the following groups: Green Valleys Association, Valley Forge Chapter of Trout Unlimited, West Chester Fish, Game and Wildlife Association, Open Lands Conservancy.
- The Wissahickon Creek Watershed Partnership includes members of the following: DEP, DCNR, industry, planning commissions, conservation district, water departments, municipalities, USEPA, USFWS, USGS, and Wissahickon Valley Watershed Association.
- Friends of the Wissahickon website can be found at <http://www.fow.org/>.
- Wissahickon Valley Watershed Association website can be found at <http://www.wvwa.org/>.
- EASI Philadelphia Center in the Park
- Wissahickon Restoration Volunteers
- Friends of the Manayunk Canal
- Mill Creek Coalition
- Morris Arboretum

These groups have a more general interest in the basin or an interest in a specific portion of the basin:

- Schuylkill Riverkeeper
- Schuylkill Center for Environmental Education
- EASI Lansdale, PA and Center in the Park
- Lower Merion-Narberth Watershed Association
- The Heritage Conservancy is a nonprofit organization located in Bucks County, PA, dedicated to the preservation of our natural and historical heritage. They have received grants from DEP and DCNR for their preservation and conservation activities. They assist local conservation groups in southeastern Pennsylvania in assessment of streams conditions and with other conservation projects. More information is available on their website at <http://www.heritageconservancy.org/>.

Public Participation/Outreach

Watershed Notebooks

DEP's website has a watershed notebook for each of its 104 State Water Plan watersheds. Each notebook provides a brief description of the watershed with supporting data and information on agency and citizen group activities. Each notebook is organized to allow networking by watershed groups and others by providing access to send and post information about projects and activities underway in the watershed. The notebooks also link to the Department's Watershed Idea Exchange, an open forum to discuss watershed issues. The website is www.dep.state.pa.us. Choose Subjects/Water Management/Watershed Conservation/Watershed and Nonpoint Source Management/Watershed Notebooks.

Funding Needs

The total dollars needed for addressing all nonpoint source problems in the watershed is undetermined. Stream assessments have been conducted and TMDLs will be developed for impaired waters in the subbasin. Watershed restoration plans developed for impaired waters will help determine what Best Management Practices (BMPs) are necessary to reduce pollution sources and provide estimates of restoration needs.

Funding sources available to support the development of site-specific implementation plans and remediation projects that address the sources of water quality impairment include the EPA Clean Water Act Section 319 grant program and the newer Pennsylvania funded Growing Greener program which target reductions in nonpoint source pollution. Pennsylvania has generally placed more emphasis on funding projects slated for implementation on water bodies where TMDLs have been completed or where water quality impairments have been documented.

Restoration Needs

The problems and impairments associated with urbanization are difficult to correct due to the amount of paving for housing and business. Many of the old industrial sites within the city have been abandoned; 100's of run-down houses are torn down every year. These newly opened areas could be put into open space use as parks, community gardens, and stormwater retention basins which could help reduce water and flow fluctuations in the creeks. Stream restoration, storm-water retention basin development and education programs are proceeding under the direction of the University of Pennsylvania and the Philadelphia Water Department in the Mill Creek watershed in West Philadelphia. A grant received by the Fairmount Park Commission for development a native plant nursery at the Andorra Natural Area in the Wissahickon Valley will provide additional environmental education activities and a nearby source of plants for city park restoration efforts.

Nonresidential development, which includes office, industrial, and commercial development, is booming in the subbasin. This type of development has a high potential for impact on surface and groundwater resources due to the massive site grading, removal of vegetation, and large areas of paving for parking lots. Local land use planning should encourage these developments to maintain open space, reduce unnecessary paving, improve land use standards, and better fit of the design to the landscape contours.

Stormwater:

Recommended actions to control stormwater and reduce flooding:

1. Continue and improve flood predictions and warnings. Educate public on dangers associated with flooding.
2. Avoid development in floodways and floodplains.
3. Discourage development in floodplain areas by converting land use to protected open space, parks and natural conservation areas.
4. Buy out currently developed properties subject to frequent flooding.
5. Increase practices that lead to use of less impervious surfaces so that increased storm water management can be eliminated before it needs to be managed. This includes an educational component for developers, local government, regulatory agencies and the public.
6. Increase use of BMPs for stormwater management.
7. Increase wetland acreage by wetland construction and by increased enforcement of encroachment permits and violations.
8. Protect and restore riparian buffer areas.
9. Educate homeowners on placement of spouting outfalls and use of grass swales, discourage large open yards, and encourage woodlands trees and shrubs.

Stream buffers:

The Heritage Conservancy conducted an analysis of stream 1,200 miles in Southeastern Pennsylvania in 2000. They developed a computerized map of riparian buffer hot spots to help local conservation groups and municipalities target areas for riparian buffer restoration. The project was funded under a grant through DEP's Coastal Zone management and Stream ReLeaf programs. The Valley Creek watershed was one of 4 watersheds studied. The method used was a helicopter fly-over and recording the streambanks with a sky-cam and GPS unit. ARC View GIS maps were produced that show the areas needing buffers. Topographic maps and aerial photos were printed and given to leading river conservation associations. Workshops were also held to explain the results of the study. Maps can be clipped and overlaid on tax parcel maps to determine which landowners to contact about riparian buffer restoration. The maps can be used as a tool to prioritize restoration activities and to track future gains and losses. A total of 37.9 miles were assessed in Valley Creek watershed. The study showed that 3.4 miles were lacking buffers on one side, 6.8 miles lacking on 2 sides, for a total of 10.2 miles or 26.9 percent of assessed miles without buffers. Data is available through PASDA, the Pennsylvania Spatial Data Access website at <http://www.pasda.psu.edu/>.

Water Quality Improvement Projects:

The Fairmount Park Commission, with the assistance of the Academy of Natural Science of Philadelphia (ANSP), developing a master plan for each of their parks. The ANSP has been conducting assessments of the plants and animals of terrestrial and aquatic habitats in the park. Major restoration plans include control of exotic species, increasing riparian buffers, reducing the amount of mowed areas, construction of new wetlands and expansion of existing wetlands, removing dams, reopening existing covered and channelized streams, stabilizing streambanks, and constructing berms and buffer strips to control stormwater runoff. More information on their activities can be found on their website at <http://www.nlreep.org/>.

The Fairmount Park Commission's Wissahickon Valley Park is a 1,426-acre oasis surrounded by the city and suburbs. It is home to hundreds of species of plants, mammals, birds, fish, reptiles, amphibians, insects and other living things. Many thousands of people visit the Wissahickon each year for nature walks, bird watching, hiking, biking, horseback riding, picnics and other recreational activities. Wissahickon Valley Park is a treasure for the City of Philadelphia and is among the few places in the country designated by the U.S. Department of the Interior as a National Natural Landmark. The City of Philadelphia began to acquire land for the park in the mid-1800s. The Fairmount Park Commission was created in 1867. Restoration of the Wissahickon Valley Park began shortly afterward and continues today.

The Wissahickon Valley Park today faces a multitude of pressures caused by modern human disturbance. Erosion, pollution, overuse by humans, invasive exotic plants, vandalism and many other factors threaten the survival of the Wissahickon Creek ecosystem. Fairmount Park Commission staff is working with every available resource to preserve and protect the Wissahickon, including volunteers who care about the Park and want to help preserve it by participating in the [Preserve-Your-Park program](#).

Many restoration projects have been completed in recent years. Trees have been planted, vines and trash have been removed and trails have been rebuilt. The restoration of the Yellow trail near Cathedral Road and the forest restoration near Daisy Field represent the results that have been achieved through the cooperative efforts of volunteers and Park staff. Many more restoration projects are planned for the future.

The Wissahickon Watershed Partnership

The partnership was formed in 1997 as a joint initiative of the PA Department of Environmental Protection, Montgomery County Planning Commission, and Fairmount Park Commission. The 120-

member partnership meets quarterly. The partnership provides a framework for coordinating the initiatives of the watershed's stakeholders. The partnership has made significant progress in developing projects that improve water quality and wildlife habitat in the watershed. The cooperation and coordination between the partnership's 120 partners provides a model for restoration and preservation of an urban watershed.

The partnership has focused on 4 major projects:

1. Paper Mill Run

The first phase of this project, development of a comprehensive riparian restoration plan and the second phase, demonstration of best management practices for stream channel, bank and area plantings with interpretive exhibits, were completed by the end of 2000. Phase III will complement the demonstration of BMPs with workshops, publications, and education and outreach programs. Construction and restoration of a portion of Paper Mill Run was completed in 1998. More information on this project is available on the University of Pennsylvania/Morris Arboretum website at <http://www.upenn.edu/morris>.

2. Wissahickon Riparian Restoration and Trail Link

This project is developing a master plan for creation of a 3.5-mile greenway zone that will allow regulation and land use management of the watershed's recreation resources. Morris Arboretum is involved with design of this project.

3. Wissahickon Watershed Pilot Project

This project will employ a watershed approach, GIS modeling, and Total Maximum Daily Load (TMDL) studies to determine cost-effective solutions to point and nonpoint source pollution, stormwater runoff, and streamside land use problems.

4. National Institute for Environmental Renewal (NIER) Project

This project is developing a coordinated environmental monitoring and data management system integrating GIS, senior and environmental site data which will allow project participants to analyze the effectiveness of certain BMPs and other actions.

Morris Arboretum

The Morris Arboretum of the University of Pennsylvania is an historic public garden and education institution. They conduct workshops for land managers, professionals, municipal officials and the public on riparian restoration, providing practical information on establishing restoration goals, site analysis, bioengineering techniques, permitting, budgeting, and plant selection. They have been the sponsors of grants to restore Paper Mill Run.

Grants from The William Penn Foundation provided Morris Arboretum with the means to develop a plan to increase and preserve forested areas along the Wissahickon Creek. They have developed a master plan to connect Fairmount Park with Fort Washington State Park with a 3.5-mile greenway and walking, biking, and multi-use trails.

Paper Mill Run Stream Restoration:

Paper Mill Run is an unnamed tributary of the Wissahickon Creek in northwest Philadelphia and Montgomery County. The 2.5 square miles watershed contains a diverse mix of open space, low and high-density residential development, institutional landholdings, and commercial land uses. A 0.4-mile section flows through Morris Arboretum property. Paper Mill Run has been degraded by pollution from urban runoff and physically affected by changes in water volume and stream velocity. Bank erosion has been severe and sedimentation high. The flat-lying limestone in the floodplain and adjacent steep topography has compounded problems. A stream restoration project was developed for Paper Mill Run within the Arboretum grounds as a demonstration and environmental education area. The overall goal was to encourage visiting landowners to implement similar best management practices on their properties. Stream restoration based on bioengineering and removal/replacement of exotic plants was begun in 1998.

Plants with high ornamental and wildlife value and native to southeastern Pennsylvania were used. One year after the project was completed, Hurricane Floyd dumped record rainfall in the area. The project withstood the floodwaters intact. Based on the success of this project, other communities and individuals have begun to implement similar stream restoration projects in upper Paper Mill Run.

Mill Creek Watershed Redevelopment Project:

This demonstration project spearheaded by the Philadelphia Water Department Office of Watersheds will be implemented around the Sulzberger Middle School in West Philadelphia to illustrate the potential for environmentally sensitive redevelopment in an urban setting. The project goals are to promote sustainable behaviors to benefit the environment and the community. Stormwater will be reduced in a cost effective manner and the water quality in the local streams will improve while treating runoff as an urban resource. The project will enhance the neighborhoods built over the buried Mill Creek floodplain and reconnect residents with their natural and urban environments. The city of Philadelphia has over 52,000 abandoned properties and vacant lots. This project will set an example of how vacant lots, abandoned buildings and public facilities can be used to become an asset to the community. The project will also enhance the environmental education curriculum at the middle school by creating an outdoor classroom. The local community will be involved in implementation of the project. Public meetings have been held to determine stormwater problems in residences and to better address concerns of local residents.

A variety of innovative best management practices (BMPs) for urban runoff will be considered, such as trenches and vegetative swales to store stormwater, roof runoff controls and storage for use in community gardens, removal of impervious surfaces and establishing plantings around the middle school, roof gardens, a butterfly garden bio-retention berm. Phase I will involve a community garden/tree nursery that will be tended and maintained by the community and local children. The garden will demonstrate BMPs through on-site water retention and displays.

Total Maximum Daily Loads (TMDL's)

TMDL's identify the amount of a pollutant that a stream or lake can assimilate without violating its water quality standards. TMDL's are calculated to include a margin of safety to protect against a mathematical or data error. TMDL's are set for each pollutant causing impairment.

A TMDL for industrial point source discharges in the Schuylkill River and Valley and Little Valley Creek watersheds was completed in 2000. These watersheds have fish consumption advisories for PCB or Chlordane contamination of fish tissue. PCB and Chlordane are now banned in the U.S., but sediments still contain the chemicals. PCB has been introduced through contaminated runoff from places where the chemicals were used or stored. The chemicals are slow to breakdown and will remain in sediments for many years. Concentrations are expected to decrease naturally due to breakdown. Contaminated sediments will also be removed at some sites to reduce runoff. Impaired segments are as follows:

- Schuylkill River: From Felix Dam in Berks County to the Fairmount Dam in Philadelphia contains fish contaminated with PCB and Chlordane. Possible sources of PCB are the Paoli Rail Yard in Chester County, the Douglassville disposal site in Berks County, and Alcoa Extrusions in Schuylkill County.
- Valley and Little Valley Creeks: The only known source is the Paoli Rail Yard.

References/Sources of Information

- State Water Plan, Subbasin 3, Lower Delaware River. Department of Environmental Protection, July 1983
- USGS Topographic Maps
- 319 project proposals and summaries

- DEP: Watershed Notebooks, Unified Assessment Document, and information from databases.
- Map of Draft Level III and IV Ecoregions of Pennsylvania and the Blue Ridge Mountains, Ridge and Valley, and Central Appalachians of EPA Regions III
- The Cleanwater Action Plan website. October 2000.
- From the Mountains to the Sea: The State of Maryland's Freshwater Streams. Maryland Department of Natural Resources and U. S. Environmental Protection Agency. EPA Publication EPA/903/R-99/023. 1999.
- Stream Restoration in Pennsylvania: Ten Case Studies. Delaware Riverkeeper Network. January 2001.
- Newsletter and website of the Fairmount Park Commission's Natural Lands Restoration and Environmental Education Program.
- Assessment of the Condition of State Water Plan Watershed 03F, Schuylkill River/ Wissahickon Creek. 20001. Environmental Futures Team Assessment. DEP Southeast Regional Office.

Streams in Subbasin 03F: 303d/305b listings

Stream	Stream Code	Drainage area square miles	Miles Impaired	Miles Attained	Impairment Sources/Causes/Comments
2-Schuylkill River main stem and 11 UNTs	00833		13.5	1.22, 2 UNTs	Siltation & water/flow variability from Urban runoff/storm sewers, road runoff, removal of vegetation, golf courses, small residential development; Road runoff
3-Jug Hollow & 2 UNTs	01014	1.35		2.61	
3-Valley Creek	00991	23.4	<u>20.94 Main stem</u> 1.4 Main stem	9.39 Main stem; 10.16, 10 UNTs	<u>Priority organics (PCB)- industrial point sources</u> Siltation & turbidity from channelization, vegetation removal & road runoff; Nutrients from AG (grazing) <i>EV</i> ; <i>Class A brown trout lower 7 miles</i>
4-Little Valley Creek	00995	7.11	<u>1.41, 2 UNTs</u> 2.29 Main stem; 3.09, 4 UNTs	2.77 Main stem; 2.98, 4 UNTs	<u>Priority organics (PCB) from industrial point sources;</u> Siltation, nutrients, & turbidity from urban runoff/storm sewers and road runoff; Flow alterations and bank modifications <i>EV</i> ; <i>Class A brown trout lower 1.7 miles</i>
3-Trout Creek	00980	8.83	10.8		Unknown causes from municipal point sources
3-Indian Creek & one UNT	00978	1.91	2.67		Siltation & water/flow variability and unknown causes from Golf courses, removal of vegetation & small residential development
3-*Crow Creek & 4 UNTs	00973	4.78		8.04	
3-Stony Creek	00948	21.2	5.37 Main stem; 16.79, 16 UNTs	2.51 Main stem; 6.12, 5 UNTs	Siltation, turbidity, & water/flow variability from Urban & road runoff, storm sewers, habitat modification, removal of vegetation, small residential development, channelization

3-Sawmill Run at Norristown & 2 UNTs	00944	4.15			
*Gulph Creek	00934	5.99	2.98	0.48	Metals from unknown source
3-Plymouth Creek & 4 UNTs	00928	7.05	10.23		Siltation & water/flow variability from Urban runoff/storm sewers, habitat modification, channelization
3-Arrowmink	00927	1.03		1.60	
3-Mill Creek at Roseglen	00903	8.32			
4-Trout Run & UNTs	00906	1.27	10.8		
Glanraffan Creek	00901	0.56	11.5		Metals & suspended solids from Urban runoff/storm sewers & "Other sources"
3-Gulley Run	00899	1.70			
3-Wissahickon Creek	00844	64.0	24.34 Main stem; 29.77, 26 UNTs	2.21, 3 UNTs	Water/flow variability, hydromodification, habitat alterations, siltation, nutrients from urban runoff/storm sewers & municipal point sources
4-Trewellyn Creek & 4 UNTs	00886	3.51	6.0		Siltation, nutrients, water/flow variability from urban runoff/storm sewers:
4-Willow Run at Penllyn	00885	3.14	2.11		Unknown causes from urban runoff/storm sewers:
4-Willow Run at Ambler	00883	0.80	1.03		Siltation & water/flow variability from Urban runoff/storm sewers
4-Prophecy Creek & one UNT	00875	2.61		3.02	
4-Sandy Run & 9 UNTs	00859	12.8	16.87		Siltation & water/flow variability from Urban runoff/storm sewers, habitat modification, channelization
4-Cresheim Creek & one UNT	00848	2.35	1.89		Siltation & water flow variability from Urban runoff/storm sewers

Impairment information is from the 1998 303d list and the 2000 305b list. Information on stream segments marked with * are from the 1996 303d listing.

Streams are listed in order from upstream to downstream. A stream with the number 2 is a tributary to a number 1 stream, 3's are tributaries to 2's, etc. Delaware River=1, Schuylkill River=2.

UNT= unnamed tributaries; AG= agriculture; Chapter 93 information: EV= Exceptional Value; HQ= High Quality; WWF= warm water fishes; CWF= coldwater fishes; TSF= trout stocked fishes