

4.0 IDENTIFICATION OF MAJOR WATERSHED ISSUES

4.1 Introduction

This chapter highlights key watershed issues raised through the public participation process and a review of published literature addressing the Schuylkill River watershed. It is not intended as a definitive discussion of all the issues affecting the watershed. Rather, it is intended to provide a context for the subsequent chapters, and to inform the reader of some of the key public concerns in the watershed.

This chapter begins with a description of the public outreach strategy, and continues with a discussion of issues identified by the watershed public. These issues are discussed in the context of previous watershed studies and literature reviewed in preparation for the development of this Plan.

4.2 Public Outreach Strategy

The public outreach strategy for the Schuylkill Watershed Conservation Plan included:

- A public opinion poll of watershed residents to assess general environmental awareness and watershed issues of concern;
- Three rounds of public meetings, each held at several locations in the watershed, to gather public input on watershed issues, on the draft Plan and recommendations, and on potential implementation projects to be listed in the final Plan;
- The incorporation of expert knowledge and stakeholder participation through a Technical Advisory Committee and literature research; and,
- Creation of the Schuylkill Watershed Conservation Plan website (<http://www.schuylkillplan.org>) to provide background on the project goals and partners, and serve as the primary distribution mechanism for the draft and final Plan, and all supporting reference maps and documents.

Methods used to identify critical environmental and institutional issues affecting the Schuylkill River watershed are discussed in the following sections.

4.2.1 Public Opinion Poll

In July 1997, a public opinion poll was conducted by the Global Strategy Group, Inc., for The Conservation Fund, to assess the general public's environmental awareness and gather input as to the perceived issues and problems in the watershed. The poll was based on a random sample of 800 adults throughout the seven counties in the Schuylkill River watershed. The number of interviews conducted in each county was directly proportional to the percentage of the total watershed population residing within that county. All data was weighted back to proper proportions of the population such that the overall margin of error was plus or minus 3.5%. Results of the poll are referenced periodically throughout this chapter, and are posted online at <http://www.schuylkillplan.org>. **Table 4.1** summarizes the results of the public opinion poll.

Table 4.1 Summary of Public Opinion Poll Results

<p style="text-align: center;">Environmental Education</p> <ul style="list-style-type: none">• 88% support increased public funding for environmental education programs• 86% said there should be more environmental education programs for adults and children• 43% said their local high school should be responsible for providing environmental education programs
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<p style="text-align: center;">Recreational Opportunities</p> <ul style="list-style-type: none">• 93% support the development of walking trails and bicycle paths by their county or municipality• 87% support an increase in public funding for the development of trails and pathways

<p style="text-align: center;">Water Quality</p> <ul style="list-style-type: none">• 66% said there currently is not enough being done to protect their community's water quality• 93% would support county or municipal requirements that developers set aside greenspace buffers along local rivers and streams• 93% support an increase in public funding to improve their local water quality• 93% support increased public funding for the restoration of degraded rivers and streams
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<p style="text-align: center;">Landscape and Land Use</p> <ul style="list-style-type: none">• 88% said land conservation should keep pace with land development• 84% said there are economic benefits to preserving open space• 82% said they would pay more for a home if parks and/or natural areas were nearby• 90% said they support the purchase of land for parks and natural areas by their county or municipality as a way to improve their environment• 86% support an increase in government efforts to mitigate sprawl and over-development• 91% support an increase in public funding for open space and natural areas protection

Environmental and water resource issues were not always the most important issues facing watershed residents. In Philadelphia County, for example, nearly half of the respondents identified crime and drugs as the most important public issues. Schuylkill County residents identified the economy as the most important issue, though this was closely followed by air and water pollution. Over-development and sprawl were noted as the most important issues in Montgomery and Bucks Counties.

4.2.2 Public Meetings

A series of three public meetings were held as part of this project's outreach strategy, to solicit public input into the watershed conservation planning process. Comments received at these meetings are referenced throughout this chapter, and were integrated into the Plan where appropriate. Public comments from these meetings have been compiled and are posted by the date of the meeting on the Schuylkill Watershed Conservation Plan website at <http://www.schuylkillplan.org>.

In the first round of public meetings, four workshops were held across the watershed during the summer of 1999. Each of these workshops was identical in format with a presentation by the project partners followed by a public comment period. These initial meetings focused on gathering input from watershed stakeholders about important issues in the watershed that could be noted or addressed as part of this Plan.

- The first workshop for Montgomery, Chester, and Bucks Counties was held in the evening of June 14th at the Upper Providence Township Municipal Building in Montgomery County. Comments were solicited from three breakout groups facilitated by the Pennsylvania Environmental Council. Approximately 25 people attended this meeting.
- The second workshop for Schuylkill and Carbon Counties was held the evening of June 17th at the Schuylkill County Agricultural Hall in Schuylkill County. Comments from the 29 attendees were solicited from two breakout groups facilitated by the Schuylkill River Greenway Association.
- The third workshop for Berks, Lehigh, and Lebanon Counties was held the evening of June 28th at the Berks County Agricultural Hall in Berks County. Comments were solicited from three breakout groups facilitated by the Berks County Conservancy. 35 people were in attendance at this meeting.
- The fourth workshop was held for Philadelphia County during the afternoon of August 10th at the Philadelphia Library. The Pennsylvania Environmental Council solicited comments from the attendees in a single group.

A second public meeting series was held in September 2000 to receive public comment on the key findings and recommendations from the draft Schuylkill Watershed Conservation Plan. Meetings were conducted at the same locations as before, and included a one-hour presentation by the project partners, followed by two rounds of simultaneous breakout sessions addressing the three major issue areas: institutional capacity, water quality, and landscape sustainability.

- The workshop for Montgomery, Chester, and Bucks Counties was held the evening of September 26th at the Upper Providence Township Municipal Building in Montgomery County. Comments were solicited from three breakout groups with assistance from the Pennsylvania Environmental Council. 35 people attended this meeting.
- The workshop for Schuylkill and Carbon Counties was held the evening of September 19th at the Schuylkill County Agricultural Hall in Schuylkill County. Comments from the attendees were solicited from three breakout groups with assistance from the Schuylkill River Greenway Association.
- The third workshop for Berks, Lehigh, and Lebanon Counties was held the evening of September 20th at the Berks County Agricultural Hall in Berks County. Comments were solicited from three breakout groups with assistance from the Berks County Conservancy. 25 people were in attendance at this meeting.

- The fourth workshop was held for Philadelphia County during the afternoon of September 27th at the Philadelphia Library. Comments were solicited from the 12 attendees in a single group with assistance from the Pennsylvania Environmental Council.

The third and final round of public meetings was held in March 2001. The goal of these meetings was to review the major recommendations of the draft Plan, and to gather input on potential implementation projects that watershed stakeholders would like to be included in the final Plan. Based on previous attendance, Montgomery, Chester and Bucks Counties were combined with Philadelphia County into a single workshop, held in Conshohocken. Potential implementation projects identified during these meetings, and those submitted separately by watershed municipalities and organizations, were compiled and are listed in the corresponding online Reference Document **Potential Implementation Projects**.

- The workshop for Montgomery, Chester, Bucks and Philadelphia Counties was held the evening of March 20th at the Department of Environmental Protection's Southeastern Office in Conshohocken. Input from the attendees was solicited with assistance from the Pennsylvania Environmental Council.
- The workshop for Schuylkill and Carbon Counties was held the evening of March 28th at the Schuylkill County Agricultural Hall in Schuylkill County. Input from the 9 attendees was solicited with assistance from the Schuylkill River Greenway Association.
- The third workshop for Berks, Lehigh, and Lebanon Counties was held the evening of March 27th at the Berks County Agricultural Hall in Berks County. Input was solicited from the 10 attendees with assistance from the Berks County Conservancy.

4.2.3 Research and Expert Sources

Numerous reports and other documentation on water quality, land use and institutional issues in the watershed were reviewed. These included reports from: federal agencies such as the U.S. Environmental Protection Agency (US EPA) and the U.S. Army Corps of Engineers (US ACE); state agencies including the Pennsylvania Department of Environmental Protection (PA DEP) and the Penn State Environmental Resources Research Institute; and nonprofit organizations such as the Schuylkill Riverkeeper and the Schuylkill River Greenway Association. These reports and documents are included in **Section 4.4 References** below.

In addition to this research, new analyses were performed specifically for this Plan including GIS (geographic information system) based analysis of geographic or programmatic institutional gaps, landscape-level sustainability, and data analysis and water quality modeling.

A Schuylkill Watershed Conservation Plan Technical Advisory Committee (TAC) was assembled and met six times: September 1998; May 1999; December 1999; May 2000; October 2000; and finally April 2001. The purpose of the TAC was to provide expert input and review during the drafting of the Plan. The TAC did not identify new issues, but rather assisted in how these issues were categorized, presented, and addressed in the Plan. The draft Plan was presented to the TAC at the meeting in October 2000 with comments accepted by them through January 2001. At the April 2001 meeting the project partners presented to the TAC a summary of public comments on the draft Plan, as well as how these and the TAC comments would be addressed in the final Plan.

Government agency representatives on the TAC included the U.S. Environmental Protection Agency, National Park Service, U.S. Army Corps of Engineers, Natural Resources Conservation Service, Delaware River Basin Commission, Delaware Valley Regional Planning Commission, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Department of Environmental

Protection, and a number of representatives from each of the counties in the watershed. Nonprofit representatives included the Montgomery County Lands Trust, Berks County Conservancy, Hawk Mountain Sanctuary, Perkiomen Watershed Conservancy, Pennsylvania Environmental Council, Schuylkill River Greenway Association, and Schuylkill Riverkeeper. Finally, industry representatives on the TAC included the Philadelphia Water Department, Philadelphia Suburban Water Company, GPU Energy, and Berks County Homebuilders Association. A full list of the TAC members is available in the **Acknowledgements** to this Plan as well as on the project website at <http://www.schuylkillplan.org/>.

4.3 Issues Identification

The issues identified through the public outreach strategy described above, including the public opinion poll, the public meetings and the TAC meetings, have been grouped into several categories for further discussion. Each of these issue areas is described in greater detail below.

- Environmental Education and Outreach Resources
- Recreational and Scenic Resources
- Cultural and Historic Resources
- Water Resources
- Landscape and Land Use Resources
- Institutional Resources

4.3.1 Environmental Education and Outreach Resources

The need for environmental education was expressed at the public meetings throughout the watershed. At the Philadelphia meeting, Philadelphia Water Department noted the need for public education regarding pollution prevention and storm water runoff. The Schuylkill Center for Environmental Education noted the need for common access to watershed information, more focus on regional impacts, bringing together municipal governments, educating institutional landowners, and stressing the economic value of watershed natural resources to city leaders. The Manayunk Development Corporation noted the need for environmental education that reconnects people to water resources in the Schuylkill River watershed.

Roughly one-third of the public opinion poll respondents correctly named the Schuylkill River watershed as the watershed in which they lived. Another third identified their watershed as the Delaware River while the remaining third were not able to name their watershed of residence. 28% of poll respondents thought that the state government should take lead responsibility for protecting and improving the natural resources of the Schuylkill River.

The *Management Action Plan for the Schuylkill River Heritage Corridor* (March 1995) prepared by the Schuylkill River Greenway Association noted the importance of incorporating environmental education and studies of the Schuylkill Corridor into school curricula from kindergarten through college. The plan adopted the slogan “The Corridor is our Classroom” to focus education efforts towards regionalism.

The manner in which the Schuylkill River watershed demonstrates the mingling of natural processes and cultural influences makes it an ideal candidate for use in environmental education. The diversity of animals that use its woodlands and live in its waterways are indicators of health that can be measured by students and citizen volunteers. Investigating the differences in a stream’s water quality and hydrology after it has flowed through a forest, versus downstream of a construction site, may help to demonstrate the

effect of land clearing. The differences in geometry of a stream channel in a pasture as compared to a channel in a forest may tell a story of the effects of agriculture on stream hydrology.

These are just a few examples of topics that can be developed to address three areas of need for environmental education and outreach: school curriculums; programs for municipal officials and nonprofit staff; and citizen programs. These areas of outreach obviously are related: students will grow into voting citizens who, when knowledgeable about the importance of protecting aquatic environments, will elect officials that understand these concerns. A well-developed education and outreach strategy should focus on developing an integrated program that can be incorporated into the regular operations of school systems, municipalities, and conservation organizations.

4.3.2 Recreational and Scenic Resources

Public perception about water quality and public access in the Schuylkill River watershed affect the recreational use of its resources. The public opinion poll found that nearly half of the watershed’s residents felt they have a “great deal” of access to public open spaces, rivers, and lakes for recreation, but only 5% “frequently” use these areas for recreation. Yet, about half of the respondents do not think there are enough open spaces in the watershed. Additionally, just over half of the respondents do not think their local rivers and streams are safe enough to swim or wade in.

In addition to these public opinions about the watershed’s recreational resources, assuring a high level of recreational opportunities and access was a high priority in Montgomery County and the lower portion of Berks County. This issue was not raised at the other public meetings.

Data obtained for the *Lower Schuylkill River Water Quality Assessment* prepared by US EPA Region III (August 1995) indicated that, except for copper residues, the lower Schuylkill River should be considered fully supporting of fishable use.

The Schuylkill River is part of the Pennsylvania Scenic Rivers System. Specific segments identified in this System, their lengths and scenic classifications are as follows (**Table 4.2**).

Table 4.2 Scenic Rivers Segments in the Schuylkill River Watershed

<i>Stream Segment</i>	<i>Length (miles)</i>	<i>Scenic Classification</i>
Port Clinton (Forks) to Cross Keys (Bridge)	16.2	Recreational
Cross Keys (Bridge) to Reading (Route 422)	12.3	Modified Recreational
Reading (Route 422) to Douglasville (Bridge)	15.3	Recreational
Douglasville (Bridge) to Fairmount Dam	49.8	Modified Recreational
Route 209 (Highway) to Cressona Route 183 (Bridge)	5.0	Recreational
Cressona Route 183 (Bridge) to Auburn Basin (Spillway)	9.6	Modified Recreational
Auburn Basin (Spillway) to Port Clinton (Forks)	7.4	Recreational
Port Clinton (Forks) to New Ringgold Route 895 (Bridge)	10.9	Pastoral

“Recreational” waterways are readily accessible, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past. “Modified Recreational” waterways may have their flow regulated by control structures upstream. “Pastoral” waterways are free-flowing except for historic or restored mill dams that are capable of or under restoration to support water-based

recreation, fish, and aquatic life. The view from the river or its banks must be predominantly pastoral or farming countryside to qualify for this classification.

Commonwealth policy is to protect and enhance those river segments representative of Pennsylvania's natural and cultural river heritage for the purposes of environmental protection, and the general recreational enjoyment and educational benefit of the public.

4.3.3 Cultural and Historic Resources

Historic structures provide a means for present-day eyes to imagine and understand the lifestyle and landscapes of previous generations. The physical remains of the past are instructional in many ways. For instance, old mills demonstrate the importance of waterpower to early settlement patterns and the beginnings of the industrial revolution. The remains of the Schuylkill River Navigation canal system provide evidence of this impressive water transportation system. Barns and other historic structures show the constantly changing styles of architectural design, as well as the influence of local topography, climate and culture. Preserving our historic and cultural legacy contributes to our sense of place and community identity. In addition, cultural, historical and environmental resources are the basis for bringing tourist revenue to the local economy.

The federal government formally recognized the importance of historic preservation with the inception of the National Register of Historic Places in 1966. The National Register is a list of buildings and districts that have been declared of national significance and therefore are afforded some protection from federal actions that might harm them. Owners of buildings on the National Register also can derive tax benefits from renovating the structures according to standards of the Department of Interior, the administrator of the National Register.

The Commonwealth of Pennsylvania, through its Historic and Museum Commission (PHMC), administers the National Register program within the state. The Pennsylvania Historic District Act 167 of 1961 allows local governments to set up historic districts where demolition, new construction, alteration, and renovation can be regulated to conserve the historic character of the district. Proposals for changes within a Historic District are reviewed by a local Historic Architectural Review Board, which advises the local governing body. Applications for PA Act 167 Historic Districts and for the National Register must be approved by PHMC.

The preservation of cultural and historic resources was widely recognized as an issue at the public meetings in most sub-regions of the watershed. A Berks County resident expressed a desire for historical sites to be integrated with a network of greenways and other environmentally valuable sites.

The 1981 *Feasibility Report of the Schuylkill River Review Study* by the Philadelphia District of the US ACE lists 46 known historical sites within the Schuylkill River watershed in Berks, Chester, Montgomery, and Schuylkill Counties. These include sites listed on the National Register, those with National Register listing pending, sites listed as a National Historic Landmark, and sites recorded by the Historic American Buildings Survey.

The most comprehensive compilation of cultural and historic resources in the watershed is found in *The Management Action Plan for The Schuylkill Heritage Corridor*, which was prepared by the Schuylkill River Greenway Association in March 1995. This plan provides a summary of cultural landscapes and historic resources, as well as recreation/open space resources and transportation resources. Nearly 250 of

these are individually located on one of five location maps. The *Management Action Plan* also discusses and defines cultural landscapes, natural and historic resources, folk life, art and artists, and education.

4.3.4 Water Resources

Results from the public opinion poll suggest that ensuring a reliable and clean source of water as the population growth and development continue is a major concern throughout the watershed. Overall, 56% of the respondents did not think their local streams and rivers were safe enough to swim and wade in. With regard to water quality, 74% of respondents strongly supported increased funding to improve water quality and 72% strongly supported funding for the restoration of degraded rivers and streams. Support for this initiative was particularly notable at the public meetings in Montgomery County.

The following sections provide a more detailed discussion of water resource issues identified based on the public opinion poll, public meetings and documentation review.

4.3.4.1 Urban/Suburban Development and Stormwater Runoff

High rates of urban/suburban development and a need for more comprehensive stormwater management were expressed as major concerns at public meetings throughout the watershed. This issue is of particular concern in the developed and rapidly developing areas of the lower watershed.

In developing watersheds, impermeable rooftops and pavement (impervious surfaces), together with storm drains that channel runoff directly to streams, cause significant changes in the hydrologic and geomorphic characteristics of the watershed. Typical hydrologic effects include increases in peak flow rates and the total volume storm runoff (Schueler 1987). To accommodate these increases, stream channels tend to erode downwards and become wider. Channel erosion can cause reduced development of pool/riffle topography that provides important habitat for aquatic organisms, and sediment eroded from banks can accumulate in the channel as sandbars and other deposits. These changes often lead to stream instability that is characterized by abrupt, episodic, and progressive changes in the location, geometry, gradient, or planform of a river/stream. Unstable channels can destroy property, damage structures, reduce water quality, diminish aquatic (and terrestrial) habitat, and degrade aesthetic quality. Non-point source pollution from urban/suburban areas also is a major concern in stormwater runoff. Because less water infiltrates into the ground when impervious cover is high, reductions in flow during dry periods also are possible. These effects of urban/suburban development impact many streams with the Schuylkill River watershed.

The Stormwater Management Act (Act 167) provides grant monies to counties for developing stormwater management plans in designated watersheds. To date, the following stormwater management plans have been completed or are currently being prepared.

Table 4.3 Stormwater Management Plans Completed or In Progress

<i>Completed Act 167 Stormwater Management Plans</i>	
Watershed	County
Stony Creek/Sawmill Run	Montgomery
Rock Run/Gully Creek/Mill Creek	Montgomery
Sacony Creek	Berks

Act 167 Stormwater Management Plans Currently Being Prepared

Watershed	County
Sandy Run	Montgomery
Swamp Creek	Montgomery
Tulpehocken Creek	Berks
East Branch of the Perkiomen Creek	Bucks

4.3.4.2 Non-point Source Pollution

Non-point source pollution is pollution of water resources that derives from a variety of activities occurring over a large geographic area, and accumulates at intermittent intervals related mostly to rainfall or snowmelt runoff. In rural areas, the principal non-point sources are associated with agricultural activities, and the resultant polluted runoff includes sediment, nutrients, and pesticides/herbicides. In urban/suburban areas, non-point pollution sources include pet waste, garbage and litter accumulation on streets, leaking fluids from vehicles, street salting, lawn care chemicals, and construction sites. Urban non-point source pollution includes nutrients and sediment as well as toxic contaminants such as heavy metals, PCB's, oil, and gasoline (Novotny and Chesters 1981).

Non-point source pollution can be a significant water quality problem, and is now a principal focus of water quality regulation under the Clean Water Act (discussed further in *Chapter 5.0 Water Quality*). Because non-point source pollution results from a large number of activities over large areas of the landscape, regulations may affect many people throughout the watershed. Results from the public opinion poll, however, suggest that much of public is not aware of this significance of the problem. The public opinion poll found that 47% of respondents, most notably those in Philadelphia, thought that industrial (point source) pollution has the greatest impact on the quality of rivers and streams in the community. Of those respondents identified as having a high level of environmental awareness, 51% believed municipal waste is more to blame.

The report *Pennsylvania Coastal Non-point Pollution Program* (PA DEP 1995) found that water quality near the coastal zone primarily is affected by non-point source pollution from agriculture and urbanization. Also, the March 1996 draft of the report *Planning for Water Quality Monitoring and Riparian Restoration in the Schuylkill Watershed* (Delaware Riverkeeper Network) noted that non-point source related water quality issues remain a problem throughout the watershed. In the 1996 report *River for Renewal - A Look at the Restoration Potential of the Schuylkill River* (Delaware Riverkeeper Network), runoff from highways, parking lots, and industrial sites were cited as sources of toxic inputs to the river. Several studies also have been conducted by the Penn State University Environmental Resources Research Institute assessing non-point source pollution loading in the Delaware River Basin and throughout Pennsylvania (see Evans et al. 1996).

Nutrient (nitrogen and phosphorus) loading from non-point source pollution also is a major concern in the watershed. Stream nutrient concentrations are one of the principle factors regulating the health and productivity of aquatic ecosystems. Low nutrient concentrations will result in less than optimal growth of primary producers (aquatic plants, phytoplankton), and high nutrient concentrations can result in excessive rates of algae growth leading to oxygen depletion, fish kills, and other ecological impacts of eutrophication. High phosphorus loading often is associated with sediment pollution, because of the tendency of phosphorus to attach to sediments in the water column.

4.3.4.3 Channel Erosion and Sedimentation

High rates of stream channel erosion and bank sloughing associated with urban development and the disturbance of riparian forests can result in significant amounts of sediment entering streams and rivers. As with sediment derived from soil erosion from upland sources, this can be a major problem for water quality and aquatic ecosystems.

Sedimentation from non-point sources has been identified as a particular concern in the watershed. The March 1996 working draft of *Planning for Water Quality Monitoring and Riparian Restoration in the Schuylkill Watershed* (Delaware Riverkeeper Network) noted that suburban developments, mostly around Philadelphia and Reading, have disturbed the original land cover and increased sediment yields in the river. The 1996 report *River for Renewal - A Look at the Restoration Potential of the Schuylkill River* (Delaware Riverkeeper Network) also noted that sediment from non-point sources is one of the major problems facing the Schuylkill River. Numerous causes were cited including deforestation, loss of wetlands, suburbanization, and intensive agricultural practices. A study by F.X. Browne in 1992 estimated that Lake Ontalaunee in Berks County had lost approximately 25% of its volume between 1938 and 1992 due to sedimentation from non-point runoff associated with agricultural activities.

4.3.4.4 Acid Mine Drainage and Other Mining Impacts

Acid mine drainage (AMD) in the headwaters region of Schuylkill County has impacted Schuylkill River water quality for many years. This issue was identified as a major concern during public meetings in Schuylkill County. Desilting basins and controls on mining practices have reduced sediment loads in mine discharge, but acid mine drainage continues to degrade the water quality in the coal region headwaters (Delaware Riverkeeper Network, 1996b). The Pennsylvania DEP confirmed these findings in the 1995 report *Pennsylvania Coastal Non-point Pollution Program*. This report stated that the largest non-point source of pollution in the headwaters is AMD, which contributes significantly to non-attainment of water quality criteria. AMD was not mentioned as a major concern at any other public meeting, however, in spite of the cumulative effects of AMD that may impair water quality in other regions downstream.

The Schuylkill River also has been impacted by vast amounts of culm (extremely fine particles of coal) that were discharged either directly or indirectly into streams from mining operations earlier in this century. In 1927, the US ACE estimated that 38 million tons of culm had accumulated in the Schuylkill River, raising the bed of the river and altering its flood stages. In 1947, Pennsylvania and the US ACE constructed about two dozen desilting pools and modified existing dams to trap silt from flowing into the Delaware River as described in *The Schuylkill River Project Desilting Pools and Impounding Basins* (PA DER 1981). In 1951, 26 million tons of sediment were removed from the river and adjacent flood plains, and in 1954 three million cubic yards of culm were pumped from behind Fairmount Dam. However, even after these efforts coal fines remain in the river. In 1973, fines comprised as much as 50% of the dredgings at sites below the city of Reading.

4.3.4.5 Water Quality Monitoring Data

Insufficient data to identify and assess water quality problems within the watershed was noted as a major issue during public meetings in the Tulpehocken sub-region of Berks County, and the Little Schuylkill sub-region of Schuylkill County. Various watershed conservation groups also highlighted the lack of sufficient data and a lack of funding to support water quality monitoring activity. A general need was expressed for a unified system to collect and store monitoring data watershed-wide.

The report *Evaluation of NPS-Related Features within Pennsylvania's Coastal Non-point Pollution Program Management Areas* (Evans et al. 1996) reviewed available water quality data, and determined that only about half of the parameters of interest have sufficient data to support a long-term trend analysis for the Schuylkill River watershed.

4.3.4.6 Effects of Dams

There are over 280 dams in the Schuylkill River watershed (Delaware Riverkeeper Network 1996b). Most of these are low dams on tributaries. Nine major dams have created over 25 miles of slack water on the mainstem, which is roughly 25% of stream miles between Pottsville and Philadelphia. Dams can provide a number of benefits to the public, including water supply, flood control, and recreation. However, dams also can cause significant ecological impacts, including altered flow regimes and physical habitats, changes in water quality, changes in sediment transport, and changes in resident and migratory fish communities. Three major tributary impoundments, Blue Marsh Reservoir, Lake Ontelauntee, and Green Lane Reservoir, suffer from nutrient over-enrichment as a result of impounded water behind dams.

4.3.4.7 Wastewater Discharges, Non-permitted Discharges, and CSOs

Under the Clean Water Act, all municipalities or industries discharging wastewater to receiving waters must be in compliance with a National Pollution Discharge Elimination System (NPDES) permit. NPDES permits specify the amounts of pollutants that can be discharged to a receiving waterway based on the designated use of the waterway and its ability to assimilate waste. Permits also specify sampling and reporting requirements that must be followed. Water quality and associated ecological impacts still can occur at or below permitted discharge levels, however, particularly during low flow periods when little water flow is available to dilute effluent. In Pennsylvania, the DEP has jurisdiction over the implementation of the NPDES program. The 1995 report *My River is the Schuylkill* (The Academy of Natural Sciences) identified 93 NPDES permitted sewage or industrial discharge sites in the watershed.

Discharges of untreated sewage by non-permitted dischargers can be a more serious threat to water quality. In the Schuylkill River watershed, non-permitted discharges were identified as a major concern during public meetings in Berks and Schuylkill Counties. These so-called "wildcat" discharges occur principally in rural areas, and include homes and other small facilities that discharge their waste directly into adjacent streams. In addition, some small boroughs and townships have central sewage collection systems, but either no wastewater treatment facilities, or facilities that are not effective in removing pollutants.

In urban areas such as Philadelphia and Reading, untreated sewage also may be discharged to streams as combined sewer overflows (CSOs). CSOs occur during runoff events when flow through sewers transporting both sanitary sewage and storm water exceed the capacity of treatment facilities, and the excess flow volume is discharged directly to a receiving stream. CSOs are regulated under the NPDES permit program.

In addition, other unintended point-source pollution may occur throughout the watershed, such as sedimentation from quarries and nutrient and chemical pollution from landfills. The report *My River is the Schuylkill* (ANS 1995) documented 32 Superfund sites in watershed, 14 in Montgomery County, seven in Berks, five in Chester, two in Schuylkill, one each in Bucks and Philadelphia Counties.

4.3.4.8 Water Supply and Flooding

Flooding in the Schuylkill River watershed occurs with some regularity in different areas, and was identified as a significant concern during public meetings in Berks County. The particularly large flood associated with Hurricane Agnes in 1972 caused the highest recorded flow rates at the Reading and Pottstown gages (90,000 cfs and 95,900 cfs, respectively), while the highest recorded flow rate at Fairmount Dam was 135,000 cfs in the flood of 1869 (flow rate was 103,000 cfs during Agnes in 1972). It was estimated by the US ACE that Hurricane Agnes caused \$141 million (in 1972 dollars) in damages. In the 1990 report *Schuylkill River Basin Limited Reconnaissance Study*, the US ACE concluded that the Schuylkill River and its tributaries continue to cause significant flood damage throughout the watershed, and recommended eight local protection studies as well as a regional flood control study.

Water conservation and the protection of groundwater supplies also was a concern in Montgomery and Berks Counties. Water conservation is important wherever urban development has the potential to reduce groundwater recharge, where significant withdrawals occur, or where geologic characteristics limit groundwater supplies. Excessive pumping of groundwater from wells can lower water tables, reduce groundwater discharge to springs and streams, and in certain cases entirely de-water small streams that formerly flowed year round (Biesecker et al. 1968). Many of the power plants in the watershed consume almost 100% of the water they intake for cooling, where water is converted to steam and vented into the atmosphere. These water flow losses clearly have hydrologic and atmospheric/climatic implications for the region. In developed and developing areas, increases in impervious cover coupled together with storm drains that channel runoff direct into streams can drastically reduce groundwater recharge. Over time, this can result in significant reductions in groundwater supplies, and reduce the amount of groundwater discharged to rivers and streams during dry periods.

An assessment of groundwater resources in parts of Berks, Bucks, Chester, and all of Montgomery Counties found that groundwater withdrawals exceed or threaten to exceed the sustainable yields of local groundwater basins (DRBC 1999). Groundwater depletion in this area already has reduced flows in some streams and dried up others. These reductions in baseflow affect downstream water uses, negatively impact aquatic life, and can reduce the capacity of waterways in the region to assimilate pollutants.

To prevent the depletion of groundwater resources and to protect the rights of lawful users, the Delaware River Basin Commission (DRBC) has established a Southeastern Pennsylvania Groundwater Protected Area in parts of Berks, Bucks, Chester, and all of Montgomery Counties. To protect groundwater resources in this area, the DRBC regulations set withdrawal limits based on an assessment of the cumulative impacts of all withdrawals within groundwater basins.

In summary, considering the input received at the public meetings, the results of the public opinion poll, as well as review of the pertinent documents that address water resource issues in the region, the following topics were determined to be of major concern in the Schuylkill River watershed.

- Need for a coordinated water quality monitoring program and data
- Urban/suburban development and stormwater runoff
- Non-point source pollution from agriculture and urban sources
- Aquatic habitat quality
- Acid mine drainage (in the Schuylkill headwaters region)
- Wastewater and other waste discharges

- Water supply and drinking water source protection

4.3.5 Landscape and Land Use Resources

The most prevalent land use concern expressed at the public meetings was open space preservation and associated issues, such as the loss of farmlands and wetlands. Concern over these issues particularly was notable in the Perkiomen sub-region in Montgomery County and Little Schuylkill sub-region in Schuylkill County, but these issues also were raised in the other public meetings. Support for increased funding of preservation efforts was evident from the public opinion poll of watershed residents. With regard to land preservation, 90% said they support the purchase of land for parks and natural areas by their county or municipality and 91% support an increase in public funding for open space and natural areas protection.

The need to track development trends and ensure that growth occurs in a responsible manner was highlighted as a major concern in Montgomery County, as was the need to create and maintain linear parks and greenways. Active stewardship of the land also was noted as a major issue of concern in Montgomery County. The need to maintain riparian buffers was mentioned as a major issue in all sub-regions. Participants at a Philadelphia public meeting expressed the need to explore the use of zoning overlays and a need to examine existing land use regulations and their enforcement. Concern was expressed over the ineffectiveness of the Municipal Planning Code (MPC) and the lack of regional planning, and there was interest in the proposed new improvements to the MPC and the effect this might have on maintaining landscape sustainability in the watershed.

In addition, many site-specific land use concerns were raised at the public meetings. For example, a proposed power plant on Maiden Creek and another near the Perkiomen Creek were each noted as major concerns. While these concerns were duly noted in the meeting minutes, site-specific issues have not been addressed directly by this Plan as our goal was a regional assessment of the strengths and weaknesses of water resources, sustainable landscape issues and institutional structure. Directly addressing issues of local concern was not a focus of this watershed-scale Plan.

These and other critical sustainable landscape and land use issues also were documented in the Report of the Governor's 21st Century Environment Commission (1998), an excellent resource on issues of sustainable landscapes and development throughout the Commonwealth.

In summary, considering the input received at the public meetings, the results of the public opinion poll, as well as review of the pertinent documents that address landscape and land use resource issues in the region, the following topics were determined to be of major concern in the Schuylkill River watershed.

- Loss of critical natural lands to development due to rapid urban/suburban sprawl
- Need to encourage responsible growth and offset associated losses of farmlands and wetlands
- Need for open space preservation to assist in water quality preservation
- Need to create and maintain linear parks and greenways as biodiversity connectors and riparian corridors to preserve water quality
- Need to address the lack of guidance on ecological management of protected natural lands
- Need to address the lack of a strategic plan for identifying and conserving the watershed's ecological resources

4.3.6 Institutional Resources

The need for more and better inter-agency cooperation regarding planning and land use issues was expressed at the public meetings throughout the watershed. Providing technical and financial assistance and incentives to farmers was noted as a high priority in the agricultural sub-regions. A somewhat related concern was the “weak” Municipalities Planning Code (MPC). Finally, understanding and protecting economic issues related to tourism and redevelopment also was noted as a major concern in various sub-regions.

In Philadelphia, the Philadelphia Water Department noted the need to coordinate activities under the Safe Drinking Water Act and the Clean Water Act. The Manayunk Development Corporation noted the need to balance preservation of open space with continuing development. They also noted that private preservation could be encouraged through demonstration projects performed on public land. Participants at the Philadelphia meeting expressed a need to create a liaison with the City administration and council districts.

In summary, considering the input received at the public meetings, as well as from review of the pertinent documents that address institutional resource issues in the region, the following topics were determined to be of major concern in the Schuylkill River watershed.

- Need for increased environmental education funding and programs for adults and children, to improve awareness and understanding of watershed issues
- Need for improved coordination of services and programs among nonprofits and public agencies in the watershed
- Need for a centralized information clearinghouse to facilitate sharing of institutional resources and to effectively build capacity of watershed organizations
- Need for coordination of watershed-wide water quality monitoring

4.4 References

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