

# **Watershed Management Plan**

for the Borough of Swarthmore & the Crum Creek Watershed

Prepared for:  
The Borough of Swarthmore and  
The Swarthmore Environmental Advisory Committee



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## **1. INTRODUCTION**

As we head into the 21<sup>st</sup> Century, there will be a new direction as to how we approach environmental awareness, improvement and regulations. Unlike policies of the past, there will be a shift away from viewing problems on an individual basis. Many matters will be handled using a wider view by taking into consideration entire watersheds, and how the different elements within the watershed effect one another. Although, new policies will remain in place for direct dischargers to waterbodies, this new approach will direct more focus on the issues of non-point pollution, air deposition, and overall cooperation between political boundaries within watersheds.

Within a watershed, communities, both upstream and downstream of one another, will need to work together towards their goals. Information will need to be shared, and planning coordinated. The purpose of this Watershed Management Plan is to design an information collection system that can be used to identify programs that will improve the quality of the community and its neighbors.

### **Objective**

The objective of the Swarthmore Borough Watershed Management Plan (WMP) is to evaluate and protect the water quality of the Crum Creek and Little Crum Creek water bodies and the watershed that encompasses them.

To meet this objective, the scope of the Watershed Management Plan will focus on the following criteria:

- Develop a data collection system and natural resource inventory.
- Coordinate between stakeholders.
- Reproduce the data collection and management system for other Communities.
- Identify sensitive areas to be further addressed.
- Provide easily accessible data to Borough Officials and the Community.
- Obtain financial support to implement the plan.

## **2. CRUM CREEK WATERSHED**

The Crum Creek watershed is located within the Lower Delaware River Basin. The hydrologic unit for cataloging (HUC) the Lower Delaware is 02040202. The headwaters for Crum Creek are located just south of Route 30 in Willistown and Easttown Townships of Chester County. From its origins in Chester County, the creek flows southeast for about 16 miles before draining into the Delaware River in the Borough of Eddystone. Crum Creek forms a long narrow watershed that is about 16 miles long and roughly 2.5 miles wide. The creek and its tributaries drain an area approximately 40 square miles; 27 square miles in Delaware County and 13 square miles in Chester County.

## **Population**

The population of the Lower Delaware River Basin is around 3.7 million people in an area of 2,708 square miles. The growth rate is estimated to be fairly steady, mostly occurring in the expanding Counties outside of the Philadelphia suburbs. The population of the Darby and Crum Creeks watershed is around 700,000 in an area of 244 square miles. There has been little population change in this area, mostly because the watershed is located within the suburban and urban outskirts of Philadelphia and there is little room for growth. The population and population trends for the Crum Creek watershed is likely to be a smaller reflection of the Darby and Crum Creeks watershed.

## **Land Use**

As the creek flows south there is an increase in urbanization and development. Land use in the upper Crum Creek watershed consists mainly of pasture, low-density housing and wooded areas. The lower Crum Creek watershed contains a mixture of residential and commercial areas. Housing densities generally increase as you travel from north to south, and the lower Crum Creek is mostly an area of suburban, urban or built up land. At the mouth of the creek and along the Delaware River, land use is largely associated with industrial and transportation. Open space in the lower reaches of the watershed is generally limited to local and county parklands.

## **Topography, Geology & Soils**

The majority of the Crum Creek basin is located within the Piedmont Upland Section of the Piedmont Physiographic Province. Physiographic provinces are characterized by their similar landscapes and geologic formations. The Piedmont Upland Section consists of complexly folded and faulted crystalline rock formations. The long period of erosion and varied resistance of the different rock types has formed a landscape of broad, gently rolling hills and valleys with low to moderate relief. At its mouth, the Crum Creek basin is located within the Coastal Plain Physiographic Province. Topographic relief on the coastal plain is very gently sloping. The geology is characterized by a wedge of unconsolidated sediment which thicken toward the Atlantic Ocean. Overlying the wedge is typically a layer of relatively recently deposited sediments. Elevations within the basin range from around 400 feet above mean sea level (msl) around its headwaters in Chester County, to 10 feet msl along the Delaware River.

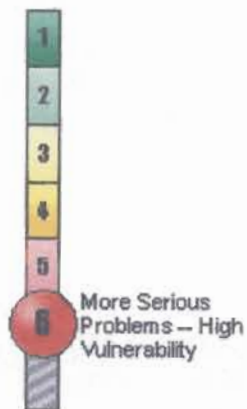
Bedrock underlying the Crum Creek basin consists of the crystalline gneiss and schist, associated with the Piedmont's uplands. The Piedmont rocks are characteristic by black and white banding, tight folds and crystalline pegmatites, associated with several periods of mountain building and metamorphism during the Cambrian and Ordovician Periods. Distinct rock types are classified into groups such as the Wissahickon Formation, felsic gneiss, mafic gneiss, granitic gneiss and serpentinite. More recent sediments, deposited by the ancient Delaware River, remain as isolated terraces on hilltops. The majority of these sediments have been eroded away, leaving the underlying crystalline bedrock exposed at the surface. The most recent sediments are found along the flood plains and valleys of streams and rivers.



The soils that have formed in the Crum Creek basin reflect the underlying bedrock and the topography. The soils can be grouped into four soil associations, Neshaminy-Glenelg association, Neshaminy-Chrome-Conowingo association, Glenelg-Manor-Chester association and the Beltsville-Sassafras-Butlertown association. The upland reaches of the Crum Creek basin are generally mapped as Neshaminy-Glenelg and Neshaminy-Chrome-Conowingo associations, while the lower reaches are mapped as Glenelg-Manor-Chester and Beltsville-Sassafras-Butlertown association. The Neshaminy-Glenelg and Glenelg-Manor-Chester soils formed by the weathering of underlying schist and gneiss bedrock. The Neshaminy-Chrome-Conowingo soils have formed from the weathering of serpentinite. Beltsville-Sassafras-Butlertown soils consist of deep, silty or sandy soils on coastal plain sediments.

### EPA's Watershed Assessment

The EPA's Index of Watershed Indicators (IWI) lists the Lower Delaware as a watershed with more serious problems and higher vulnerability to stressors. The IWI rating of the watershed was 6 out of 6, with 6 being the worst. A score of 6 indicates the aquatic conditions are well below State water quality goals and that the watershed has the greatest need for corrective measures to be taken to protect the quality and prevent further decline. Previously the watershed had a rating of 4 "Less Serious Problems – High Vulnerability", but has changed this month to 6 with an evaluation of the most recent data. A summary of the IWI ratings are provided in the appendix.



A review of the Condition Indicators indicates that three of the categories are scored as "More Serious", Fish Consumption, Source Water Condition and Wetlands Loss. The Designated Use category, which provides the greatest weight to the score, is rated as "Less Serious" (50% to 80% of the water bodies meet the designated use). Four of the Vulnerability Indicators (Aquatic Species, Urban Runoff, Estuarine Pollution Susceptibility and Air Deposition) were rated as "High".

Overall, no one category appears to influence the rating (e.g., Designated Use). But an even distribution of problem areas and vulnerabilities provide the IWI score of 6. With respect to the Crum Creek basin some of these indicators do not appear to be relevant. The Fish Advisories listed were all for water bodies in New Jersey and most of the wetlands loss is associated with

the Delaware Estuary and not uplands. The Vulnerability Indicators ratings do appear to reasonably apply, with the exception of the Estuarine Pollution Susceptibility Index.

### **Special Protection Watershed**

The State lists upper reaches of Crum Creek in Chester and Delaware Counties as a special protection watershed. The creek is listed as a High Quality- Cold-Water Fishery watershed from the source near Malvern, downstream to the Newton, Edgemont, and Willistown Township borders.

### **Point Source Dischargers**

There are few point source dischargers into Crum Creek. There are five NPDES industrial dischargers and four residential sewage treatment plants in the watershed. A review of the data from the BASINS model did not list any of the major sources as exceeding their discharge limits. However, there was no data listed for the minor dischargers, the residential STPs.

### **Existing Watershed Plans**

A Watershed Plan or Stormwater Management Plan has not been generated by either Delaware, Chester Counties or the Crum Creek watershed. Chester County has recently received funding to initiate their Stormwater Management Plan. The PADEP has recently hired an additional biologist to work in each regional office to develop remediation plans and TMDL's for streams such as Crum Creek that are affected by non-point source pollution. The adjacent watershed, Chester Creek and Darby Creek are in Phase I of their Watershed Plans and Ridley Creek has a Stormwater Management Plan.

## **3. WATERSHED RESOURCES**

Crum Creek is used for many purposes including drinking water, flood retention, irrigation, and recreation. There are two water supply reservoirs within the Crum Creek watershed, the Crum Creek Reservoir and the Springton Reservoir. The two reservoirs combined encompass 398 acres of the watershed's area. The Springton Reservoir is Philadelphia Suburban Water's second largest reservoir, sits north of the Crum Creek Reservoir, and has a capacity of 3.5 billion gallons.



Springton Reservoir



There are several parks, schools, golf courses and farms located within the watershed, providing open space. There are also several quarries, industrial buildings and small dams, associated with the areas industrial past and present, that utilized the creek's water in their various processes.

#### 4. WATERSHED IMPAIRMENTS

Problems associated with the Crum Creek watershed can be divided into two categories, the Upper Crum Creek in Chester County, and the Lower Crum Creek in Delaware County. The upper and lower sections of Crum Creek face separate problems. The Upper Crum Creeks' water quality problems stem from agricultural runoff and new development issues, while impacts on the Lower Crum Creek's water quality stem from problems associated with an already developed region.

Two locations on the creek have been listed on the EPA's 303(d) list of impaired water bodies for 1998. The source of the impairments is from hydromodifications. Crum Creek Dam (PA003550), approximately 1 mile upstream of Swarthmore, creates a 282 acre feet reservoir. The reservoir is one of the two water supply sources on the creek. Reportedly, PSW has no minimum flow requirements for the dam. The second section on the 303(d) list includes the entire reach from Route 1 downstream to the mouth, including the length through Swarthmore.

Table 1 summarizes the Crum Creek watershed impairments that are on the current and proposed impaired waters 303 (d) list. The table was adopted from proposed changes to the current 303 (d) listing by PA DEP.

##### Impairment Sources & Causes for Crum Creek Basin

Source	Cause	Main Stem	Tributaries	303 (d)
Urban Runoff	Unknown	X	X	2000
	Water Flow Variability	X	X	
	Siltation	X	X	
Flow Modification PSWC Intake *	Flow alterations	X		1998
Agricultural Runoff	Algal growth	X		2000
Loss of Riparian Buffer due to Development	Habitat Modification		X	2000

##### Upper Crum Creek

In the PADEP's Unassessed Water Screening of the Crum Creek Watershed in 1999, the most recent addition to the proposed 303 (d) impairment listing is excessive algal growth at the extreme headwaters of the main stem in Malvern, for approximately one mile. Non-point source runoff from the Phelps Farm School in Malvern appears to be the source of the impairment. The

cause is agriculture runoff, related to nutrients, however no chemical testing has been performed as of this date.

Chester County recently received state funding to prepare a stormwater management plan for the Crum Creek watershed. This plan, as opposed to Delaware County's, will focus on non-point source pollution originating from agricultural runoff and from construction sites in developing areas.

### **Lower Crum Creek**

The PADEP Unassessed Water Screening determined that the majority of Crum Creek's impairments are caused by urbanization and development. These impairments were concentrated in the Lower Crum Creek Basin and are related to non-point sources of pollution, flow diminution, and flow variability.

The EPA's Basin land use report for the Crum Creek watershed indicates that 58% of the area is urban, or developed land, and land use in the Lower Crum, Delaware County, is nearly 100% urban or built-up land. The EPA's Enviromapper indicates that more than 4% of the land in the watershed is 28.92% impervious. This figure is obtained from an IWI analysis for the entire Lower Delaware watershed, and is supported by data from the 1999 PADEP Unassessed Water Screening of the Crum Creek Watershed and Basin's soil erodibility report that indicates erodibility decreases towards the mouth of the creek.

### **Stormwater Runoff**

Urbanization has increased the volume and velocity of surface water runoff in the Lower Crum Creek watershed, this has eroded streambanks and increased sediment loads in the creek. During times of peak flows, sediment loads greatly increase due to the large percentage of impervious surfaces within the Lower Crum Creek. Rooftops, roads, sidewalks, and parking lots increase the area of impervious surfaces and dramatically decrease the infiltrative capacity of the ground. Modifying drainage systems in developed areas is expensive, and convincing the public of the benefit-cost ratio is difficult.

Analyzing and comparing peak discharge data of the creek during the recent tropical storm to data obtained from historical analysis of USGS flow meters should show an increase in peak discharges compared to predevelopment levels and also show the effects of urbanization. Urban Runoff Potential is high not only in the Lower Crum Creek, but also in the entire Lower Delaware watershed due to a high population density.

The PADEP's unassessed waters screening shows that development is one of the causes of both sedimentation and the loss of riparian buffer. Sixteen monitoring stations were assessed for biological and habitat impairments utilizing macroinvertebrate communities and twelve descriptive habitat parameters. Impairments were found at 44% of the stations, and again, the majorities were located in the Lower Crum Creek. The data from this screening shows that non-point source pollution from developed areas directly affects water quality in the Lower Crum Creek. The major pollutants found in runoff from urban areas include sediment, nutrients,



oxygen-demanding substances, road salts, heavy metals, petroleum hydrocarbons, pathogenic bacteria, and viruses. Urban runoff during peak flow periods from storms that contains high concentrations of decaying organic material can severely decrease dissolved oxygen concentrations.

### **Stream Bank Erosion**

As open areas become developed and more of the land is covered and becomes impervious, the volume of runoff during rain events increases. These higher flows cause the existing, perhaps previously stabilized, stream channels to begin cutting back at their banks. Since space is already limited in most areas of the watershed, stream bank erosion can cause serious structural problems, loss of property, as well as being aesthetically unappealing. Stream bank erosion also contributes to increases sedimentation of the creek.

### **Hydrologic Modifications**

Hydromodifications, including dams and culverts, cause changes to the creek's ecology. Poor resource management in the Crum Creek basin has created a hydromodification impairment of a segment of the creek due to Philadelphia Suburban Water Company's Lower Reservoir intake. The Crum is currently listed for a 1.72 mile segment downstream from Philadelphia Suburban Water Company's Lower Reservoir. This listing is associated with Philadelphia Suburban Water Company's intake that, at present, does not have a minimum baseflow requirement.



Crum Creek Reservoir

The two dams also create open water bodies that become significantly affected by temperature. Data from the Basins water quality monitoring stations indicate that the average water temperature along creek ranges from 7 to 12 °C. While the average temperature at the Springton Reservoir is 23 °C.

In the developed areas of the watershed, many stretches of the creek have been channelized, diverted, placed in culverts, or filled over. The final mile of the creek flows underground through a concrete culvert, so that the expansive industrial area in the early 1900's (e.g., Baldwin Locomotive, PECO, Iron Works), could be built over top of the creek.



Crum Creek through Eddystone Borough

## **5. SWARTHMORE WATERSHED MANAGEMENT PLAN**

This Watershed Management Plan presents a preliminary outline of the projects to be encouraged by the Swarthmore Environmental Advisory Council toward improving the water quality and ecosystem within the Borough of Swarthmore. The focus of this plan is to develop a data gathering tool that can be; used to identify potential problems and projects; used as a planning tool by Borough officials; and, provide an educational resource to the community.

### **Community Overview**

The Borough of Swarthmore is an approximately 2 mi<sup>2</sup> community located in Delaware County, Pennsylvania. The Borough is a middle and upper middle class neighborhood in the southwest suburbs of Philadelphia, Pennsylvania. According to 1990 census data, the population of the Borough is 6,157, with 39% of the population under 21, 46% between 21 and 64, and 15% 65 and older. There are 2,115 housing units in the Borough, 8% built before 1900 and 50% built before 1939.

Like much of Delaware County, most of the land within the Borough has been developed. The bulk of the Borough consists of single family, residential homes on lots around 1/3 to 1/2 acre in size. There is a small downtown business district and a widely regarded liberal arts college.



Open space is limited to county and local parks, school district property, and a large area owned by the College. There are approximately 30 open lots within the Borough that are large enough to potentially be subdivided.

### **Crum Creek Watershed**

In Swarthmore, Crum Creek flows largely undisturbed through 330 acres of woodlands and meadows owned by the College. The two Philadelphia Suburban Water Company dams are located upstream approximately 1 and 3 miles respectively. Immediately upstream and downstream of Swarthmore, the Creek flows through parklands or wooded residential neighborhoods. There are two dams on the creek within the Borough. Both dams are associated with historic activities and do not retain significant amounts of water. There are numerous commercial businesses close by, which are primarily located along the major roadways in the area, Baltimore Pike, Route 320, Route 476.



### **Little Crum Creek**

Little Crum Creek is a tributary to Crum Creek. Two of the three branches to Little Crum Creek originate in Swarthmore. The main branch originates from a spring house along Route 320 in Swarthmore. A smaller branch begins near the downtown area and joins the main branch approximately 1,000 feet downstream. The third branch starts on the south side of Baltimore Pike in Springfield Township. This branch flows into the Borough and joins the Swarthmore branch in Little Crum Creek Park, located on the east edge of town. The creek continues to flow south and joins Crum Creek in Eddystone, approximately ¼ mile upstream of the mouth.

For the most part, Little Crum Creek flows through residential neighborhoods and parks. The headwaters to the creek are located just south of Baltimore Pike, which is a primary business roadway in the area. Much of the stormwater from the roadway and commercial businesses along Baltimore Pike, is diverted toward Little Crum Creek.

### **Potential Impacts**

Being largely a residential area, there are few point source dischargers in the watershed. The only major discharge source is PECO, located on the Delaware River at the Creeks mouth. There are several regulated facilities along the main roadways. Most of these are associated with commercial businesses and industrial facilities such as automobile dealerships, gasoline service stations, and local light industry.



The biggest impacts to the creek come from its flowing through Swarthmore's older, densely populated, suburban neighborhood. Impacts associated with this developed area include stormwater runoff, changes to stream channel, flood plain development, stream bank erosion and the discharge from combined or broken sewer systems.



As open areas become developed and more of the land becomes impervious, the amount of runoff during rain events increases. These higher flows cause the existing stream channels to begin cutting back at their banks. Since space is limited already in most areas of the watershed, stream bank erosion can cause serious structural problems as well as being aesthetically unappealing.

During heavy rainfall, combined sewer systems discharge the excess flow directly into the creek. These discharges can create releases of sewage and household chemicals. The release of bacteria from broken sewer lines is also a problem due to old lines running in, or adjacent to the stream beds.

## 6. NATURAL RESOURCE INVENTORY

The initial phase of the Watershed Management Plan will be to create a data base and natural resource inventory. The EAC will work in conjunction with county and private organizations to create a *database using a Geographic Information System (GIS)* such as ArcInfo. Data will come from existing sources such as federal and state agencies (EPA, PADEP, USGS, PGS), the county planning commission (soils, tax maps, land use, projected growth areas), transportation and utility agencies (PADOT, PECO, pipelines), Borough information (sewer, water, zoning) and private organizations

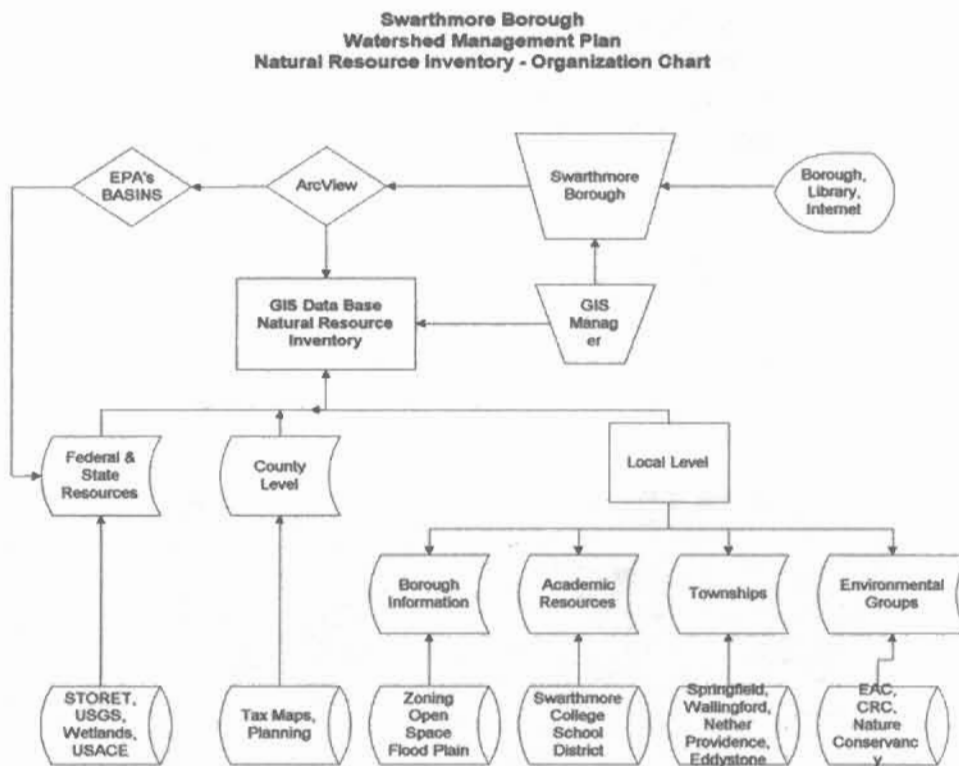




(watershed groups, colleges, non-profit conservation groups). Local information will also come from programs initiated by the EAC, such as the nature inventory to school kids, conducted in the spring.

The database will become a resource that can be used by Borough Officials in planning and zoning issues, identifying sensitive lots along wetlands or streams, flood prone areas. The community will also have access to the resource inventory through local network systems in the Public Library or via the internet. Access will be available using free GIS viewing software such as ArcView.

A generalized organizational and data management chart is presented below:



## 7. IDENTIFY RESTORATION PROJECTS

Using the information obtained from the natural resource inventory, watershed improvement and restoration projects can be more accurately identified. Project are likely to include stream bank restorations, buffer zone enhancement, stormwater runoff reduction, open space acquisition and water quality improvement and creek cleanups.

## Stream Bank Restoration

Programs such as the recently completed stream bank restoration project in Little Crum Creek Park will be identified and implemented. The section of the Little Crum Creek that flow through the Little Crum Creek park will serve as a model for future projects. For this project vegetation, organic matting and biologs were used to re-stabilize the heavily eroded stream bank. Plants and equipment were purchased through a grant, and the project was implemented using volunteers from the community. Both the project and the visible results will serve as a teaching tool for residents.

Buffer strips provide a filtering action to runoff through several methods. First, a reduction of water velocity from upland areas occurs due to this riparian buffer. Second, the buffer area reduces sediment from reaching the stream by filtration; a portion of the sediment remains in the buffer zone. And finally, nutrients and heavy metals attached to the sediment are also diminished from reaching the stream as the particles travel through the buffer zone. It is ideal to use vegetation for streambed restoration, but boulders, riprap, or the construction of retaining walls can be used in eroding areas for streambed stabilization.

The Morris Arboretum, of the University of Pennsylvania, is creating an on-the-ground demonstration of best management practices in urban landscapes for nonpoint source pollution reduction through riparian corridor restoration along a 0.4 mile portion of the Paper Mill Run. Included in the demonstration is the implementation of best management practices for riparian corridor buffer restoration. Projects will be targeted that preserve, enhance, or establish buffers that provide water quality benefits along Crum Creek and Little Crum Creek.



Little Crum Creek Streambank Stabilization

## Stormwater Management

Stormwater management goals for this watershed plan are to identify areas that are sensitive to stormwater runoff, and identify stormwater management systems that need repair or modifications. To assist the Borough in complying with stormwater management regulations, best management practices will be identified for sensitive areas, and efforts and information will be coordinated between Borough and County offices.

Project will be targeted that reduce surface water runoff pollution loadings from areas where development has already occurred; Limit surface water runoff volumes in order to minimize sediment loadings resulting from the erosion of streambanks and other natural conveyance systems; and assist in the new stormwater management permitting programs.

### 8. PRELIMINARY BUDGET ESTIMATE

An estimated budget for implementing the proposed watershed management plan is provided below. This budget includes the purchase of computer hardware and software, collection and input of the data, and management of the inventory. The database will be developed and managed by a consultant or other experienced GIS operator. Resource information will be primarily collected from existing information and surveys by the community representatives. Representatives of the Borough will be trained in using the GIS system to allow proper use for planning, decision making, and educational purposes. The preliminary estimated budget is presented below:

Computer Hardware	\$ 3,000
Computer Software (ArcInfo)	\$ 1,500
Collection of Background Information	\$ 3,000
Develop Database & Input of Data Layers	\$ 10,000
GIS Manager	\$ 5,000
Training	\$ 1,000
Management Plan & Grant Applications	<u>\$ 3,000</u>
<b>Total Budget Estimate</b>	<b>\$ 26,500</b>

### 9. SOURCES OF FUNDING

Funding for the management plan and resource inventory will hopefully be obtained from a variety of sources such as state and federal grants, and community business and individual gifts and donations. Two potential State sources of financial assistance are through the Watershed Restoration and Assistance Program (WRAP) and the Section 319 Nonpoint Source Management Program. In addition, there are several non-profit watershed groups that offer assistance in watershed management, protection and restoration programs. A list of possible financial and assistance sources, and information on the available grants is presented in the Appendix.

## 10. STAKEHOLDERS

There are many groups and individuals involved in the Crum Creek Watershed. Two of the primary groups include the Chester Ridley Crum Watershed Association and Swarthmore College.

The goals of the Chester Ridley Crum Watershed Association are to create and support public awareness and support scientific investigations and research. The association is in the preliminary planning phase of a Crum Creek natural inventory assessment.

Swarthmore College Crum Creek Monitoring Project was started in 1996 to monitor the overall health of the Crum Creek watershed in the area immediately surrounding the Swarthmore College Campus. The project has approximately 20 monitors that visit pre-assigned sites to perform weekly observations and tests. Water is tested for nitrate, phosphate, alkalinity, dissolved oxygen, chloride and pH levels. Visual observations, such as the presence of petroleum or sewage are also recorded. Information on the Swarthmore College, Crum Creek Monitoring Project is included in the Appendix.

A list of stakeholders associated with the Crum Creek watershed is presented below.

Wallingford-Swarthmore School District, SRS (Elementary School), Sandy Sparrow, Principal, Tom Elverson, teachers and students.

Swarthmore College (and Scott Arboretum), Al Bloom, President; Claire Sawyers, Arboretum Director; professors and students.

Chester Ridley Crum Watershed Association, Carl Dupoldt, President.

Crum/Ridley/Chester Volunteer Monitoring Program, Frank Dowman, Coordinator.

Delaware County Conservation District, Ed Magargee, District Manager.

Delaware County government, Ted Erickson, Executive Director.

Delaware County Anglers and Conservationists, Jim Moreland.

Delaware County Environmental Network, Deborah Haines, Chairperson.

Philadelphia Suburban Water Company, Preston Luitweiler, Research and Environmental Affairs.

Swarthmore Boro (and Environmental Advisory Committee), Ann Seidman, Council President; Jane Billings, Boro Secretary.

Swarthmore Rotary Club.

Trout Unlimited, Delco Manning Chapter, Steve Kosiak.

Widener University, Robert Bruce, President; Bruce Grant, Biology Department.

Delaware River Basin Commission, Richard Albert.

PA Department of Environmental Protection, Nancy Crickman, Watersheds, Southeast Regional Office;

Diane Wilson, Citizens' Volunteer Monitoring Program.

PA Department of Conservation, Teresa Kromel.

US EPA Watershed and other water-related programs.

US EPA Source Water Protection program.

US EPA Crum watershed residents.

US EPA Green Communities program.

Other Federal agencies (US Geological Survey, US Fish & Wildlife Service, US Natural Resources Conservation Service, US Army Corps of Engineers, others).



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