2017 Annual Status Report

Long Term 2 Enhanced Surface Water Treatment Rule Watershed Control Program Plan

Queen Lane Drinking Water Treatment Plant
Schuylkill River, Philadelphia, PA

Prepared by the Philadelphia Water Department

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This report was produced for the Pennsylvania Department of Environmental Protection in accordance with the Environmental Protection Agency National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule.

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List of Acronyms

AEU	Animal Equivalent Unit
BCCD	Berks County Conservation District
BCWSA	Berks County Water and Sewer Association
BMP	Best Management Practice
CAC	Citizens Advisory Council
CAFO	Concentrated Animal Feeding Operation
CDC	Community Design Collaborative
CNMP	Comprehensive Nutrient Management Plan
CSO	Combined Sewer Overflow
CREP	Conservation Reserve Enhancement Program
DRBC	Delaware River Basin Commission
DRWI	Delaware River Watershed Initiative
EPA	United States Environmental Protection Agency
EWS	Early Warning System (Delaware Valley)
FWWIC	Fairmount Water Works Interpretive Center
GCCW	*Green City, Clean Waters*
LTCPU	Long Term Control Plan Update
LT2	Long Term 2 Enhanced Surface Water Treatment Rule
MS4	Municipal Separate Storm Sewer System
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
PADEP	Pennsylvania Department of Environmental Protection
PDE	Partnership for the Delaware Estuary
PEC	Pennsylvania Environmental Council
PHS	Pennsylvania Horticultural Society
PWD	Philadelphia Water Department
SAN	Schuylkill Action Network
SAS	Schuylkill Action Students
SRDC	Schuylkill River Development Corporation
SRG NHA	Schuylkill River Greenways National Heritage Area
SRRF	Schuylkill River Restoration Fund
SWA	Source Water Assessment
SWPP	Source Water Protection Plan
WCP	Watershed Control Plan
WSS	Watershed Sanitary Survey
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
USDA	United States Department of Agriculture

1.0 Executive Summary

In 2017, the Philadelphia Water Department (PWD) completed its fifth year of its Watershed Control Program Plan (WCP) for the Queen Lane intake in the Schuylkill River Watershed in compliance with the Long Term 2 Enhanced Surfaced Water Treatment Rule (LT2). The plan aims to reduce *Cryptosporidium* loadings in the Schuylkill River watershed from priority sources such as wastewater effluent, agriculture, animal vectors, and urban stormwater runoff. Source water protection initiatives as well as structural control measures were identified and implemented as part of the WCP to achieve a target *Cryptosporidium* load reduction. Progress made in 2017 towards WCP objectives is summarized below by priority source along with highlights from the previous four years of the WCP.

Priority Source: Wastewater Effluent

The UV installation projects upstream of the PWD Queen Lane intake, at Upper Gwynedd Wastewater Treatment Plant (WWTP) and Fleetwood WWTP, are fully operational and effective at inactivating *Cryptosporidium* oocysts and reducing the public health risk. In 2015, PWD completed a comprehensive Schuylkill Watershed Sanitary Survey (WSS) detailing the status of wastewater treatment technologies and sewage system planning efforts throughout the Schuylkill River watershed. PWD continues to track developments in the watershed related to Act 537 sewage facility planning through the Schuylkill Action Network (SAN) Pathogen and Point Source Workgroup and updates the WSS accordingly. Additionally, PWD engages wastewater utilities through its continued participation in the SAN Pathogen and Point Source workgroup and as the owner of the Early Warning System for the lower Delaware River watershed. In 2017, the SAN Pathogen and Point Source Workgroup promoted the wet weather and high flow management workshop for wastewater treatment plant operators in eastern Pennsylvania. The group also engaged wastewater utilities by creating public education materials for wastewater utilities to purchase and distribute to minimize the risk of treatment interruptions.

Priority Source: Agriculture

Over the last 5 years PWD has supported the construction of either manure storage basins or vegetated buffers at 10 separate agricultural operations in the watershed through its participation and annual contribution to the Schuylkill River Restoration Fund (SRRF). In 2017, $74,800 from PWD's annual contribution to the SRRF funded three watershed protection projects in the Schuylkill River watershed, two of these priority projects were selected for the implementation of agricultural best management practices on farms to support WCP *Cryptosporidium* control objectives. The Youse Farm, a 325-acre property in the Manatawny Creek Watershed in Berks County, received a $40,000 SRRF grant, matched by several partner organizations to construct a manure storage basin, repair rain gutters, and install other stormwater controls on the property. Another agricultural property in Centre Township, Berks County, along Irish Creek received a grant to mitigate years of streambank erosion caused by

overgrazing and uncontrolled stream access from a beef operation that formerly occupied the land. The $19,800 SRRF grant for the Irish Creek stream restoration was also matched by contributions from several partner organizations to restore 350 feet of streambank, 1.4 acres of forested riparian buffer, and 1.3 acres of marginal pastureland wildlife habitat buffer.

PWD continues to be an active participant in the SAN Agricultural Workgroup to most efficiently coordinate efforts among watershed partners with similar environmental protection objectives. Through the SAN, education and outreach materials were developed and additional stakeholders were engaged to promote the implementation of agricultural best management practices and nutrient management plans throughout the watershed. In 2017, a total of 25 Comprehensive Nutrient Management Plans (CNMP) were developed and implemented in the Schuylkill River watershed. A total of 11 manure storage basins, 14 barnyard repairs or heavy use area construction, 2 stream crossings, and 37.4 acres of riparian buffers were planted on agricultural lands throughout the Schuylkill River watershed through SAN partners.

Priority Source: Animal Vectors

At Fairmount Park properties and PWD facilities Canada geese, known mechanical vectors of *Cryptosporidium*, were removed and nests and eggs treated through a partnership with the US Department of Agriculture (USDA) during each year of the WCP. In FY2017, a total of 61 Canada goose eggs were treated and 21,219 geese were harassed or removed from the Fairmount Park properties. A total of 83 eggs were treated and 5,559 geese removed from PWD facilities. In 2017 PWD also continued monitoring and analysis of *Cryptosporidium* occurrence and animal sources in the watershed through a research contract with Lehigh University. Both ongoing initiative are expected to continue into future years of the WCP.

Priority Source: Urban Stormwater

Stormwater best management practices (BMPs) were not directly included in the scope of the WCP. Stormwater projects are already implemented through a variety of other programs, including stormwater ordinances and MS4 permits. Stormwater management practices are implemented throughout the City of Philadelphia as part of PWD's *Green Cities, Clean Waters* (GCCW) program, which is a 25-year plan to reduce stormwater pollution by 85% through the installation of green infrastructure. Since the inception of GCCW in June 2011, PWD and private developers have implemented over 1,100 green stormwater tools within the City of Philadelphia. Additionally, through the Rain Check program residents of Philadelphia learn about the benefits of green stormwater infrastructure and how to select the best options for their property. In FY2017, a total of 73 workshops were held with 1,423 participants. As a result of the FY2017 program, residential properties in Philadelphia have installed a variety of stormwater management tools including 9 depaving projects and 68 installations of permeable pavers to allow for better infiltration of stormwater, 121 downspout planters, 18 rain garden plantings, and 710 rain barrels.

Through the SAN a number of riparian buffer plantings and education and outreach events have occurred throughout the watershed. The SAN Stormwater and Education & Outreach Workgroups have engaged students in managing stormwater on school campuses to benefit MS4 communities through the Schuylkill Action Students (SAS) program. In 2017, the Stormwater Workgroup provided technical assistance to four area schools with projects ranging from rain gardens to master planning and implementation. PWD plans to continue its participation in the SAN Stormwater Workgroup into the future years of the WCP.

Estimated Cryptosporidium Reductions from WCP Projects

The WCP was developed with the objective of reducing the Cryptosporidium load to the Queen Lane intake on the Schuylkill River by 2.7% or an estimated range of 2.1E+11 to 3.8E+13 oocysts per year. The annual removal of *Cryptosporidium* from Queen Lane source water due to the installation of 10 agricultural best management practices implemented over 5 years is estimated to be in the range of 2.87E+10 to 4.31E+13 oocysts per year, or 13.6-112% of the targeted reduction. Including the installation of UV disinfection at upstream WWTPs, the estimated reduction of viable *Cryptosporidium* is in the range of 2.89E+10 to 6.45E+13 oocysts per year or 13.7-168% of the targeted reduction. However, targeted reduction estimates serve as a preliminary step in developing a quantitative assessment of Schuylkill River watershed *Cryptosporidium* loading reduction, and uncertainties in the method emphasize the need for further research.

The Future of the WCP

The second round of LT2 compliance sampling ended in March 2017. Each PWD intake on the Schuylkill and Delaware Rivers was sampled bimonthly for a period of 2 years. *Cryptosporidium* results from the Queen Lane Water Treatment Plant achieved an average result less than the 'Bin 1' threshold value of 0.075 oocysts per liter; however, the Queen Lane Water Treatment Plant remains classified as 'Bin 2' due to sampling results obtained from the first round of LT2 monitoring. The Queen Lane Water Treatment Plant will continue to achieve individual and combined filter effluent performance requirements as approved by PADEP to achieve compliance with the first round of LT2 sampling. PWD will continue ongoing initiatives outlined in the WCP through its existing Source Water Protection Program framework and will explore opportunities to expand WCP efforts into the Delaware River watershed.

2.0 Introduction

In April 2011, the Philadelphia Water Department (PWD) completed a Watershed Control Plan (WCP), and after receiving approval from the Pennsylvania Department of Environmental Protection (PADEP) the WCP went into effect December 2012. The WCP presents a comprehensive source water protection approach to reducing levels of infectious *Cryptosporidium* in finished drinking water (US EPA, 2006). The elements of the WCP are being achieved through previously established and ongoing efforts of the PWD Source Water Protection Program and through WCP actions aimed to specifically reduce levels of *Cryptosporidium* in the Schuylkill River watershed, a PWD drinking water source. The following report documents PWD progress towards WCP initiatives during 2017, the fifth year of the plan.

3.0 Background

The US Environmental Protection Agency (EPA) published the first source water quality based drinking water regulation on January 5, 2006. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2), a series of amendments to the Safe Drinking Water Act, serves to protect the public from waterborne illness caused by *Cryptosporidium* and other microbial pathogens in drinking water. In the United States, *Cryptosporidium* has been the cause of several outbreaks of Cryptosporidiosis, a gastrointestinal disease particularly dangerous for immunocompromised individuals. The LT2 requires public drinking water systems with surface water sources, or groundwater sources influenced by surface water, to monitor monthly for *Cryptosporidium* at each supply intake for two years. The observed *Cryptosporidium* concentrations categorize each intake into one of four 'Bins.' Public water systems placed in Bin 1 indicate the lowest concentrations of *Cryptosporidium* and require no additional treatment. Public water systems placed in Bins 2, 3 and 4 require 4-log, 5-log and 5.5 log removals, respectively. Public water systems using conventional treatment processes, coagulation, flocculation, sedimentation, filtration, are assumed to achieve a 3-log removal. Therefore, additional 1-log, 2-log or 2.5 log treatment credit(s) is required of a conventional treatment facility if placed in Bins 2 through 4. The EPA provides a "microbial toolbox" describing options to earn additional treatment credits including source water protection and management programs, pre-filtration processes, treatment performance programs, additional filtration components and inactivation technologies.

PWD *Cryptosporidium* monitoring data categorized each of Philadelphia's three drinking water treatment plants (WTPs) into Bins. Baxter and Belmont achieved Bin 1 status with average oocyst concentrations less than 0.075 per liter. However, Queen Lane data resulted in an average oocyst concentration of 0.076 per liter falling into Bin 2. Since Queen Lane uses conventional treatment processes, and automatically receives a 3-log removal credit, an additional 1-log removal credit is required. PWD has selected to use the combined filter effluent for 0.5-log credits, the individual filter effluent for 0.5-log credits, and the development and implementation of a WCP for 0.5-log back up credits. PWD submitted a WCP to the

PADEP in April 2011 and received approval in December 2012. A timeline of critical LT2 events is shown in Table 3-1.

Table 3-1: LT2 WCP Timeline

Action	Reporting	Due Date
Notification to State of intent to submit WCP		April 2010
WCP submitted to State		April 2011
State approved WCP		December 2012
	Presentation of 2013 Annual Status Report to State	January 2014
	2013 Annual Status Report due to State	January 2014/Approved May 2014
Sampling Plan for 2nd round of monitoring due		January 2015
2014 Annual Status Report due to State	2014 Annual Status Report due to State	January 2015/Approved February 2015
Second round of *Cryptosporidium* sampling scheduled to begin		April 2015
	Watershed Sanitary Survey due to State	December 2015
	2015 Annual Status Report due to State	January 2016
	2016 Annual Status Report due to State	January 2017
Second round of *Cryptosporidium* sampling scheduled to end		March 2017
Bin classification and supporting data from 2nd round of monitoring due to State		October 2017
	2017 Annual Status Report due to State	January 2018

Note: Shading indicates milestones that have been completed at the time of the report's preparation.

4.0 2017 Progress towards Source Water Protection Program Initiatives

After recognizing the need for a watershed wide effort to improve and promote the health of the Schuylkill River watershed, PWD, EPA, PADEP, Delaware River Basin Commission (DRBC), and Partnership for the Delaware Estuary (PDE) formed the Schuylkill Action Network (SAN) in 2003. The SAN is comprised of workgroups to address a number of watershed issues: abandoned mine drainage, agricultural runoff, stormwater runoff, pathogens and compliance, land protection, and education and outreach. PWD participates in many projects led by these workgroups, but because the Schuylkill River watershed is a diverse watershed affected by a range of pollution sources, PWD looks to the expertise of SAN partners to achieve certain

watershed protection goals and WCP objectives. The SAN Agriculture and SAN Pathogens and Point Sources Workgroups are particularly important to the WCP because they address potential sources of *Cryptosporidium* in the watershed. To further support this effort, PWD continues to contribute funding to the administration of SAN through a contract with PDE to support the SAN coordinator position and SAN workgroup leadership.

In the WCP, PWD outlines ongoing and proposed initiatives from the Schuylkill River watershed Source Water Protection Plan (SWPP) that are relevant to the control of *Cryptosporidium* upstream of the Queen Lane intake. In the WCP, PWD identifies four categories of source water protection initiatives. The four categories include mitigation of *Cryptosporidium* from wastewater treatment plant (WWTP) effluent, agricultural runoff, animal vectors, education and outreach in the City and watershed. This section discusses the progress PWD has made towards each of the ongoing and proposed initiatives by category.

4.1 Wastewater Discharge/Compliance

Effluent from WWTPs upstream of the Queen Lane intake is a source of *Cryptosporidium* in the watershed (PWD, 2002; PWD, 2011). Although only 2% of the Schuylkill River watershed is in Philadelphia, PWD plays a leadership and supporting role in multiple initiatives outside of the city. These initiatives aim to reduce the risk of *Cryptosporidium* contamination from treated WWTP effluent and minimize the occurrence of raw sewage discharge. Ongoing and proposed initiatives in Philadelphia and in the Schuylkill River watershed are detailed in Table 4-1 and Table 4-2, both reproduced from the WCP. Progress made in 2017 towards these initiatives is summarized in this section.

Table 4-1: Ongoing Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Philadelphia	**4.1.1 Philadelphia's Act 537 Plan** Continue to regularly review and update Philadelphia's Act 537 Plan. The plan was last updated on February 27th, 2009.
	4.1.2 Combined Sewer Overflow (CSO) and Municipal Separate Storm Sewer System (MS4) National Pollutant Elimination System (NPDES) Permit Annual Report Continue to implement the initiatives outlined in the annual Combined Sewer Management and Stormwater Management Plans in order to fulfill the City's Stormwater and CSO permits. Ongoing initiatives include monitoring as part of the Defective Lateral Detection and Abatement Program and completion of the Main and Shurs Elimination project.
	4.1.3 Early Warning System Continue to maximize usage for the Early Warning System while maintaining the system's ongoing operations and maintenance needs.
Schuylkill River Watershed	**4.1.3 Provide Project Support for the Lehigh University *Cryptosporidium* Study** Continue to support Lehigh University's *Cryptosporidium* source tracking study by providing support in terms of sampling, elution, and project management and oversight.
	4.1.5 SAN Pathogens and Point Source Workgroup Continue to support efforts of the SAN Pathogens and Point Source Workgroup. The strategies for the 2017 SAN Pathogens and Point Source Work Plan are as follows: 1) Strengthen communication between and provide educational resources to wastewater and drinking water utilities to improve source water protection efforts. 2) Facilitate data and information sharing to document wastewater treatment technologies, improvements, and other pertinent source water protection information. 3) Investigate evolving source water issues, such as unregulated contaminants, and develop a better understanding of what these issues mean for water suppliers source water protection strategies. 4) Promote pathogen successes and understanding of pathogen water quality issues and solutions to target audiences in the watershed.
	4.1.6 Abate Wildcat Sewers Continue to support SAN in its efforts to identify and abate wildcat sewers throughout the Schuylkill River watershed.

Table 4-2: Proposed Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Phila-delphia	**4.1.7 PWD Schuylkill River Watershed 10-Year Review** Develop a Source Water Assessment (SWA) update for the Schuylkill River by revisiting priorities established in the 2002 assessment and updating water quality analyses with recent data.
Schuylkill River Watershed	**4.1.8 Support *Cryptosporidium* Monitoring at Major WWTPs and Inclusion in NPDES Permits** Support/help develop an effluent monitoring plan for *Cryptosporidium* at major WWTPs in the Schuylkill River watershed. In conjunction with this effort, should *Cryptosporidium* monitoring be considered for incorporation into NPDES permits, PWD will support such an effort. However, in regard to *Cryptosporidium* monitoring, it is very important to PWD that the EPA promulgate an analytical method that takes into account critical factors such as recovery rates and sample variability. Track the progress of these initiatives by continuing to attend SAN Pathogens/Compliance workgroup meetings.
	4.1.9 Track Wastewater Related Changes in the Watershed Through continued participation in the SAN Pathogens/Compliance workgroup, help ensure that high-priority areas requiring regulatory enforcement action are identified and addressed. Areas of concern may be identified using the following measures to track wastewater related changes in the watershed. o Assist the workgroup in identifying high-priority municipalities in need of updated Act 537 Plans in the Schuylkill River watershed. Municipalities with outdated plans located in Zones A and B of the area of influence are especially relevant. o Assist the workgroup at continuing to align sewage facilities planning, or Act 537, enforcement with the wasteload management reports filed under Chapter 94. o In addition to the above two measures, track WWTP upgrades, new facilities and community sewer improvement projects (such as the sewering of new areas) by reviewing Part II Permits. o Track projects funded under government loan programs, such as PennVest.
	4.1.10 Wet Weather and High Flow Management Education for WWTP Operators Coordinate with SAN to provide wet weather and high flow management education to WWTP operators in a workshop format. Include overview of information that should be included in I & I abatement and high-flow maintenance plans.
	4.1.11 Research on WWTP Effluent and *Cryptosporidium* in Surface Waters Support future research initiatives surrounding the impact of WWTP effluent on *Cryptosporidium* surface water concentrations by partnering with research organizations and/or academic institutions

4.1.1 Philadelphia's Act 537 Plan

Act 537 is the Pennsylvania Sewage Facilities Act. The program addresses existing sewage disposal needs and future disposal needs through proper planning, permitting and design of sewage facilities. The Philadelphia Act 537 Plan was last updated in 2009.

4.1.2 Combined Sewer Overflow (CSO) and Municipal Separate Storm Sewer System (MS4) National Pollutant Elimination System (NPDES) Permit Annual Report

Each year, PWD submits a report to PADEP summarizing activities and programs pertaining to the management of stormwater in combined and separate sewers in accordance with the CSO and MS4 NPDES permits. A major component of PWD CSO NPDES permit requirements is the implementation of the Long Term Control Plan Update (LTCPU), also called the *Green City, Clean Waters* program. *Green City, Clean Waters* is a 25-year program that includes a green stormwater infrastructure-based approach to reduce pollutants discharged by the combined sewer system. The 2017 annual report is available on phillywatersheds.org.

4.1.3 Early Warning System

The Delaware Valley Early Warning System (EWS) is designed to improve the safety of the drinking water supply by providing real time water quality monitoring results and event notification to regional users. The system features include a notification system, a time of travel model, the Spill Model Analysis Tool, real-time water quality data and a central website where users can access event information, analysis tools and data. As of 2017, the EWS user base consists of more than 350 registered users from 50 organizations.

PWD continues to develop and enhance the EWS Tidal Spill Trajectory Tool. The Tidal Spill Trajectory Tool was developed using a $295,000 grant awarded to PWD by the Maritime Exchange for the Delaware River and Bay. The tool was first launched in 2014 and expanded EWS capabilities to include predicting a contaminant spill path and contaminant plume arrival times at tidal intakes in the lower Delaware River. In 2015, the EWS was honored with the Governor's Award for Environmental Excellence due to the integration of the advanced spill modeling capabilities.

In September 2016, EWS was nationally recognized by EPA Water Security Division as a case study published in *Online Source Water Quality Monitoring for Water Quality Surveillance and Response System*. The document is available online at http://www.epa.gov/waterqualitysurveillance/online-water-quality-monitoring-resources. The EWS was also featured as part of the Philadelphia Water Department case study in the 2017 publication of the American Water Works Association (AWWA) entitled *Operational Guide to AWWA Standard G300: Source Water Protection*, 2nd Edition. Planned system upgrades for 2018 include a newly designed user interface to facilitate event reporting and information gathering.

4.1.4 Provide Project Support for the Lehigh University *Cryptosporidium* Study

For over a decade, Lehigh University has been contracted by PWD to support continuing research on *Cryptosporidium* in Philadelphia source water. PWD and Lehigh University collaborate to develop sampling programs to better understand the occurrence, sources and vectors of *Cryptosporidium* in the Schuylkill River watershed. Sampling programs are designed to answer research questions and improve and expand methods for field sample collection and laboratory analysis of *Cryptosporidium*. PWD contributes field sample collection support, project management and oversight. PWD regularly communicates with project partners at Lehigh to create solutions for issues encountered in the field and lab, incorporate improvements and expand the project. Beginning in October 2015 and continuing through March 2017, PWD collected samples approximately twice per month in Philadelphia and at locations upstream in the Schuylkill River watershed. For more information refer to Sections 4.1.11, 4.2.6, and 4.3.3.

4.1.5 SAN Pathogens and Point Source Workgroup

The SAN Pathogens/Compliance Workgroup was renamed the SAN Pathogens and Point Source Workgroup during the 2016-2020 strategic planning process. The new strategic goal of the SAN Pathogens and Point Source Workgroup is to facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding Clean Water Act and Safe Drinking Water Act goals. The workgroup identifies ten strategies to address this goal. The objectives and strategies can be reviewed in the 2016-2020 SAN Strategic Plan available at schuylkillwaters.org and in Appendix A. PWD regularly attends quarterly SAN Pathogens and Point Source Workgroup meetings. The minutes for the meetings in 2017 are included in Appendix B.

4.1.6 Abate Wildcat Sewers

Wildcat sewers are sewer systems that discharge sewage directly into creeks and streams without any treatment at a waste water treatment facility. These systems discharge pathogens into the Schuylkill River watershed and can be a source of *Cryptosporidium.* In 1990, EPA identified communities in the Schuylkill River watershed with wildcat sewers. After the formation of the SAN, the formerly named SAN Pathogens/Compliance workgroup led efforts addressing issues in many of the listed communities (PWD, 2011). PWD supports the SAN in efforts to identify and abate wildcat sewers through participation in the SAN Pathogens and Point Source Workgroup. In 2015, PWD completed a Watershed Sanitary Survey (WSS), required under LT2 to maintain the WCP credit. As part of the WSS, PWD compiled available information from the PENNVEST database, news sources, community announcements, and personal communication with a contracted engineering firm on projects addressing wildcat sewers in the Schuylkill River watershed. The wildcat sewer project update serves as a working document and is available in the 2015 Watershed Sanitary Survey (PWD, 2015). The document with 2017 updates is included in Appendix C.

4.1.7 PWD Schuylkill River Watershed 15-Year Review

The Source Water Protection Program 15-Year Review focuses on the objectives defined in the SWPP and highlights program achievements towards these objectives. The 15-Year Review describes PWD Source Water Protection Program capabilities and responses to unplanned source water events. Water quality data from PWD's WTP intakes on the Schuylkill River from the last decade are included and observed for changing trends. Additionally, Schuylkill River watershed water quality data provided by other water utilities and sources is used to observe spatial trends in pH, temperature, TDS and iron and manganese. PWD continues to monitor water quality trends in the Schuylkill River observed at PWD intakes and at watershed sampling locations. The draft is currently pending internal review.

4.1.8 Support *Cryptosporidium* Monitoring at Major WWTPs

PWD regularly attends the quarterly SAN Pathogens and Point Source Workgroup meetings. Through this involvement, PWD supports the development of research and monitoring for *Cryptosporidium* at major WWTPs. Although the feasibility of such efforts is still being determined, PWD remains an active participant of the workgroup and related activities and shares with the workgroup pertinent updates regarding PWD monitoring and research efforts in the watershed.

4.1.9 Track Wastewater Related Changes in the Watershed

Through the SAN Pathogens and Point Source Workgroup, PWD and the PADEP Southeast Regional Office initiated a data compilation effort in 2013. The project compiled information submitted in Chapter 94 reports to three PADEP regional offices by WWTPs in the Schuylkill River watershed upstream of Philadelphia. In 2014, PWD collected information from Chapter 94 annual reports from the PADEP southeast regional office and from the Reading District Office for WWTPs in the south central region. In 2015, PWD staff reviewed Chapter 94 reports from the northeast region. The data includes WWTP location, receiving stream, average and permitted discharge flow rates, overload conditions, treatment technologies and more. The intended purpose of the project is as follows:

- To promote a holistic view of WWTP discharge in the Schuylkill River watershed
- To serve as a quick reference to SAN Pathogen workgroup members when WWTP discharge related events are reported on EWS
- To encourage the sharing of specific WWTP related events and news in the watershed
- To provide an informational tool for water utilities assessing source water protection planning strategies related to upstream point sources.

PWD used this information to inform the Watershed Sanitary Survey submitted to PADEP in December 2015. A map of the WWTPs in the Schuylkill River watershed upstream of Philadelphia is presented in Figure 4-1. The map shows WWTP locations and relative average flows and incorporates data from the Chapter 94 reports and the EPA Permit Compliance System and Integrated Compliance Information System (PCS-ICIS).

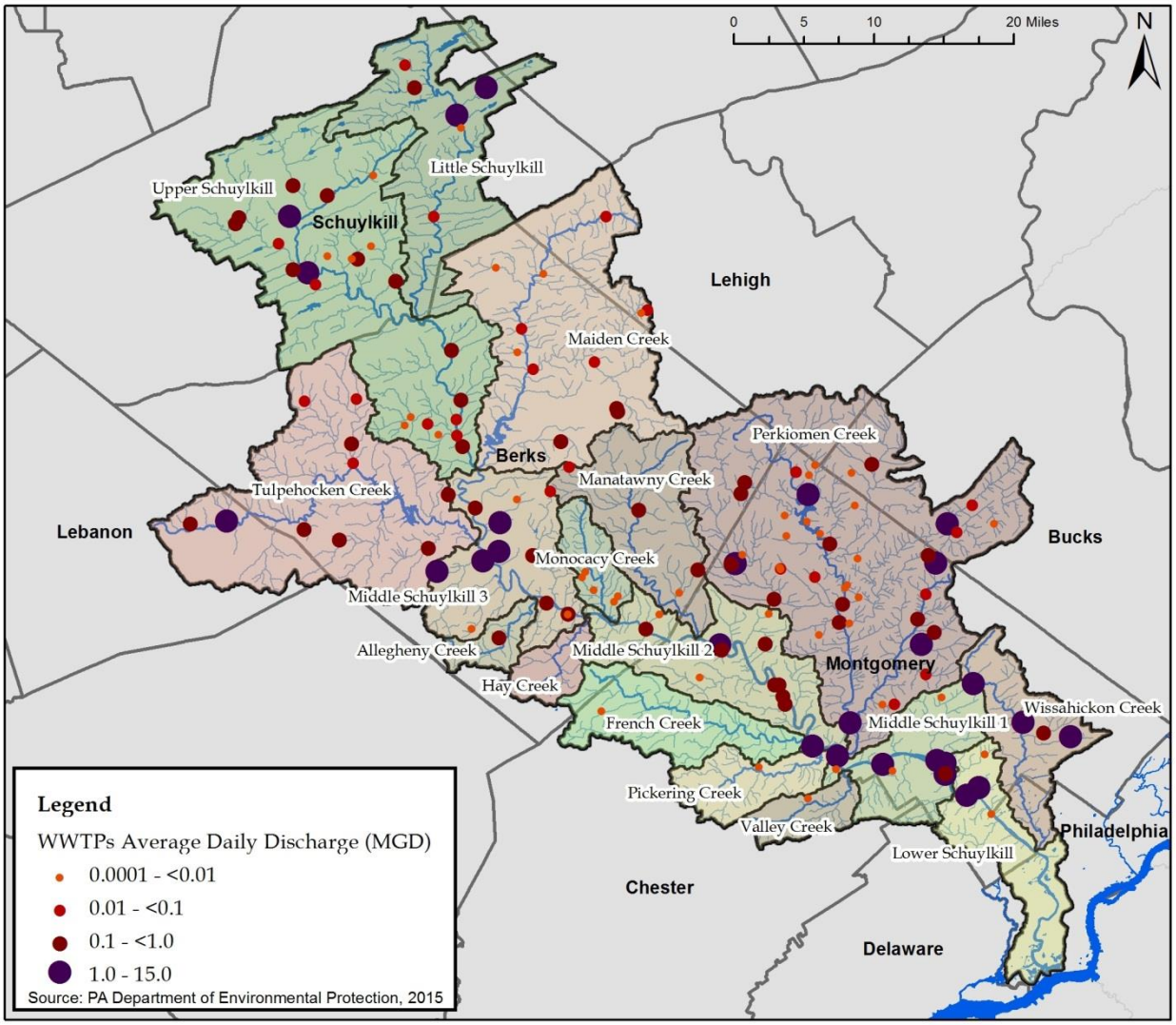

Figure 4-1: Wastewater Treatment Plants in the Schuylkill River Watershed by Average Daily Discharge (MGD) and Subwatershed (PCS-ICIS, 2015; PWD, 2015b)

4.1.10 Wet Weather and High Flow Management Education for WWTP Operators

Providing a wet weather and high flow management workshop to WWTP operators and potentially reducing wastewater overflows in the Schuylkill River watershed during wet weather has been a long-term goal of the SAN Pathogen and Point Source Workgroup. The Eastern Pennsylvania Water Pollution Control Operators Association hosted this workshop in 2017, which was available to take for PADEP continuing education hours towards the renewal of their operator certification. In 2017, the Pathogens and Point Source workgroup aimed to provide further assistance to wastewater utilities. An educational pamphlet, "What Not to Put Down the Drain" was developed to assist WWTPs with public messaging. The resource is available through the SAN website and wastewater treatment plants can purchase copies to print as mailers or rack cards.

4.1.11 Research on WWTP Effluent and *Cryptosporidium* in Surface Waters

In collaboration with Lehigh University, PWD funds and conducts research investigating sources of *Cryptosporidium* in the source water. In 2015, PWD and Lehigh expanded their research project goals and began collecting samples in October 2015 at five sites in the Schuylkill River watershed. Sampling continued through March 2017 aligning with the timeline for Round 2 LT2 *Cryptosporidium* monitoring. Sample collection sites include the Wissahickon Creek, the Schuylkill River near the USGS Norristown and Berne gage stations, the Tulpehocken Creek and Lake Ontelaunee, see Figure 4-2. PWD partnered with two other water suppliers: Western Berks Water Authority and Reading Area Water Authority. Samples were analyzed at Lehigh University to determine the species of any *Cryptosporidium* detected and assist in source tracking. The project also documented watershed conditions including rainfall, streamflow and, as available from PADEP, WWTP overflow events to correlate with *Cryptosporidium* sample results. An expansion of existing *Cryptosporidium* research efforts is being planned for early 2018.

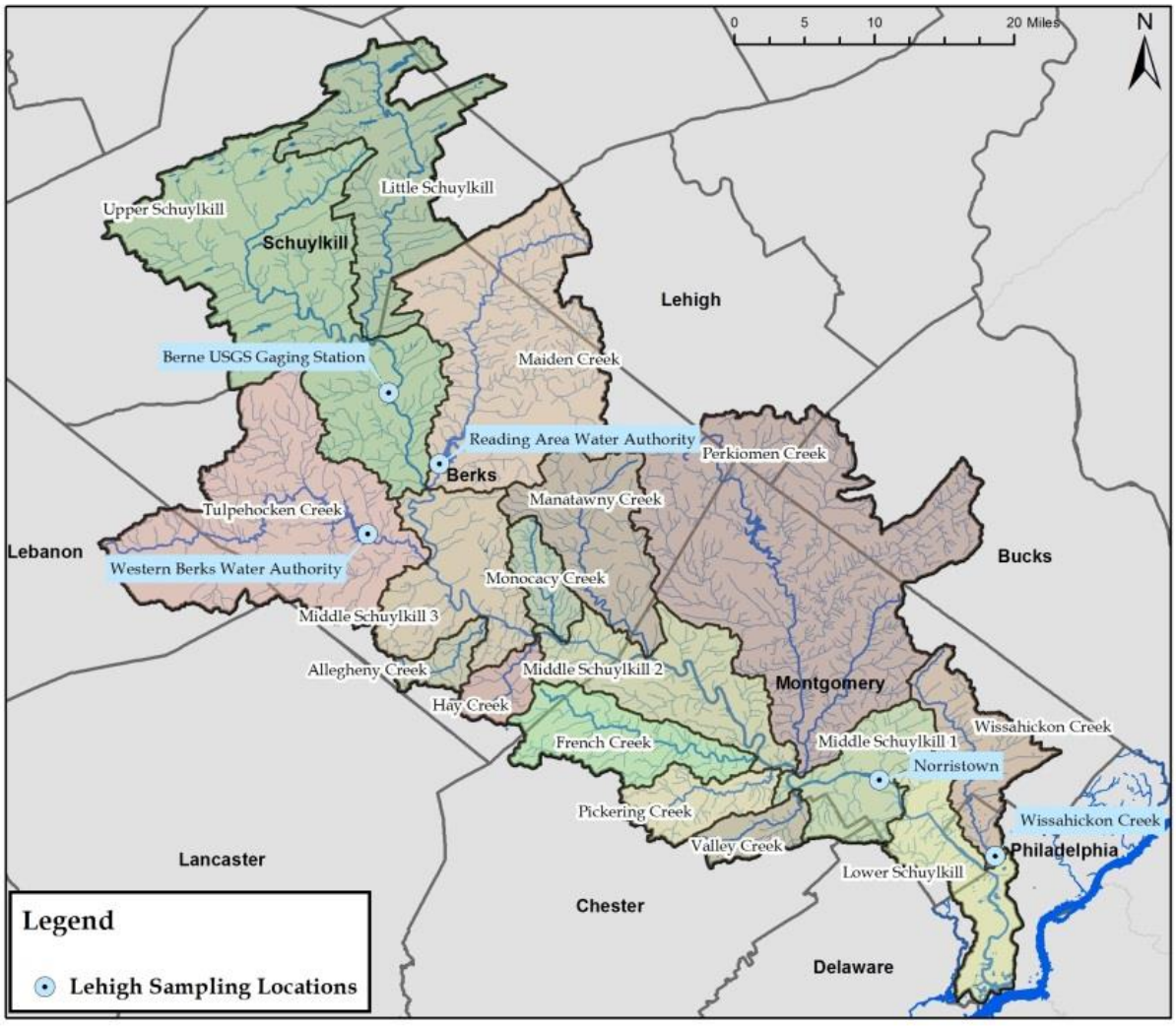

Figure 4-2: Lehigh Study Sampling Locations for October 2015 through March 2017

4.2 Agricultural Land Use and Runoff

Stormwater runoff containing manure from agricultural land is a source of *Cryptosporidium* and pathogens in the Schuylkill River watershed (PWD, 2002; PWD, 2011). PWD efforts to address agricultural runoff occur upstream of Philadelphia because the agricultural land within the city and upstream of the intakes is minimal and best management practices (BMPs) have previously been installed at Northwestern Stables, Belmont Stables, Courtesy Stables, Monastery Stables and W.B Saul High School (PWD, 2011). Table 4-3 and Table 4-4 outline the ongoing and proposed SWPP initiatives that aim to reduce the impact of agricultural activities on water quality in the Schuylkill River watershed. This section explains the progress made in 2017 towards each initiative listed.

Table 4-3: Ongoing Agricultural Land Use and Runoff SWPP Initiatives

Project Location	Project Overview
Phila-delphia	*BMPs have been implemented at all agricultural sites within the City.*
Schuylkill River Watershed	**4.2.1 SAN Agriculture Workgroup**
	Continue to be an active participant in the SAN Agriculture Workgroup and support future efforts. The strategies for the 2017 SAN Agriculture Workgroup plan are as follows: 1) *BMP Implementation*: Support and implement agricultural best management practice (BMP) with funding, information, expertise, and collaborative problem solving. 2) *Communication*: Provide a forum for partner and agency communication and coordination around agricultural projects and issues and the formulation of creative new approaches for solving agricultural related problems. 3) *Media*: Promote agricultural BMP successes and understanding of agricultural water quality issues and solutions to target audiences in the watershed. 4) *Monitoring*: Monitor the impacts of agricultural BMP installations on stream water quality.

Table 4-4: Proposed Agricultural Land Use and Runoff SWPP Initiatives

Project Location	Project Overview
Philadelphia	**4.2.2 PWD In-City Agricultural BMPs** Develop a maintenance plan for PWD's in-city agricultural BMPs, which include Northwestern Stables, Belmont Stables, Courtesy Stables, Monastery Stables and the WB Saul High School project.
	4.2.3 Natural Lands and Erdenheim Farm Natural Lands (formerly Natural Lands Trust) is currently performing stream restoration on a tract of land on Erdenheim Farm, located in the Wissahickon Creek watershed. The land is currently not being used for grazing, but may be used for this purpose in the future. PWD will consider future coordination with Natural Lands and the Erdenheim Farm Foundation to install additional agricultural BMPs at the farm.

	4.2.4 Land Use in the Schuylkill River Watershed As part of the SWA update process, PWD plans to re-assess land use in the Schuylkill River watershed. To complete this update, the 2011 National Land Use Database will be used, along with more current information from the 2010 Census.
Schuylkill River Watershed	**4.2.5 Visual Assessments for the Agriculture BMP Projects** Coordinate with SAN to develop a maintenance and monitoring plan for the agricultural BMPs installed as a result of the parcel prioritization process. The maintenance plan may be centered on regular visual assessments to identify any problems or repair needs.
	4.2.6 Agricultural BMP Monitoring for *Cryptosporidium* PWD will explore the possibility of partnering with academic institutions on *Cryptosporidium*-related research. Relevant research may include monitoring to assess the efficacy of different agricultural BMPs at removing pathogens from runoff. PWD will also identify priority research needs that may be fulfilled in collaboration with Lehigh University.
	4.2.7 Promotion of SAN Agriculture Projects Through involvement in the SAN Agriculture Workgroup, PWD will continue to work with partners, state and federal agency representatives to identify priority projects and available funding sources. For funding programs that already exist within the watershed, such as the United States Department of Agriculture (USDA) – Natural Resource Conservation Service (NRCS) conservation programs outlined in the 2008 Farm Bill, PWD will help promote drinking water protection and *Cryptosporidium* contamination reduction as a high-priority water quality improvement goal that requires adequate funding.
	4.2.8 CAFO Identification in the Watershed Through the SAN Agriculture Workgroup, PWD will work with partners to identify CAFOs located in the Schuylkill River watershed and identify opportunities to reduce agricultural runoff.
	4.2.9 Schuylkill River Restoration Fund (SRRF) Grants for Agriculture BMP Projects Starting in 2012, PWD has committed SRRF dollars to be directed toward priority agricultural BMPs addressing pathogen-contaminated stormwater runoff from livestock operations. These projects will be selected on an annual basis through the established project selection processes. PWD commitments to the SRRF will address priority stormwater and pathogen concerns while promoting the importance of watershed partnerships.

4.2.1 SAN Agriculture Workgroup

The strategic goal of the SAN Agriculture Workgroup is to maximize reduction and/or prevention of agricultural impacts to water quality. The workgroup identifies 11 strategies to address this goal. The objectives and strategies can be reviewed in the 2016-2020 SAN Strategic Plan available at schuylkillwaters.org. PWD regularly attended quarterly SAN Agriculture Workgroup meetings. The minutes for the meetings in 2017 are included in Appendix B.

4.2.2 PWD In-City Agricultural BMPS

In 2015, the Community Design Collaborative (CDC) completed a master plan for Saul High School. PWD served on the Saul Task Force for the (CDC) with community members and other stakeholders to participate in development of the master plan. Additionally, the Natural Resource Conservation Service (NRCS) performed an Engineering Inventory and Evaluation Report for the agricultural portion of the Saul campus. The report details nutrient and sediment management and stormwater issues on the site by area (dairy facility, equine facility, sheep and swine facility, beef operation, composting facility and community supported agriculture (CSA) area), and one or two optional solutions to address each issue. Master planning efforts allowed Saul to apply for and win grant funding for green infrastructure implementation. Throughout 2016 and 2017, CH2M engineers and Nature Conservancy scientists worked directly with students and faculty to design and construct a rain garden on campus to address stormwater quality concerns. The rain garden was completed in June 2017. PWD is coordinating internally to determine resources available to support projects to manage stormwater and protect source water on the Saul campus.

4.2.3 Natural Lands and Erdenheim Farm

Erdenheim Farm is located in Lafayette Hill along the Wissahickon Creek. The section of the Wissahickon Creek that enters and exits the Erdenheim property is surrounded by preserved forests, the Fort Washington State Park to the north of the property and parcels of Wissahickon Valley Park to the south of the property. In cooperation with Natural Lands (formerly the Natural Lands Trust) and the Whitemarsh Foundation, the entire property has been protected by conservation easements since 2009. Projects previously implemented at Erdenheim farm include the planting of a 14-acre native meadow, the stabilization of a meandering channel, and construction of a shallow stormwater basin and forebay, a basin constructed to allow sediment from incoming stormwater to settle before reaching the main stormwater basin. These projects intend to reduce erosion of Erdenheim Farm and detain stormwater prior to discharging to the Wissahickon Creek.

In October 2017, PWD attended the 2017 Open Space Showcase hosted by the Chestnut Hill Conservancy to obtain more information on the status of conservation efforts in the Wissahickon Creek watershed. The event included presentations from several conservation groups including Erdenheim Farm Foundation, Friends of the Wissahickon, Natural Lands,

Preservation Alliance for Greater Philadelphia, the Whitemarsh Foundation, and the Wissahickon Valley Watershed Association. Erdenheim Farm has partnered with the Philadelphia Outward Bound School to organize a cleanup effort around the Wissahickon Creek, removing more than 40 tires from the Wissahickon Creek. The Erdenheim Farm Foundation has also partnered with the Academy of Natural Sciences to quantify existing conditions of the Wissahickon Creek in a two-year baseline study. The PowerPoint presentations from the Open Space Showcase are included in Appendix H.

4.2.4 Land Use in the Schuylkill River Watershed

USGS released the 2011 National Land Cover Dataset (NLCD) at the end of 2013. As part of the 2015 Watershed Sanitary Survey (WSS), PWD completed an updated analysis on land cover and land cover changes since 2001 in the Schuylkill River watershed. A map of the Schuylkill River watershed overlain by the 2011 NLCD is shown in Figure 4-3.

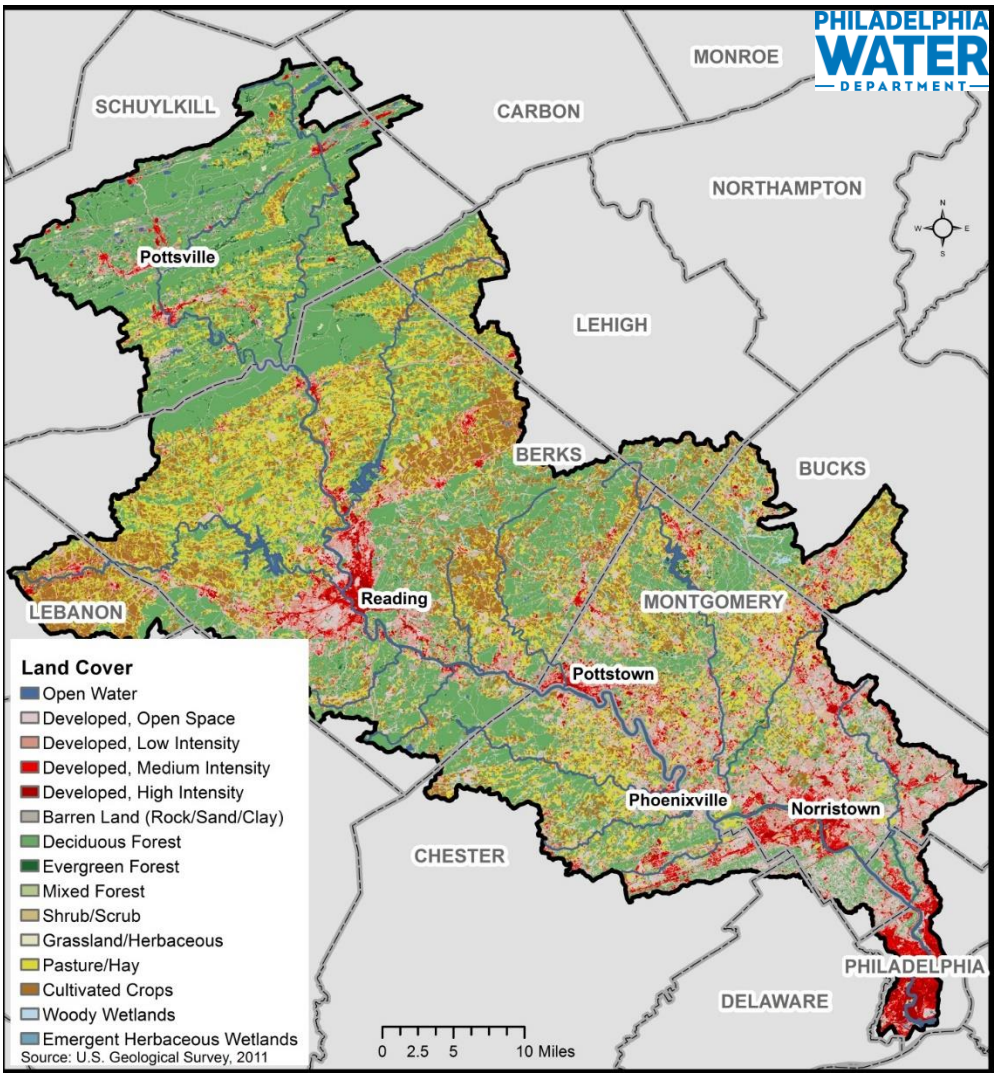

Figure 4-3: Land Cover Type in the Schuylkill River Watershed (USGS, 2011)

4.2.5 Visual Assessments for Agriculture BMP Projects

PWD developed a field visual monitoring form, which was shared with the SAN Agriculture Workgroup in 2013. The field visual monitoring assessment serves as a tool available to SAN Agriculture Workgroup members implementing and tracking projects on the ground. Beginning in 2015, portions of the field visual monitoring form were incorporated into required monitoring strategies for a number of projects receiving grants through the Delaware River Watershed Initiative (DRWI). The DRWI is a multi-year investment by the William Penn Foundation to protect and restore watersheds that provide a critical drinking water source.

Additionally, PWD annually visits agricultural BMP projects funded by the SRRF during or after construction to assess project progress, take photos and document BMPs installed.

4.2.6 Agricultural BMP Monitoring for *Cryptosporidium*

Beginning in October 2015 and continuing through March 2017, PWD and Lehigh University began a new *Cryptosporidium* source tracking research project. There are five sampling locations throughout the Schuylkill River watershed. *Cryptosporidium* samples collected at each site will be genotyped. Although this project does not specifically focus on monitoring for BMPs, two of the sampling locations are in sub-watersheds heavily influence by agriculture: the Tulpehocken and the Maiden Creek watersheds. These watersheds are approximately 50% agricultural land cover, including cultivated crops and pasture/hay designated by the National Land Cover Database (NLCD) (PWD, 2015).

4.2.7 Promotion of SAN Agriculture Projects

PWD and PDE completed a BMP guide for agricultural properties in the Schuylkill River watershed in 2014. The guide, entitled *A Farmer's Guide for Healthy Communities*, includes the importance of managing runoff on agricultural properties, sample stormwater projects, spotlight farms with projects completed through the SAN and watershed partners, and funding resources for farmers interested in implementing projects on their own properties. The SAN continues to distribute *A Farmer's Guide for Healthy Communities* to farmers, SAN members and other interested stakeholders. The guide is available on the SAN website at www.schuylkillwaters.org/projects.cfm.

Additionally, on September 7, 2016, PWD and the SAN hosted a tour of source water protection projects in the Schuylkill River watershed. The tour included stops at an abandoned mine drainage treatment system and a sustainable dairy farm. The tour group also attended the Schuylkill River Restoration Fund press event for the 2016 grant recipients held at the beautiful 170-acre property along the Schuylkill River. The property received funding from the SRRF in 2012 towards a conservation easement. Representatives from PWD public affairs attending the tour published a blog post on the visit, entitled *Schuylkill River Restoration Fund: Eight new Investments in River's Health Announced,* and posted project photos on PWD social media. The post promotes the SRRF and PWD's partnership approach to source water protection and can be viewed at www.phillywatersheds.org/blog.

In November 2017, PWD organized a site visit of recent Schuylkill River Restoration Fund (SRRF) grant recipient projects in Berks County with watershed partners. The site visit was attended by representatives from the Partnership for the Delaware Estuary, Berks Nature, Berks County Conservation District, and Aqua Pennsylvania. Project sites included two 2017 SRRF recipients, the Youse Farm and the Irish Creek property, and one 2016 SRRF grant recipient, the Zettlemoyer Farm. See Section 5.2.1 for more information.

4.2.8 CAFO Identification in the Watershed

Concentrated animal feeding operations (CAFOs) are agricultural operations where animals are confined in small land areas. CAFOs have the potential to contribute *Cryptosporidium* contaminated runoff to the Schuylkill River watershed. In 2017, PWD received updated CAFO data from PADEP including number of animal equivalent units and primary animal for each operation. As of November 2017, a total of 29 CAFOs exist in the Schuylkill River watershed representing more than 16,500 animal equivalent units (AEUs, 1 AEU = 1,000 lbs of animal weight). An updated map is shown in Figure 4-4.

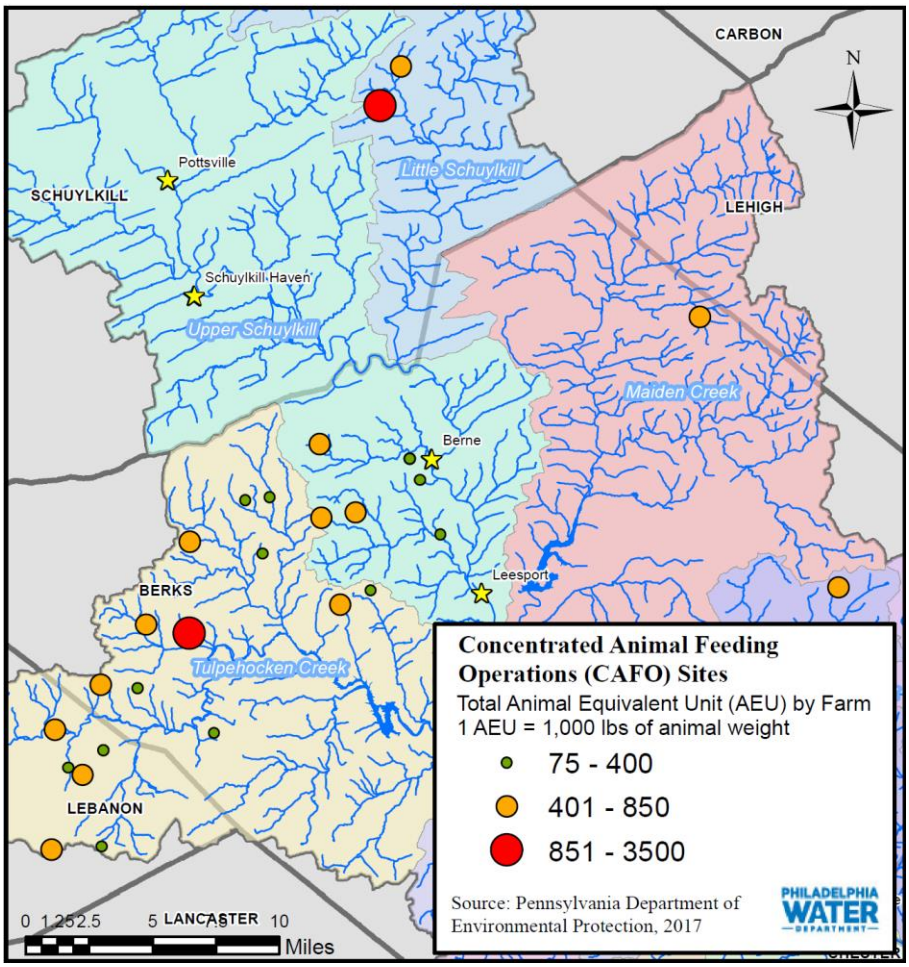

Figure 4-4: Concentrated Animal Feeding Operations in the Schuylkill River Watershed by Total Animal Equivalent Units (AEUs) (PADEP 2017)

4.2.9 Schuylkill River Restoration Fund Grants for Agriculture BMP Projects

PWD contributes financial support and participates in the SRRF grant selection process. PWD identifies and advocates for high priority projects. In 2017, PWD supported the selection of two agricultural projects to receive SRRF grants for stormwater management projects: the Youse Farm manure storage basin and the Irish Creek streambank improvements. Additionally, PWD supported the Schuylkill River Banks bioswale that will also help reduce pathogen-contaminated runoff into the Schuylkill River but is not counted towards WCP target reduction goals. The SRRF projects are discussed in more detail in Section 5.2.1.

4.3 Animal Vectors

Animals in the Schuylkill River watershed serve as mechanical vectors of *Cryptosporidium*, transferring viable oocysts from original hosts. Geese in particular are vectors, as identified in PWD and Lehigh University source tracking studies (Jellison et al., 2009; Jellison, 2010a). Table 4-5 and Table 4-6 outline the SWPP ongoing and proposed initiatives that aim to reduce the impact of animal vectors near the PWD Queen Lane and Belmont intakes and expand implementation of animal vector control in the Schuylkill River watershed. This section explains the progress made in 2017 towards each initiative listed.

Table 4-5: Ongoing Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	**4.3.1 Belmont Meadow Extension and Intake Project** Maintain plantings at the site of the Belmont Meadow Extension/Intake project. Continue to monitor goose activity around the Belmont intake.
	4.3.2 Education and Outreach on Threat of Animal Vectors in the City Continue education/outreach efforts concerning the threat of animal vectors and the role they play in the cycle of pathogen contamination. These efforts may include working with Fairmount Park to expand existing programs, such as the dog waste program, and developing new programs that focus on the relationship between geese and drinking water quality.
Schuylkill River Watershed	**4.3.3 Lehigh University *Cryptosporidium* Source Tracking** Continue to support Lehigh University source tracking research to further identify and understand the animals that serve as mechanical vectors of *Cryptosporidium* in the watershed.

Table 4-6: Proposed Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	**4.3.4 Goose Measures at Fairmount Park Properties** Identify and implement appropriate goose control measures at Fairmount Park properties, including Peter's Island, and incorporate educational signage in these areas.
	4.3.5 Waterfowl Management at PWD Facilities Complete implementation of the USDA waterfowl management program at the Queen Lane WTP, Belmont WTP and Baxter WTP as well as the three PWD WWTPs.
Schuylkill River Watershed	**4.3.6 Animal Vector Education and Outreach in the Watershed** As part of the Source Water Protection Program education and outreach efforts, raise awareness of the threat animal vectors pose to drinking water supplies. These efforts may focus on supporting Lehigh University efforts to publish scientific journal articles.

4.3.1 Belmont Meadow Extension and Intake Project

The goal of the Belmont meadow project is to deter non-native Canada geese, vectors for *Cryptosporidium*, from dwelling and feeding around the Belmont intake. This was achieved by installing fencing along Peter's Island, installing educational signage shown in Figure 4-5(b), and planting trees, shrubs, and two meadows. The project began in 1999 with the implementation of the Phase I meadow, and was completed in 2004 with the Phase II extension meadow. The plants create an inhospitable environment by obstructing the sight of the geese and increasing their fear of predators (PWD, 2011). In 2017, the Belmont meadow and intake plantings were maintained by Philadelphia Parks and Recreation to continue deterring geese from the area.

Figure 4-5: Belmont Goose Meadow (a) Educational Signage (b) Accompanying Educational Flyer

4.3.2 Education and Outreach on Threat of Animal Vectors in the City

PWD provides education and outreach efforts concerning the management of animal vectors in the Schuylkill River watershed. In partnership with PDE, PWD hosts the Philly's Best Friend Spokes Dog Competition where two dogs are selected to be the Philly's Spokes Dog and serve for one year as ambassadors educating dog owners on the importance of picking up pet waste. The last competition occurred in December 2015, and the next one is in the planning phase. Additionally, Penn Praxis, Philadelphia Parks and Recreation, Fairmount Park Conservancy and University of Pennsylvania Project for Civil Engagement collaborated on "The New Fairmount Park," a community vision and improvement plan for Fairmount Park in Philadelphia. The plan was completed in 2014, and progress has been made towards some of the priority projects identified. PWD will continue to follow the plan status and look for opportunities to align source water goals with the plan, such as including educational signage on geese as vectors of pathogens in Fairmount Park.

4.3.3 Lehigh University Cryptosporidium Source Tracking

PWD continues to support Lehigh University research on the prevalence of *Cryptosporidium* in the Schuylkill River watershed. Lehigh University has the capability to genotype *Cryptosporidium* species in field samples and assists PWD in tracking sources of *Cryptosporidium*. In October 2015, PWD and Lehigh University began sampling for *Cryptosporidium* at five sites in the Schuylkill River watershed: the Schuylkill River at Berne and Norristown USGS gaging stations, the Wissahickon Creek, the Tulpehocken Creek downstream of Blue Marsh Reservoir and Lake Ontelaunee in the Maiden Creek sub-watershed, see Figure 4-2. *Cryptosporidium* samples collected at each site are genotyped. Additionally, Lehigh University and PWD will collect watershed data including streamflow, rainfall and WWTP discharge data as available to correlate with *Cryptosporidium* sample results. Sampling coincided with LT2 Round 2 monitoring and ended in March 2017. Further research is being planned for 2018.

Figure 4-6: Lehigh Sampling Locations on the Schuylkill River near USGS gage stations at (a) Norristown and (b) Berne

4.3.4 Goose Measures at Fairmount Park Properties

In 2017, under a PWD contract with the USDA, goose control measures were implemented at a number of Fairmount Park locations, including Pleasant Hill Park, FDR Park and Golf Course, Concourse and Centennial Park, and Peter's Island. Under this contract, geese are harassed or removed from the site and eggs and nests are treated to reduce the population. This effort is discussed in greater detail in Section 5.5 of this report.

4.3.5 Waterfowl Management at PWD Facilities

In 2017, under a PWD contract with the USDA, goose control measures were implemented at the three drinking WTPs, three WWTPs and Oak Lane Reservoir. Under this contract, geese are harassed or removed from the site and eggs and nests are treated to reduce the population.

Additional measures are taken to control other wildlife populations at PWD facilities. This effort is discussed in greater detail in Section 5.5 of this report.

4.3.6 Animal Vector Education and Outreach in the Watershed

PWD continues to support Lehigh University efforts in *Cryptosporidium* related research and the publishing of scientific articles by incorporating PWD source water protection goals into Lehigh University research goals. PWD shares Lehigh University literature and research findings on deer and geese as vectors of human-infectious *Cryptosporidium* with upstream water utilities and SAN partners to support the implementation of animal vector control techniques.

4.4 Education and Outreach

Education and outreach initiatives are a critical component of PWD SWPP because point and nonpoint source discharges and land management throughout the Schuylkill River watershed influence water quality at the Queen Lane and Belmont intakes. Many education and outreach initiatives are implemented through PWD watershed partnerships, which are maintained by various programs within PWD. Table 4-7 and Table 4-8 outline the SWPP ongoing and proposed initiatives that maintain watershed partnerships and continue to promote the importance of source water protection. This section explains the progress made in 2017 towards each initiative listed.

Table 4-7: Ongoing Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	**4.4.1 Watershed Partnerships in the City** Remain an active participant in watershed partnerships and begin integrating drinking water issues into the scope of work for the Wissahickon Watershed Partnership.
	4.4.2 Annual Water Quality Report Continue to submit a comprehensive annual water quality report that emphasizes critical source water issues and, in particular, educates customers as to the research initiatives and implementation strategies PWD is using to reduce the risk of *Cryptosporidium* contamination.
	4.4.3 Water Quality Council Continue to convene the Water Quality Council (WQC) to address water quality issues on a holistic basis. Utilize the committee as a forum for providing feedback to strengthen the WCP.
	4.4.4 Improve Environmental Quality of Philadelphia Fairmount Park System Continue to work with Fairmount Park to improve the environmental quality of City parks and streams through land management practices and BMP implementation.
	4.4.5 Maintain Fairmount Water Works Interpretive Center Continue to maintain the FWWIC and promote source water protection through FWWIC exhibits and learning programs.
	4.4.6 Philly RiverCast Continue to operate Philly RiverCast and promote the web-based recreational warning system.
Schuylkill River Watershed	**4.4.7 Active Members of SAN Pathogen and Point Sources and Agriculture Workgroups** Continue to be an active member of the SAN Pathogens and Point Sources and Agriculture workgroups and support initiatives outlined in the annual work plans.
	4.4.8 Collaboration with Partnership for the Delaware Estuary Continue to collaborate with PDE on various education and outreach initiatives, including the publication of guidance materials and organization of public programs and meetings surrounding water quality concerns.
	4.4.9 Schuylkill River Restoration Fund Continue to support the SRRF to achieve implementation of BMPs at high-priority sites in the watershed.

Table 4-8: Proposed Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	**4.4.10 Implement In-City Source Water Programs in East Falls, Roxborough and Manayunk** Implement in-city source water projects in the East Falls, Roxborough, and Manayunk neighborhoods along the Schuylkill River. These projects will involve the implementation of stormwater management practices, storm drain labels and a dog waste control program. Through these initiatives, communities will become more involved in protecting their waterways as they develop a better understanding of the impacts of daily activities on their drinking water source.

4.4.1 Watershed Partnerships in the City

PWD supports a contract with the Pennsylvania Environmental Council (PEC) for the coordination of watershed partnerships for the City of Philadelphia. PEC coordinates the Watershed Alliance of Southeastern Pennsylvania including facilitating meetings for the Watershed Alliance and for the five individual watershed partnerships in the city, conducting a needs assessment for the Watershed Alliance members, promoting multi-municipal collaboration, identifying stormwater financing programs and maintaining the Watershed Alliance newsletter. PEC conducts outreach to upstream landowners on projects proposed in the Integrated Watershed Management and Act 167 Stormwater Management Plans (available at phillywaterheds.org) and coordinates this effort with the William Penn Foundation Upstream Suburban Cluster. PEC also facilitates the *Green Cities, Clean Waters* advisory committee meetings and e-newsletter.

PWD and PEC are collaborating to coordinate a community-based maintenance program, Soak It Up Adoption. The Adoption program provides grants to civic organizations in exchange for help with aesthetic maintenance on green stormwater infrastructure in their community. This hands-on approach reinforces community acceptance of infrastructure completed under the *Green City, Clean Waters* initiative and provides on-going opportunities for public engagement on stormwater. In 2017, PWD expanded PEC's role to include engagement in the MS4 sewershed. Drawing on their experience as a regional facilitator, PEC is engaging community leaders on stormwater management and helping to further refine PWD public education programs on non-point source pollution.

In 2017, PWD continued to help Philadelphia residents manage stormwater and beautify their homes through the Rain Check program, a collaborative effort with the Pennsylvania Horticultural Society (PHS) and the Sustainable Business Network. As part of the program, residents attend a workshop to learn about stormwater tools and how to select the most appropriate management tools for the property, see example project in Figure 4-7. Once the property owner identifies the most suitable stormwater management practices, PWD and PHS will help connect them with a contractor to assist with the installation, and Rain Check provides a portion of the project cost. In FY2017, Rain Check held a total of 73 workshops throughout Philadelphia with a total of 1,423 participants. Stormwater controls installed are itemized in Table 4-9.

Figure 4-7: Photo of Rain Check Depaving Project (a) Before and (b) After Installation

Table 4-9: Rain Check Program Progress in FY2017

Stormwater Management Practice	Total FY2017 Installations[1]	Cumulative Total (Fall 2014 - July 2017)[2]
Depaving	9	26
Permeable pavers	68	114
Downspout planters	121	218
Rain gardens	18	43
Rain barrels	710	1,690

Sources: 1 - J. Waldowski, personal communication, October 14, 2017.
2 - PHS (2017). Rain Check. Retrieved from https://phsonline.org/programs/rain-check/.

4.4.2 Annual Water Quality Report

PWD annually distributes source water protection information to customers in the annual Drinking Water Quality Report. The most recent report published in 2017 shares 2016 water quality data and information on the Schuylkill and Delaware River SWPPs, pharmaceuticals and *Cryptosporidium* source tracking. The report also includes sources for additional information on source water protection issues. PWD takes a proactive approach to customer education and goes beyond reporting requirements by including robust overviews of source water and watershed protection efforts.

4.4.3 Water Quality Council

In 2001, the Stormwater and Drinking Water Quality Citizen Advisory Councils (CACs) merged to form the Water Quality Council. The Water Quality Council was facilitated by PDE and took a holistic approach to water quality issues (PWD, 2011). The Water Quality Council no longer convenes, but citizens take an active role addressing stormwater and water quality issues

through PDE programs (Section 3.4.8) and watershed partnership groups in the City (Section 3.4.1).

4.4.4 Improve Environmental Quality of Philadelphia Fairmount Park System

As described earlier in Section 3.3, Penn Praxis, Philadelphia Parks and Recreation, Fairmount Park Conservancy and University of Pennsylvania Project for Civil Engagement collaborated on "The New Fairmount Park." The community-driven revitalization plan was completed in 2014. The Fairmount Park Conservancy has begun the design phase of a new recreational space along Parkside Avenue that will better connect residents of West Parkside to the park and increase park use between the Please Touch Museum and the Philadelphia Zoo. The East Park Coalition of more than 30 organizations was created to better serve the larger community. The coalition is leading efforts to improve the Mander Recreation Center and has begun to establish a half mile trail along Randolph Creek connecting the Schuylkill River Trail to the Strawberry Mansion Community. PWD will continue to follow the implementation of the plan and look for opportunities to align source water protection goals with the plan.

4.4.5 Maintain Fairmount Water Works Interpretive Center

The Fairmount Water Works Interpretive Center (FWWIC) is a PWD educational center that presents the history of the Schuylkill River, and the influence of human activities on water quality and quantity through innovative exhibits and interactive educational programs. Fairmount Water Works, PWD, Academy of Natural Sciences and PDE have partnered to develop a Freshwater Mussel Recovery Program. Freshwater mussels filter water and improve water quality. The goal of the program is to rebuild populations of native mussels through hatchery propagation to improve water quality in the Schuylkill and Delaware River watersheds. Additional program information is available online at delawareestuary.org/Science_Programs. The project includes the development and construction of a freshwater mussel hatchery and an aquatic field station at the FWWIC. The goal of the hatchery is to propagate new mussels to increase the population in the Delaware River watershed. Installation of the demonstration hatchery at the FWWIC was completed in 2017 and is now open to the public.

4.4.6 Philly RiverCast

PWD continues to promote and maintain Philly RiverCast. The website has received over 1,000,000 visits since its launch in 2005. In 2017, PWD assisted individuals and recreational groups in interpreting RiverCast ratings. In the past organizers of the Philadelphia TriRock triathlon had reached out to PWD for assistance interpreting the RiverCast ratings and referenced the tool to assess race day conditions alongside their own pre-race water quality testing. In 2016, PWD updated some aesthetic components to the RiverCast interface. The Source Water Protection Program and Public Affairs at PWD are developing a communication plan for RiverCast including strategies to make the tool more user-friendly.

4.4.7 Active Members of SAN Pathogens and Point Source and Agriculture Workgroups

PWD regularly attends quarterly SAN Pathogens and Point Source and Agriculture Workgroup meetings. The 2017 meeting minutes for both workgroups are included in Appendix B. In 2015, the SAN began planning for a SAN website upgrade and redesign. SAN is currently working with PWD on creative solutions to include priority website functions and minimize cost. Watershed stakeholders were given a sneak peak at the new design during the SAN Annual Meeting in November 2017, and the website is scheduled to be launched in 2018.

To support education and outreach in 2017, the SAN Agriculture Workgroup continued to promote and distribute *A Farmer's Guide for Healthy Communities*, detailed in Section 3.2.7. The guide and additional complimentary outreach materials including a PowerPoint and photos from the guide are available on the SAN website www.Schuylkillwaters.org. Additionally, the Saucony Creek Brewing Company continues to contribute a portion of each sale of its Stonefly India Pale Ale to the Berks Watershed Restoration Fund to support agricultural BMP projects in Berks County in the Schuylkill River watershed.

A number of SAN Pathogens and Point Source Workgroup members are a part of the Berks County Water and Sewer Association (BCWSA). In July 2017, the BCWSA held its 5th annual conference, which brings together regional drinking water suppliers, wastewater operators, and related organizations to discuss common concerns and issues. In 2016, the BCWSA and the Berks County Planning Commission developed a county-wide program to combine source water protection and stormwater management practices, which allows for assistance to cross watershed and municipal boundaries.

4.4.8 Collaboration with Partnership for the Delaware Estuary

In 2017, PWD continued to contribute financial resources towards collaboration efforts with Partnership for the Delaware Estuary (PDE) on several education and outreach initiatives. Initiatives include engaging Philadelphia residents in the prevention of stormwater pollution to the Schuylkill and Delaware Rivers and facilitating coordinated action, communication and projects for the Schuylkill Action Network (SAN). In 2017, PDE organized its annual *Green City, Clean Waters* art contest for Philadelphia students grades K to 12 receiving more than 1,400 entries. The four first place winners from each age group have his or her artwork used in advertisements featured on SEPTA buses and subways, as shown in Figure 4-8, and as temporary street art stickers promoting clean water.

Figure 4-8: ***Green City, Clean Waters*** **SEPTA Advertisements featuring Student Artwork (PDE 2017)**

PDE hosted the 2017 annual Pennsylvania Coast Day at Penn's Landing in Philadelphia, which received more than 3,000 visitors. Additionally, PDE aided coordination of the annual Schuylkill Scrub cleanup effort partnering again with the Keep Pennsylvania Beautiful. The 2017 Schuylkill Scrub included 1,752 cleanups with approximately 28,000 volunteers that removed an estimated 784,035 pounds of trash and 2,587 tires.

The SAN also sponsored a Sojourn Steward, Sarah Chudnovsky, to participate in the 2017 Schuylkill River Sojourn. On the 112-mile kayak journey, Sarah spent a week testing water quality. Water quality data was uploaded to the GLOBE program, where users around the world can compare her data against their own. Sarah also photographed wildlife and shared blog posts updates from her journey on social media using the hashtag #SojournSteward, see example in Figure 4-9.

Figure 4-9: Social Media Post from 2017 Schuylkill River Sojourn

Additionally, PWD, PDE, Academy of Natural Sciences, and FWWIC partnered to install a freshwater mussel hatchery demonstration project at FWWIC that was opened to the public on February 16, 2017, see Section 4.4.5.

4.4.9 Schuylkill River Restoration Fund

PWD continues to support the SRRF. In 2017, PWD contributed $100,000 to the SRRF, and staff participated in the review of grant applications and the selection of the recipients. The SRRF is discussed in more detail in Section 5.2.1 of this report.

4.4.10 Implement In-City Source Water Protection Programs in East Falls, Roxborough and Manayunk

First steps to implement source water protection programs in East Falls, Roxborough and Manayunk neighborhoods are in progress. North Light Community Center, in Manayunk, received a grant from the SRRF in 2016 to remove impervious playground surface and install a stormwater management system with a rain garden and native plans. The project will serve as a demonstration and outdoor learning space for students and the community. AMY Northwest middle school, located in the Roxborough neighborhood, is also developing plans for a greener schoolyard. In 2016, Saul High School created a 501(c)(3) as a mechanism to acquire funding for projects identified in the school master plan as detailed in Section 4.2.2. These schools and community spaces are located in Manayunk and Roxborough, and the projects will serve as demonstrations of source water protection and stormwater management for the students and surrounding community.

Progress has also been made in the Roxborough neighborhood to implement green stormwater infrastructure to control the quantity and improve the quality of stormwater draining into the

Wissahickon Creek. Initial concepts for Roxborough's Pocket Park project resulted from the Roxborough 2020 Initiative, a comprehensive stakeholder engagement and strategic planning process led by the Roxborough Development Corporation (RDC). The project will transform an unused asphalt parking lot on Ridge Avenue into a multi-purpose green space with social, economic, and environmental benefits. The remediation of impermeable pavement and the installation of a green stormwater infrastructure system will work to improve stormwater runoff quality entering the Wissahickon Creek and ultimately the Schuylkill River. In 2016 the first phase of the project was completed with the installation of 14 evergreen and deciduous trees, 33 shrubs, and mulch for planting beds. In 2017 the second phase of the project began, which included site preparation activities like excavating and grading the site for the installation of permeable pavers, plantings, rain gardens, and flower beds. In 2017, PWD worked with the Roxborough Development Corporation (RDC) and Mural Arts Program to commission artist and Roxborough native, Paul Santoleri, to develop a water and history themed mural at the site.

4.5 Additional 2017 Highlights

4.5.1 Outreach to Watershed Community

On September 6, 2017, PWD and the Schuylkill Action Network (SAN) hosted a tour of source water protection projects in the Schuylkill River watershed in celebration of the 10-year anniversary of its funding award through the $1.15 million Targeted Watershed Initiative Grant. The tour included stops at a stormwater management project at Spring Ford High School and a dam removal and creek restoration project at the Brookside Country Club in Montgomery County, PA. The tour group also attended the Schuylkill River Restoration Fund press event for the 2017 grant recipients held at the Meadowood Senior Living, which received funding for a stormwater basin retrofit in 2013.

PWD participated in the SAN Annual Meeting in November 3, 2017. The meeting drew approximately 80 watershed partners to participate in a day of presentations and discussion. The theme was *One Schuylkill: Many Solutions* focusing on planning efforts in the basin. The afternoon session featured speakers from different sectors presenting on how a cleaner river impacts their work and life. See Appendix D for presentations from the annual meeting.

4.5.2 Ecological Restoration Group

The Ecological Restoration Group at PWD has implemented a number of projects that manage stormwater and restore stream banks throughout the Wissahickon Creek Watershed, upstream of the Queen Lane WTP intake on the Schuylkill River. Most recently, a stream channel improvement project was implemented at Gorgas Run, a tributary to the Wissahickon Creek. This project will stabilize the stream banks, reduce erosion and prevent large amounts of sediment from being carried downstream. Additional projects include the development of conceptual plans for stormwater wetland sites, similar to those implemented at Wises Mill Run and Saylor Grove.

5.0 2017 Progress towards Watershed Control Program Plan Initiatives

In addition to the implementation of Source Water Protection Program (SWPP) initiatives, the Watershed Control Plan (WCP) includes implementation of structural and non-structural measures to physically reduce the loading of *Cryptosporidium* in the Schuylkill River watershed. These control measures address priority sources of *Cryptosporidium* identified to be wastewater effluent, agricultural land runoff, and animal vectors. The WCP control measures consist of the following: quantifying the water quality implications of UV installation at the Upper Gwynedd and Fleetwood WWTPs; supporting the installation of manure storage basins on at least five separate farms; supporting the installation of vegetated buffers on at least five farms; supporting the completion of at least five Comprehensive Nutrient Management Plans (CNMPs) at farms throughout the Schuylkill River watershed; implementing a riparian buffer to deter animal vectors at a selected site; and, implementing a PWD waterfowl management program. The WCP control measures and their implementation timeframe are summarized in Table 5-1 below. However, please note that modifications to this schedule were approved by the PADEP in March 2016 to accept the installation of a total of ten agricultural best management practices over the 5-year implementation schedule, see Appendix G.

Table 5-1: Watershed Control Program Plan Initiatives and Implementation Schedule

Project Type - Priority Source Addressed	Project	Implementation Timeframe			Project Lead and Partners
		Project Initiation	Construction Started	Project/ Construction Complete	
Structural - WWTP Effluent	UV Installation - Upper Gwynedd WWTP				N/A
Structural - WWTP Effluent	UV Installation - Fleetwood WWTP				N/A
Structural - Ag Land Use/Runoff	Farm - Manure Storage Basin #1	2012	2012	2013	NRCS, BCCD, Berks Nature, SAN Ag Workgroup Partners, PWD
	Farm - Manure Storage Basin #2	2013	2013	2014	
	Farm - Manure Storage Basin #3	2014	2014	2015	
	Farm - Manure Storage Basin #4	2015	2015	2016	
	Farm - Manure Storage Basin #5	2016	2016	2017	
	Farm - Vegetated Buffers #1	2012	2012	2013	
	Farm - Vegetated Buffers #2	2013	2013	2014	
	Farm - Vegetated Buffers #3	2014	2014	2015	
	Farm - Vegetated Buffers #4	2015	2015	2016	
	Farm - Vegetated Buffers #5	2016	2016	2017	
Non-Structural - Ag Land Use/Runoff	Nutrient Management Plans - 5 Farms	2012-2017	N/A	2017	NRCS, BCCD, SAN Ag Workgroup Partners, PWD
Structural - Animal Vectors	Riparian Buffer Plantings - 1 Site	2014	2014	2014	PWD, SAN Partners
Non-Structural - Animal Vectors	Waterfowl Management Program	2011	N/A	2017	PWD, USDA

5.1 UV Installation at Wastewater Treatment Plants

5.1.1 Upgraded Wastewater Treatment Plants

Since the development of the WCP, PWD has noted the progress of the Upper Gwynedd and Fleetwood WWTP upgrade projects. The Fleetwood UV disinfection system became operational in January 2013 (Fleetwood Borough, 2013). The Upper Gwynedd UV disinfection system became operational in 2011 (Environmental Engineering & Management Associates, Inc., 2013). The North Wales WWTP closed and diverted flow to Upper Gwynedd in June 2013 (Carroll Engineering Corporation, 2013).

In the past, PWD has learned of UV disinfection system installations at WWTPs in the watershed through township news sources and other publicly available sources. In 2013, PWD and the Schuylkill Action Network (SAN) Pathogens and Point Source Workgroup initiated an effort to track wastewater in the Schuylkill River watershed, and data collection continued through 2015 as described in Section 4.1.9 of this report. Through this effort, PWD has a more complete understanding of the level of wastewater treatment upstream of the Queen Lane and Belmont intakes, and can better track upgrades to WWTPs such as UV disinfection. In the Watershed Sanitary Survey, a WCP credit requirement submitted to PADEP in December 2015, PWD used the data from Chapter 94 reports to estimate the portion of WWTP discharge disinfected with UV systems. Upstream of Queen Lane, there are 152 wastewater treatment plants (WWTPs) discharging a total average of 109 million gallons per day (MGD) to the Schuylkill River watershed. Of the WWTPs in the Schuylkill River watershed, 33 WWTPs discharging a combined average of 27.8 MGD have UV disinfection systems.

5.1.2 *Cryptosporidium* Loading from Wastewater Treatment Plants

To estimate a range of *Cryptosporidium* loading from WWTP effluent in the Schuylkill River watershed, minimum and maximum loadings were calculated in the WCP using Equation 5-1 and Equation 5-2, respectively and are further detailed in Section 7.5.1.2 of Appendix A of the WCP (PWD, 2011). Average effluent discharge rates from WWTPs in the Schuylkill River watershed are taken from the 2008 *Schuylkill Action Network Pathogens Workgroup Study of Cryptosporidium Occurrence in Wastewater Treatment Plants*. Minimum and maximum estimates of oocysts per liter in WWTP effluent receiving secondary treatment are based on pooled values from literature, and in effluent receiving tertiary treatment, an additional log removal is assumed (Crockett, 2007). The results are summarized in Table 5-2.

Equation 5-1: Maximum Oocysts Loading from all Schuylkill River Watershed WWTPs:

$$\Sigma_{\text{all WWTPs in Schuylkill River watershed}} [\text{average effluent discharge rate} * 365 \text{ days} * \text{maximum oocysts per liter treated wastewater}] = \text{maximum oocysts per year discharged into Schuylkill River watershed}$$

Equation 5-2: Minimum Oocysts Loading from all Schuylkill River Watershed WWTPs:

$$\Sigma_{\text{all WWTPs in Schuylkill River watershed}} [\text{average effluent discharge rate} * 365 \text{ days} * \text{minimum oocysts per liter treated wastewater}] = \text{minimum oocysts per year discharged into Schuylkill River watershed}$$

Table 5-2: Schuylkill River Watershed Loading from WWTP Effluent

Schuylkill River Watershed Loading	Min Estimate (oocysts/year)	Max Estimate (oocysts/year)
WWTP Effluent	5.09E+09	6.51E+14

5.1.3 *Cryptosporidium* Loading Reduction from UV Installation at WWTPs

In the WCP, the range of potential *Cryptosporidium* inactivation and loading reduction from the addition of UV disinfection at two WWTPs, Upper Gwynedd and Fleetwood, is calculated

using in Equation 1 and Equation 2 with average effluent discharge rates for only Upper Gwynedd and Fleetwood WWTPs and an assumed additional 3 log (99.9%) removal. The calculation is further detailed in Section 7.5.3.1 of Appendix A of the WCP (PWD, 2011). The results of these calculations are presented in Table 5-3 and compared to the WCP target loading reduction in Section 6.2.

Table 5-3: Loading Reduction Estimates from UV Installation at WWTPs

Structural Control Measure	Min Potential Inactivation (oocysts/year)	Max Potential Inactivation (oocysts/year)
UV Installation - Upper Gwynedd	1.41E+08	1.80E+13
UV Installation - Fleetwood	2.61E+07	3.34E+12

5.2 Agricultural Best Management Practices

In the WCP, PWD outlines a number of actions to reduce *Cryptosporidium* in the Schuylkill River watershed from agricultural runoff. These include the installation of a total of ten agricultural BMPs, either manure storage basins or vegetated buffers, on separate farms in the Schuylkill River watershed. PWD contributions to the Schuylkill River Restoration Fund (SRRF) and involvement in the SAN Agriculture Workgroup are the main vehicles for identifying projects and implementing them. Projects funded by the SRRF and the SAN partners are described in the following sections.

5.2.1 Schuylkill River Restoration Fund Farms

In 2006, Exelon, SAN, and the Schuylkill River Greenways National Heritage Area (SRG NHA) established the Exelon Restoration Fund, now the SRRF. The SRRF provides grants to support projects that improve and protect water quality in the Schuylkill River watershed. Initially, Exelon provided all the funding to fulfill a requirement in their DRBC docket for the Wadesville Mine Demonstration Project. Beginning in 2009, PWD became the second annual contributor to the SRRF. Partnership for the Delaware Estuary (PDE) became a member and contributor in 2010 and Aqua PA followed in 2012. Additionally, MOM's Organic Market contributed to the SRRF 2014 through 2016, and Coca Cola contributed in 2015. Members of the SAN serve as technical experts in the grant selection process to support the review of project applications for their benefit to the Schuylkill River watershed. SRG NHA oversees the SRRF and distributes grant money.

PWD has been part of the grant recipient selection process since the creation of the SRRF. Since 2009, PWD has contributed $100,000 annually to the SRRF. As a contributor to the SRRF, a select few applications per year are deemed high priority to PWD. These projects are advocated for by PWD in grant award deliberations.

In 2017, two farms received funding from the SRRF. The PWD highest priority project was agricultural best management practice (BMP) installation at Youse Farms. PWD also identified a second farm as high priority advocating for the SRRF to fund agricultural BMPs at the Irish Creek property. (Additionally, PWD recognized a bioswale along the Schuylkill River Trail in Philadelphia as high priority addressing focus areas outside of LT2 regulatory goals.) Farms receiving SRRF grants also receive match funding and project support from other SAN and watershed partners including Natural Resource Conservation Service (NRCS), Berks Nature (formerly Berks Conservancy), Berks County Conservation District (BCCD), National Fish and Wildlife Foundation (NFWF), William Penn Foundation, local townships and water suppliers. The two 2017 SRRF farm projects are described here in detail. Additionally, construction updates for farms receiving SRRF grants in 2016 are also provided.

5.2.1.1 Youse Farm

During the 2017 SRRF grant round, Youse Farms property was selected by PWD as one of the highest priority projects. The Youse family farms include several properties totaling 325 acres in the in the Manatawny Creek Watershed in Berks County. The dairy farm is located at the headwaters of an unnamed tributary to the Little Manatawny Creek.

The Youse Farm project includes the construction of one liquid manure storage basin, rain gutters and other stormwater barnyard controls. PWD awarded the Youse farms a $40,000 SRRF grant which is matched by contributions from the Natural Resource Conservation Service (NRCS) under the US Department of Agriculture, the Berks Watershed Restoration Fund and the National Fish and Wildlife Fund as part of the William Penn Delaware River Watershed Initiative to cover a total project cost of over $245,555. Other project partners include Berks Nature, Berks County Conservation District and the SAN.

The manure storage basin, shown in Figure 5-1, is designed to hold six months of manure generated daily from dairy cows at the operation. The manure is collected in an underground septic tank that pumps the liquid manure into the cement pit. The storage allows the farmer to spray the slurry on crops when nutrients are needed to grow, preventing the application of manure outside of the growing season when it is likely to be washed away by precipitation and runoff into nearby waterways.

Figure 5-1: Youse Farm Liquid Manure Storage

Repair of the rain gutters allow stormwater to be collected from the roof on both sides of the barn where it is gravity fed to an underground pipe into a wetland on the property, Figure 5-2. Grading of the cement surrounding the barnyard allows runoff to enter the drain system via gravity, as shown in Figure 5-3.

Figure 5-2: Youse Farm - Wetland

Figure 5-3: Youse Farm (a) Pitched Feeding Area (b) Stormwater Drainage collection at the corner of the barn (c) Drain to Collect Stormwater Runoff with Screen to Capture Large Debris

As of November 2017, the project is near completion. The cemented area alongside the barn shown in Figure 5-4 is a heavy use area designed for the cows to travel without impacting farmland. As shown by the presence of tire marks, farm vehicles also use this space to bring feed to the milk cows. With this area now covered in cement, soil erosion is prevented, stormwater runoff quality is improved and ultimately receiving stream water quality. The heavy use area will be fenced in, posts for exclusion fencing are marked by arrows in Figure 5-4. The heavy use area will lead to a fenced alley constructed with geotextiles to reduce erosion, that will lead to pasture. The wetlands, shown in Figure 5-2, will receive animal exclusion fencing during project completion. Dirt areas adjacent to the septic tank will be matted to avoid the creation of sediment rich runoff.

Figure 5-4: Youse Farm – Fencing Posts and Heavy Use Area

5.2.1.2 Irish Creek Streambank Stabilization

Approximately 70% of the Irish Creek watershed is agricultural land. Thirty-one miles of Irish Creek are listed as impaired by the PADEP for sediment from agriculture runoff and erosion from derelict land. The 21.7 acre J. Madenford property in Berks County, shown in Figure 5-5, is adjacent to impaired segments of the Irish Creek. The property was once leased to a beef operation where years of livestock overgrazing and uncontrolled access to the creak has led to eroded stream banks, Figure 5-6.

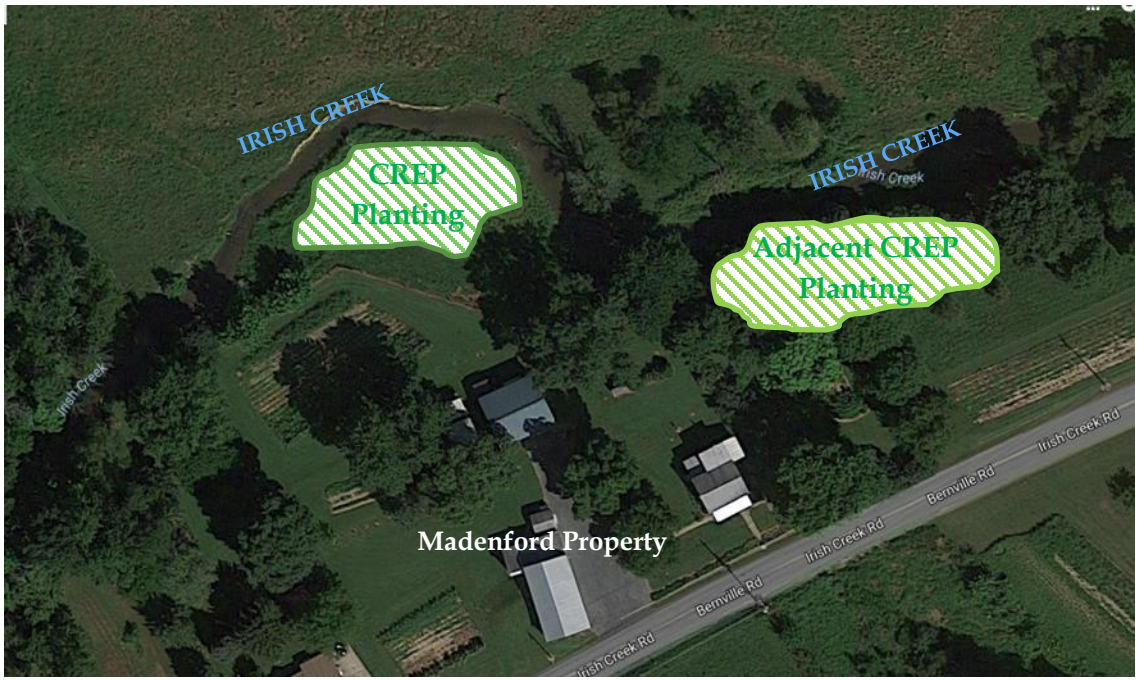

Figure 5-5: Google Satellite Imagery of Madenford Property on Irish Creek (April 2017)

Figure 5-6: Irish Creek Streambank Erosion – (a) Right Stream Bank (b) Upstream View of the Left Bank where Stormwater Drains into the Creek

The project includes 350 feet of streambank restoration and vegetation and will be implemented with the protection of 1.4 acres of forested riparian buffer and 1.3 acres of marginal pastureland wildlife habitat buffer through the USDA Conservation Reserve Enhancement Program (CREP), Figure 5-7(a), and 700 feet of livestock exclusion fencing. PWD awarded the Berks County Conservation District a $19,800 SRRF grant which is matched by cash and in-kind contributions from the Stroud Water Research Center, Berks County Conservation District, US Department of

Agriculture Farm Service Agency and CREP, and volunteers. Other project partners include PA Association of Conservation Districts and NRCS Lebanon Technical Center.

Approximately 28 beef feeder cows (800-1000 lbs each) were removed from the property as 3.0 acres of the pasture land was removed from grazing production. About 1.5 acres of riparian forest buffer and 1.5 acres of wetland protection will take its place. A conjoined property of about 11 acres will also be planted as part of CREP, photographed in Figure 5-7(b) approximate area shown in Figure 5-5.

Figure 5-7: Irish Creek – (a) CREP Riparian Buffer Planting on Madenford Property (b) CREP Plantings on Adjacent Property

As of November 15, 2017, the streambank restoration project has yet to break ground due to inclement weather. The left bank will be graded to a slope of 3:1 and a total of five barbs, or rock structures 500 square feet each, will be installed. The deflectors will stabilize the streambank, prevent erosion, and create fish habitat for the warm water fish stream. As runoff flows over the left bank and into the creek, the rock will capture sediment and help to rebuild the streambank. Additionally, a stream crossing will be installed. On the adjacent property, the right bank will be backfilled with rock toe.

5.2.1.3 Zettlemoyer Farms

For the 2016 SRRF grant round, the Zettlemoyer farms were considered the highest priority project by PWD. These farms are located on Manor Creek in the Maiden Creek watershed. The operation includes two farms owned and four farms rented by the Zettlemoyers, a total of 450 acres farmed. The Zettlemoyer farm completed conservation and nutrient management planning in 2014, and received a 2016 SRRF grant for the first two years of a four-year BMP implementation project. The four-year project will address stormwater and nutrient management issues on all six farm properties.

The Zettlemoyer farms constitute a heifer operation with 60 heifers located on two of the farm properties. Prior to construction, manure was stacked in the barn yard area, Figure 5-8(a), where manure laden runoff leaks from the barnyard area, Figure 5-8(b), down the driveway, across the street, and towards the creek, Figure 5-8(c).

Figure 5-8: Zettlemoyer Farms Prior to BMP Construction (November 2016) (a) Manure Storage Area (b) Barnyard Drainage (c) Drainage Path to Creek

The project includes storage that captures dry manure from the barnyard area and stormwater controls to keep manure contaminated runoff from leaving the site. Repairs were made to the barnyard to better manage nutrients on the property. The barn roof was extended to cover the feed area and prevent rain exposure, Figure 5-9(a). Inside the barn a cement walled area was installed to store manure inside the barn, Figure 5-9(b). Stormwater runoff that has not mixed with manure now drains to the wetland. In the last phase of the project, the field will be planted and used as a pasture for rotational grazing.

Figure 5-9: Zettlemoyer Farm (November 2017) (a) Roof extends over feeding area (b) New roof from the inside of the barn, cement wall to hold dry manure

At the second Zettlemoyer farm, construction of a heifer barn with dry manure storage took place in fall 2016, Figure 5-10(a) and (b). There is an intermittent stream on this property. Removable fencing, an animal crossing and a rotational grazing plan are designed to keep cows out of the stream during seasons when there is water.

Figure 5-10: Zettlemoyer, Second Farm (a) Heifer Barn Under Construction in Early November 2016 (b) Heifer Barn Improvements Completed in Late November 2016

5.2.1.4 Durkin Farms

The Durkin farms are located on Manor Creek in the Maiden Creek watershed. The operation includes five farms owned by the Durkins, a total of 450 acres farmed. The Durkin farms completed conservation and nutrient management planning in 2014, which includes all 501.5 acres of the Durkin properties. PWD selected the Durkin farm as a high priority project and awarded a 2016 SRRF grant for the first two years of a four-year BMP implementation project.

The four-year project will address stormwater and nutrient management issues on all five farm properties.

The Durkin farms constitute a dairy operation with approximately 95 milking cows and 30 dry cows and heifers. The farm property includes steep terrain. Figure 5-11 (a) and (b) show Google satellite imagery of the Durkin Farm headquarters with dotted arrows indicating downhill and the direction of the flow of runoff on the farm. Before construction, runoff from the higher elevations flowed through the barnyard area to the driveway and into a drain that leads toward the creek on the other side of the road. This segment of the creek had a previously existing riparian buffer that was planted in 2003. However, even with the buffer in place, manure laden runoff was being directed towards the creek. As part of the project, 6-month liquid manure storage was constructed, Figure 5-12(a) and Figure 5-11(b). Manure from the dairy barn is pumped to the manure storage basin. A heavy use area will capture additional runoff that will also be pumped up to the liquid storage. Dry manure storage will be constructed to hold manure from the heifer barn.

Figure 5-11: Google Earth Imagery of Durkin Farm Headquarters (a) Satellite Imagery as of April 2016 (b) Satellite Imagery in April 2017

Figure 5-12: Durkin Farm Headquarters (a) Completed Liquid Manure Storage Basin (November 2016) (b) Dry Manure Storage Basin Under Construction (November 2016)

This project also included the implementation of a riparian buffer, Figure 5-13(a), funded by the Trust for Tomorrow and a PADEP Growing Greener grant at another Durkin farm downstream

of the farm headquarters. Tree saplings were planting in 5 foot tubes to prevent deer rubbing. Fish and Wildlife contributed to the project adding log veins and mud sills to create aquatic habitat in the stream segment. At this site, there is 50 to 100 feet of riparian buffer along the stream with fencing and an animal crossing, Figure 5-13(b), to keep grazing cattle out of the creek.

Figure 5-13: Durkin Property (a) Trees Planted Along Streambank (November 2016) (b) Animal Stream Crossing (November 2016) (c) Cattle Grazing on Fenced Pasture Adjacent to Riparian Buffer Plantings (November 2017)

5.2.2 *Cryptosporidium* Loading from Agricultural Land

To estimate a range of *Cryptosporidium* loading from agricultural land in the Schuylkill River watershed, minimum and maximum loadings were calculated in the WCP using the runoff method and the animal population method detailed in Section 7.5.1.1 in Appendix A of the WCP (PWD, 2011). To estimate the *Cryptosporidium* loading using the agricultural runoff method, the estimated number of oocysts from two agricultural land use types (pasture/hay and row crops) are summed. The method uses agricultural land acreage in Queen Lane Zone B (PWD, 2002), event mean concentrations of *Cryptosporidium* (PWD, 2006), rainfall in Hamburg, Pennsylvania (World Climate), and the average of high and low runoff coefficients for the two land use types (McCuen, 2004). The runoff method is described by Equation 5-3. To estimate the *Cryptosporidium* loading using the animal population method, the estimated number of

oocysts from beef cattle, dairy cattle, and calves, swine, sheep and horses are summed using numbers of animals in the watershed (USDA, 2002) multiplied by infection prevalence and oocyst shedding rates from available literature sources as noted in Appendix F. The animal population method is described by Equation 5-3. The results are summarized in Table 5-4.

Equation 5-3: Agricultural Runoff Method (Minimum Estimate):

$\Sigma_{\text{pasture/hay and row crop land use types}}$ *[Acres agricultural land * event mean concentration for Cryptosporidium * rainfall per year * average runoff coefficient] = oocysts per year introduced to Schuylkill River watershed*

Equation 5-4: Animal Population Method for Farm BMP Projects (Maximum Estimate):

$\Sigma_{\text{dairy cattle, beef cattle, calves}}$ *[number of animal type * estimated prevalence of infection in animal type* oocysts shed per day per animal*365 days]*
$+ \Sigma_{\text{swine, sheep, horses}}$ *[number of animal type* estimated prevalence of infection in animal type* animal mass*weight of manure per day per weight animal*365 days*oocysts per weight manure] = oocysts per year introduced to Schuylkill River watershed*

Table 5-4: Schuylkill River Watershed Loading from Agricultural Land Runoff

Schuylkill River Watershed Loading	Min Estimate (oocysts/year)	Max Estimate (oocysts/year)
Agricultural Land Use	6.65E+12	7.75E+14

5.2.3 *Cryptosporidium* Loading Reduction from Agricultural BMP Projects

To estimate the Schuylkill River watershed *Cryptosporidium* loading reduction from the agricultural BMPs installed, the WCP follows a set of assumptions. First, a "standard" farm with several set parameters is assumed. All assumptions were confirmed as appropriate for the Schuylkill River watershed with local agricultural management experts, Larry Lloyd from Berks Nature and Nick Ramsey from NRCS. The characteristics of the standard farm are as follows:

- 120 acre dairy farm
- 80 cows (includes heifers) and 10 calves

Second, *Cryptosporidium* removal rates of 2 log (99%) and 100% are assumed for vegetated buffers and manure storage basins, respectively. Additional information may be found in Section 7.5.3.2 in Appendix A of the WCP (PWD, 2011).

Using the assumed "standard" farm characteristics, *Cryptosporidium* removal rates by BMPs and the same methods described for the estimation of the Schuylkill River watershed *Cryptosporidium* loading from agricultural runoff, minimum and maximum estimates for the

impact of five manure storage basins and five vegetated buffers are calculated in the WCP, Table 5-5.

Table 5-5: *Cryptosporidium* Loading Reduction Estimates from Agricultural BMPs

Structural Control Measure	Estimated Min Reduction (oocysts/year)	Estimated Max Reduction (oocysts/year)
Manure storage basins – 5 farms	1.10E+10	1.20E+13
Vegetated buffers – 5 farms	1.09E+10	1.19E+13

In 2017, one manure storage basin and one vegetative buffer was supported by the SRRF. The characteristics of the farms are:

Youse Farm (2017 SRRF)

- 325 acres farmed
- 50 milk cows
- 50 non-milk cows, assumed to be calves

Irish Creek (2017 SRRF)

- 2.7 acres of pasture (including farmstead)
- 17 acres of cropland
- 28 beef feeder cows, 10% assumed to be calves

The *Cryptosporidium* loading reduction per year is estimated for the Youse farm and the Irish Creek property using the agricultural runoff and the animal population methods described in Equation 5-3 and Equation 5-4, respectively. For the agricultural runoff method, the number of acres of agricultural land in the watershed is replaced with the acreage of each farm. For the animal population method, the number of farm animals in the watershed is replaced with the number of adult cattle and calves at each farm. The non-milk cows at the Youse Farm are assumed to be calves and the beef cows formerly at the Irish Creek site are assumed to be 90% adult cattle and 10% calves. The results of these calculations are presented in Table 5-6 and compared to the WCP target loading reduction in Section 6.2.

Table 5-6: Loading Reduction Estimates from Agricultural BMPs Implemented

Structural Control Measure	Estimated Min Reduction (oocysts/year)	Estimated Max Reduction (oocysts/year)
Youse manure storage	1.19E+10	1.20E+13
Irish Creek streambank vegetation	1.06E+08	1.46E+08

5.2.4 SAN Ag BMPs

Outside the SRRF, many other SAN partners contributed to the implementation of agricultural BMPs in the watershed in 2017 including NRCS, Berks Nature, and BCCD. Table 5-7 estimates the number of agricultural BMPs implemented in 2017.

Table 5-7: Ag BMPs Implemented in 2017 through SAN partners

Ag BMPs Implemented in 2017 through SAN Partners*				
Comprehensive Nutrient Management	Manure Storages	Barnyard Repairs/ Heavy Use Areas	Stream Crossings	Riparian buffers
36	11	14	2	37.4 acres (7 buffer locations)

*These counts represent the number of projects completed with NRCS involvement. NRCS is responsible for much of the engineering required to complete the design and construction of many of the BMPs. However, additional projects were completed by other SAN partners making these counts a conservative estimate.

5.3 Comprehensive Nutrient Management Plans

Supporting the implementation of five Comprehensive Nutrient Management Plans (CNMPs) is another PWD action item outlined in the WCP. Manure management issues at farms are often addressed through the nutrient management plan process led by NRCS. The SAN and NRCS consider the completion of a CNMP at a farm, which includes a nutrient management plan and a conservation plan, a criterion for funding eligibility in the Schuylkill River watershed. As outlined in the WCP, PWD plays a role in the completion of CNMPs by supporting the implementation of agricultural BMPs on farms with CNMPs, and working to ensure adequate resources are available to complete additional CNMPs. The farms that received SRRF grants had a CNMP in place prior to receiving the 2017 grants. Additionally, NRCS implemented 36 CNMPs in 2017.

5.4 Riparian Buffer Plantings

PWD committed to supporting the implementation of one riparian buffer in the Schuylkill River watershed as part of the WCP. Through the SRRF, PWD supported the Shawmont Waterfront Restoration Project. The project received a grant in 2011 and implementation was completed in 2012 and 2013. During the 2017 SRRF grant round, PWD supported the Schuylkill River Trail bioswale. The bioswale, although not selected for WCP credit, provides source water protection benefits to the Schuylkill River. Additionally, other riparian buffers have been planted in the Schuylkill River watershed through the SAN.

5.4.1 SRRF Riparian Buffer Plantings

Shawmont Restoration Project

The Shawmont Restoration Project included invasive plant removal and completion of a riparian buffer along the Shawmont waterfront and the Ottinger Tract, adjacent to the Schuylkill River and a segment of the Schuylkill River Trail network. This area is publicly

owned land in Philadelphia along the Schuylkill River and Manayunk Canal. The Shawmont waterfront and Ottinger Tract are directly upstream of the PWD Queen Lane Drinking Water Plant intake.

The Shawmont Restoration Project received a SRRF grant in 2011 and implementation was completed in 2012 and 2013. Partners included Destination Schuylkill River/the Schuylkill Project, Philadelphia Parks and Recreation, Philadelphia Water Department, Natural Lands Trust, Pennsylvania Horticulture Society, TreeVitalize, William Penn, Philadelphia Planning Commission, Shawmont Civic Association, and community members. As part of the project, extensive invasive removal and planting of trees and shrubs was completed along an approximately ¾ mile stretch of waterfront property. TreeVitalize provided nearly 700 trees. A local Shawmont resident provided over 300 trees and scrubs, and worked with students from Greenwoods Charter to plant a portion of the trees. Figure 5-14(a) shows a view of the Manayunk Canal looking downstream with part of the restored waterfront on the left bank. Figure 5-14(b) shows an area planted with trees and scrubs as part of the project. This project has engaged the community in the protection and maintenance of this section of waterfront. Volunteers have expanded the restoration area clearing invasive plant species and replanting sections along the canal which has linked a total of nearly 1.5 miles of waterfront plantings.

Figure 5-14: Shawmont Waterfront Restoration Project

The Shawmont Restoration project restored the natural landscape along the Shawmont waterfront. The project improves absorption and filtration of stormwater runoff, a major issue in the Shawmont and Manayunk sections of Philadelphia. In addition to being erosive, stormwater also carries contaminants including pathogens from the land to the Schuylkill River and the Manayunk Canal. Wooded portions of this section of the city increase the prevalence of wildlife, a priority source of *Cryptosporidium* in the watershed identified in the WCP. This restored riparian buffer and the momentum in the community to continue the effort is critical for the protection of Philadelphia's drinking water.

Schuylkill River Bank Bioswale

The Schuylkill River Development Corporation (SRDC) will implement a half-acre bioswale along an erosion-prone area of the Schuylkill River Trail in Philadelphia. The bioswale will include native plantings and help reduce stormwater runoff, filter non-point source pollution and prevention erosion. In 2017, SRRF awarded SRDC a $15,000 SRRF grant which is matched with $51,000 and in-kind support from SRDC, stakeholders and other pending grants. The SRDC was selected to receive the grant because it is located at a high traffic area along the Schuylkill River Trail in Philadelphia. The location is an opportunity to educate trail users, coming from all areas of the city, about the importance of source water protection. Additionally, a large number of Canada geese make their home year-round along the banks of the Schuylkill River. The vegetated buffer planning will help filter runoff contaminated with nutrients and pathogens from geese.

SAN Riparian Buffer Plantings

Riparian buffers were planted in the Schuylkill River watershed by SAN partners. In 2017, 37.4 acres of riparian buffers were planted through the Conservation Reserve Enhancement Program (CREP) with support from Stroud Water Research Center and BCCD, reported in Table 5-7. CREP is a partnership between federal and state governments and private groups and is administered by the USDA. It installs riparian buffers, including trees, fences and livestock crossings, at little or no cost to the landowner and typically pays an annual rent for each acre of buffer. More information on the program is available online at www.creppa.org. The Stroud Water Research Center Farm Stewardship Program offers "BMP vouchers" of $4,000 for each acre of buffer installed that is at least 35 feet wide. A farmer can earn a maximum of $20,000 in vouchers. The vouchers are used to plan and install additional conservation BMPs on farms and are typically combined with other funding sources. With continued funding in the watershed from the William Penn foundation as well as additional resources from NRCS through the Resource Conservation Partnership Program, more riparian buffer plantings are anticipated in future years with the help of SAN partners NRCS, Stroud Water Research Center and BCCD.

5.5 Waterfowl Management

To address animal vectors of *Cryptosporidium*, PWD is committed to geese management through the WCP. PWD has active contracts with the United States Department of Agriculture (USDA) for geese management at Fairmount Park properties and PWD facilities. Geese management is conducted at Fairmount Park properties including Peter's Island, Pleasant Hill Park, Concourse and Centennial Park and FDR Park and Golf Course. Geese management is also conducted at PWD facilities including the Belmont WTP, Queen Lane WTP, Baxter WTP, Southeast WWTP, Southwest WWTP, Northeast WWTP, and Oak Lane Reservoir.

On Fairmount Park properties and PWD facilities, the geese are harassed and dispersed or removed from the site. Geese are dispersed using a range of harassment techniques including

physical harassment, electronic harassment devices, pyrotechnics, lasers and paintball guns. At all locations, any nests and eggs are treated with 100% food grade corn oil that stops embryo development by preventing air from passing through the shell.

The numbers of Canada geese removed and dispersed and eggs treated July 2016 through June 2017 at Fairmount Park properties are shown in Figure 5-17. A total of 61 eggs were treated, 13 nests destroyed, 28 geese lethally removed, and 153 geese removed during roundups, and more than 21,000 geese were harassed and dispersed from the Fairmount Park properties.

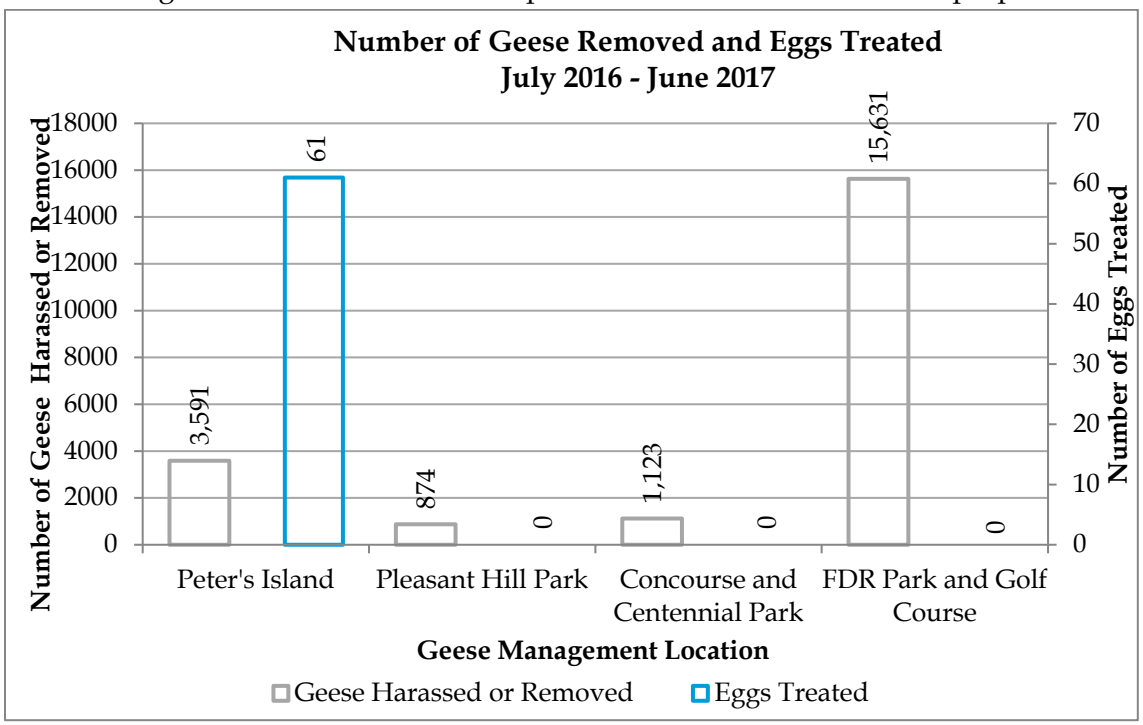

Figure 5-15: A total of 61 Canada goose eggs were treated and 21,219 geese were harassed or removed from the Fairmount Park properties during FY2017.

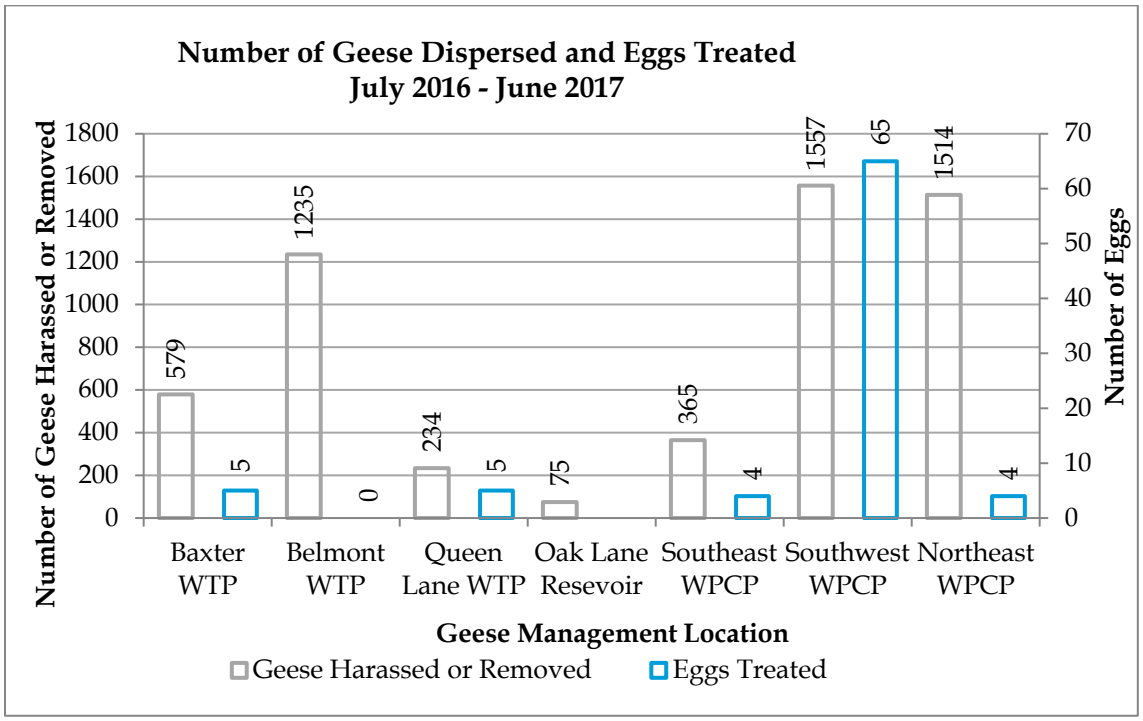

Figure 5-16: A total of 83 Canada goose eggs were treated, 9 geese were removed, and 5,550 were harassed and dispersed from PWD facilities.

The data collected between 2011 and 2017 is encouraging and suggests that the geese management strategies implemented by PWD through contracts with the USDA are impacting geese populations. These impacts are particularly evident at Peter's Island and the surrounding park area. Peter's Island is located directly upstream of Belmont WTP intake and offers breeding habitat for geese. In the past five years, PWD has observed a decrease in the number of eggs treated during the nesting season at this site. In 2011, 2012 and 2013, the numbers of eggs treated were 499, 535 and 353, respectively. In 2014, 2015, 2016, and 2017, 55, 58, 66 and 61 eggs were treated, respectively. The number of geese removed and harassed is more challenging to compare from year to year. This data may be affected by specific site conditions and the number of times USDA staff visited the sites to conduct harassment and round ups.

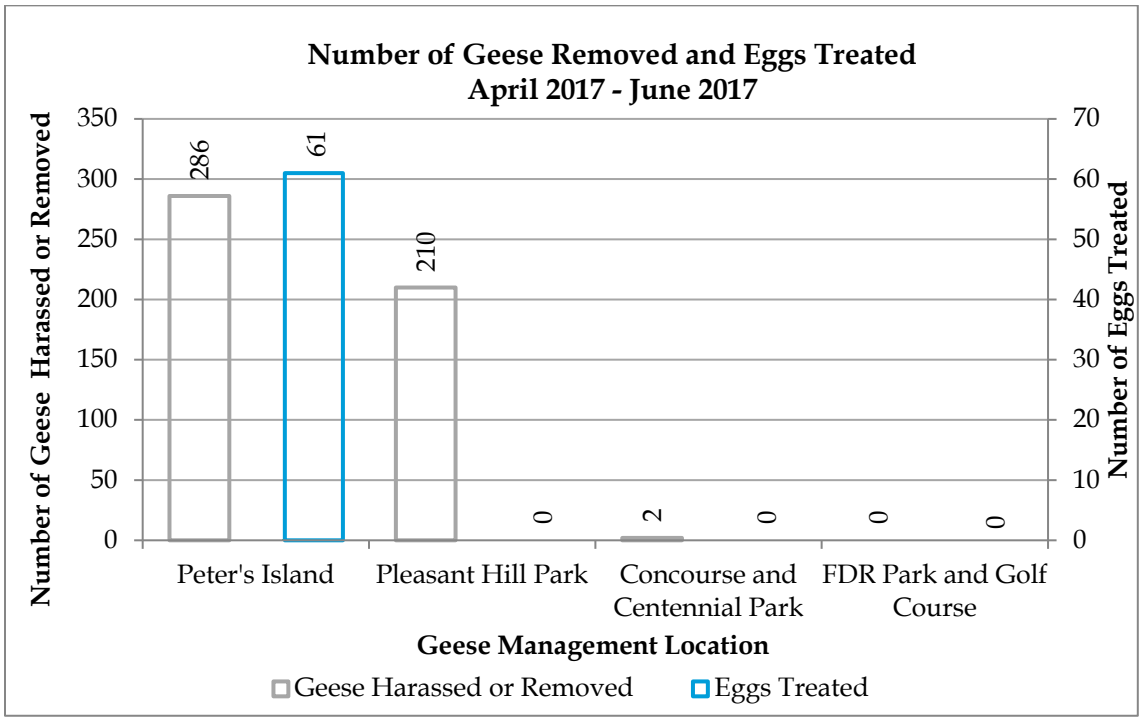

Figure 5-17: Geese Management at Fairmount Park Properties April 2017 through June 2017

6.0 2017 Watershed Control Plan Progress

6.1 Watershed Control Plan Project Summary

PWD continues to be a part of many projects and partnerships that support the WCP. Below is a summary of the action items PWD committed to as WCP deliverables and the progress made. The UV installation projects upstream of the Queen Lane intake at Upper Gwynedd WWTP and Fleetwood WWTP, which PWD has followed through publicly available information, are both fully operational, as reported in the 2013, 2014, 2015, and 2016 Annual Status Reports. PWD contributed to the SRRF, which awarded grants to support the construction of three best management practices in the Schuylkill River Watershed in 2017, one manure storage basin and one vegetative buffer on separate farms and a bioswale along the Schuylkill River Trail. Thirty-six new farms implemented a CNMP through NRCS in 2017. Geese were removed and nests and eggs treated at Fairmount Park properties and PWD facilities. The WCP progress in 2017 is summarized in Table 6-1.

Table 6-1: WCP Project Progress Summary

	WCP Project Type	Project Description	Status
2013	WWTP Upgrade	UV installation at Upper Gwynedd WWTP	Complete
	WWTP Upgrade	UV installation at Fleetwood WWTP	Complete
	Farm BMP	Manure storage basin at Havens Farm	Complete
	Farm BMP	Manure storage basin at Leid Farm	Complete
	Nutrient Management Plans	4 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	Shawmont Waterfront Restoration Project	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2013	Complete/ Ongoing
2014	Farm BMP	Manure storage basin at Martin Farm	Complete
	Farm BMP	Manure storage basin at A. Zimmerman Farm	Complete
	Nutrient Management Plans	1 Comprehensive Nutrient Management Plan	Complete
	Riparian Buffer Planting	--	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2014	Complete/ Ongoing
2015	Farm BMP	Manure storage basin at Donald Rice Farm	Complete
	Farm BMP	Manure storage basin at Dalton Biehl Farm	Complete
	Nutrient Management Plans	12 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	--	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2015	Complete/ Ongoing
2016	Farm BMP	Manure storage basin at Zettlemoyer Farm	Complete
	Farm BMP	Manure storage basin at Durkin Farm	Complete
	Nutrient Management Plans	29 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	--	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2016	Complete / Ongoing
2017	Farm BMP	Manure storage basin at Youse Farm	Complete
	Farm BMP	Riparian buffer plantings at Irish Creek property	Complete
	Nutrient Management Plans	36 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	---	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2017	Complete/ Ongoing
WCP Completion Requirement Check	WWTP Upgrades	Track UV Installation at 2 plants	Complete
	Farm BMPs	Manure storage basins - 9	Complete
		Vegetated buffers - 1	Complete
	Nutrient Management Plans	Nutrient Management Plans -5	Complete
	Riparian Buffer Planting	Sites - 1	Complete
	Waterfowl management	Years - 5	Complete/ Ongoing

* There is an alteration to the original timeline described in Table 5-1. In the first three years of the WCP implementation, PWD has decided to contribute to a second manure storage basin project instead of a vegetated buffer at a farm.

In 2016, PWD received approval from the PADEP to support the implementation of a manure storage basin or a riparian buffer at ten different farms in the watershed. This was an adjustment from the initial WCP which required five manure storage basins and five riparian buffers at a total of ten different farms. The letter requesting the adjustment and the approval letter are included in Appendix G.

The SRRF is the primary vehicle through which PWD can support projects on farms with the needed expertise and matching funds from partners. The partners, NRCS, Berks Nature and the Berks County Conservation District, take a holistic approach when implementing BMPs to control animal waste and stormwater on a farm choosing a combination of BMPs that address all nutrient and stormwater management issues. The BMPs typically include manure storage solutions, stormwater management, a riparian buffer for stream reaches on the property, and other best management practices. Many of the farms entering into contracts for BMP projects do not have streams and riparian corridors directly on the property. However, this does not make manure and stormwater management less important on the site. With earthen lagoons as manure storage basins, the stormwater and groundwater are at risk of contamination. If groundwater on the site becomes contaminated, the karst and limestone geology in the Berks County area, which allows groundwater to move quickly underground, makes nearby surface waters vulnerable to contamination. Additionally, PWD calculations presented in Section 5.2.3 assume manure storage basins contain 100% of *Cryptosporidium* on site, and riparian buffers filter 99% of *Cryptosporidium* from stormwater before it enters the stream. For this reason, PWD considers both manure storage basins and riparian buffers on farms in Berks County essentially equal in benefit to the watershed, and will support the BMPs recommended by the expertise of SAN partners.

To date, manure storage has been most critical at the priority farms identified for funding by SAN partners. After the completion of the fifth year of the WCP program, PWD has supported the implementation of nine manure storage basins and one riparian buffer.

6.2 *Cryptosporidium* Watershed Loading and Targeted Reduction

The WCP initiatives described in Section 5.0 have the potential to reduce the total loading of *Cryptosporidium* to the Schuylkill River. In order to quantitatively assess the impact of PWD projects and their potential to reduce the total loading of *Cryptosporidium* to the Schuylkill River watershed, a series of calculations are performed (see Sections 5.1 and 5.2). The calculations described serve as a preliminary step in developing a quantitative method to assess *Cryptosporidium* loading from priority sources in the Schuylkill River watershed. The methods used are based on assumptions and values found in published scientific literature. Due to a lack of scientific agreement regarding the methodology and accuracy of quantitative assessments of *Cryptosporidium* sources, the results should not be used to make absolute conclusions. The uncertainties associated with quantifying total *Cryptosporidium* loading across

the Schuylkill River watershed, and reductions in that loading caused by the implementation of priority projects, highlight the need for continued and expanded *Cryptosporidium* research.

The WCP estimates a range of total *Cryptosporidium* loading in the Schuylkill River watershed comprised of contributions from priority sources: WWTP effluent, agricultural land runoff and stormwater runoff. The maximum and minimum *Cryptosporidium* loading from WWTP effluent was estimated using Equation 5-1 and Equation 5-2 and the method summarized in Section 5.1.2. The maximum and minimum *Cryptosporidium* loading from agricultural land use runoff was estimated using Equation 5-3 and Equation 5-4 and the method described in Section 5.2.2.

To estimate the *Cryptosporidium* loading from stormwater runoff, the estimated number of oocysts from three land use types (commercial/industrial/transportation, high density residential and low density residential) are summed. The method uses urban land acreage in Queen Lane Zone B (PWD, 2002), event mean concentrations of *Cryptosporidium* (PWD, 2006), rainfall in Hamburg, Pennsylvania (World Climate), and the average of high and low runoff coefficients for the land use types (McCuen, 2004). The results are summarized in Table 6-2.

Equation 6-1: Estimate of Oocyst Loading from Stormwater Runoff:

$$\Sigma_{\text{urban land use types}} [\text{number of acres of land use} * \text{event mean concentration for Cryptosporidium} * \text{rainfall per year} * \text{average rainfall coefficient}] = \text{oocysts per year introduced to Schuylkill River watershed}$$

Table 6-2: Schuylkill River Watershed Loading from Stormwater Runoff

Schuylkill River Watershed Loading	Estimate (oocysts/year)
Stormwater Runoff	1.14E+12

The methods used to perform the estimates of the total *Cryptosporidium* loading to the Schuylkill River watershed from priority sources are summarized in Table 6-3.

Table 6-3: Calculation Methods for Annual *Cryptosporidium* Loading Estimates

Schuylkill River Watershed Loading	Minimum Loading Estimate Method	Maximum Loading Estimate Method
WWTP Effluent	Minimum values for oocysts/liter in secondary effluent based on pooled values from various sources of literature documented in Crockett 2007. Oocyst concentrations are multiplied by average daily flow rates at each of the 72 WWTPs in the Schuylkill River watershed. Tertiary systems are assumed to have an additional 1 log removal.	Maximum values for oocysts/liter in secondary effluent based on pooled values from various sources of literature documented in Crockett 2007. Oocyst concentrations are multiplied by average daily flow rates at each of the 72 WWTPs in the Schuylkill River watershed. Tertiary systems are assumed to have an additional 1 log removal.
Agricultural Land Use	Method multiplies agricultural land area, runoff volumes, and *Cryptosporidium* event mean concentration, similar to the 2002 Source Water Assessment (SWA) approach.	Method estimates infected livestock populations for the Schuylkill River watershed and oocyst shedding rates for each category of livestock.
Stormwater Runoff	Method multiplies various land cover areas, runoff volume and *Cryptosporidium* event mean concentrations for urban/developed land, similar to the 2002 SWA approach.	
TOTAL LOADING	Summation of minimum estimates of Schuylkill River watershed *Cryptosporidium* sources.	Summation of maximum estimates of Schuylkill River watershed *Cryptosporidium* sources.

Upon determining an estimated range for the total Schuylkill River watershed *Cryptosporidium* loading, an attempt is made to establish a loading reduction target by comparing the observed average concentration of 0.076 oocysts/L at the Queen Lane intake during the Long Term 2 Enhanced Surface Water Treatment Rule (LT2) monitoring period (2001- 2003) to a desired Bin 1 concentration of 0.074 oocysts/L. The ratio of the maximum Bin 1 concentration to the observed concentration at the intake, 0.074/0.076 is used to calculate a target *Cryptosporidium* loading reduction of 2.7% in five years. Multiplying the estimated minimum and maximum total Schuylkill River watershed *Cryptosporidium* loadings by 2.7% yields minimum and maximum reduction targets. The minimum reduction target is 2.11E+11 oocysts per year, and the maximum reduction target is 3.85E+13 oocysts per year.

As the WCP is implemented, project impact is assessed using the same approaches used to estimate the total Schuylkill River watershed *Cryptosporidium* loading. Schuylkill River watershed *Cryptosporidium* loading reductions from control measures implemented 2013 through 2017 are estimated for UV installation at two WWTPs, and the construction of nine manure storage basins and one vegetative buffer at ten separate farms in the watershed, Sections 5.1.3 and 5.2.3, respectively. The potential for reducing the total Schuylkill River watershed *Cryptosporidium* loading is then compared to the range of reduction targets

established. Schuylkill River watershed loadings, reduction targets and reductions from control measures are summarized in Table 6-4.

By summing the estimated impacts of UV installation at two WWTPs and BMP implementation at ten farms, total estimates of *Cryptosporidium* loading reduction in years one through five of the PWD WCP are calculated. The impact of control measures implemented both in 2017 and over the life of the WCP is estimated to potentially account for 5.7% to 31.3% and 13.60% to 112%, respectively, of the reduction target. As previously mentioned, the estimates serve as a preliminary step in developing a quantitative assessment of Schuylkill River watershed *Cryptosporidium* loading reduction, and uncertainties in the method emphasize the need for further research.

Table 6-4: Schuylkill River Watershed *Cryptosporidium* Loading Reduction (2.11E+11 to 3.85E+13 Oocysts per Year) Summary

	Schuylkill River Watershed Loading	Minimum Estimate (oocysts/year)	Maximum Estimate (oocysts/year)		
Total Loading from Watershed	WWTP Effluent	5.09E+09	6.51E+14		
	Agricultural Land Use	6.65E+12	7.75E+14		
	Stormwater Runoff	1.14E+12	1.14E+12		
	TOTAL LOADING	7.80E+12	1.43E+15		
	WCP Structural Control Measure	**Minimum Potential Reduction (oocysts/year)**	**Maximum Potential Reduction (oocysts/year)**	**Minimum Reduction as % of Minimum Reduction Target**	**Maximum Reduction as % of Maximum Reduction Target**
2013	Upper Gwynedd WWTP UV Installation	1.41E+08	1.80E+13	0.07%	46.80%
	Fleetwood WWTP UV Installation	2.61E+07	3.34E+12	0.01%	8.70%
	Manure Storage Basin at Havens Farm	1.83E+09	4.82E+12	0.87%	12.51%
	Manure Storage Basin at Leid Farm	1.37E+09	2.17E+12	0.65%	5.63%
2014	Manure Storage Basin at Martin Farm	1.76E+09	2.65E+12	0.83%	6.88%
	Manure Storage Basin at A. Zimmerman Farm	1.25E+09	1.95E+13	0.59%	50.68%
2015	Manure storage basin at Donald Rice Farm	1.85E+09	4.58E+12	0.88%	11.89%
	Manure storage basin at Dalton Biehl Farm	4.03E+09	4.34E+12	1.91%	11.26%
2016	Manure storage basin at Zettlemoyer Farm	8.25E+09	3.61E+12	3.91%	9.39%
	Manure storage basin at Durkin Farm	8.25E+09	1.45E+12	3.91%	3.75%
2017	Manure storage basin at Youse Farm	1.19E+10	1.20E+13	5.65%	31.29%
	Riparian buffer planting at Irish Creek	8.90E+06	3.94E+08*	0.00%	0.19%
5-Year Reduction Target	2.7% of Total Schuylkill River Watershed Loading	2.11E+11	3.85E+13	100%	100%
Cumulative Loading Reduction	WWTP UV Installation	1.67E+08	2.14E+13	0.08%	55.50%
	Farm BMPs	2.87E+10	4.31E+13	13.60%	112.00%
	TOTAL LOADING REDUCTION	2.89E+10	6.45E+13	13.68%	167.59%

*Irish Creek maximum reduction estimates were obtained through the use of the land use and EMC method while the minimum estimate was obtained through the animal population method

7.0 Expectations for 2018

Although the second round of LT2 compliance sampling resulted in an average *Cryptosporidium* concentration within 'Bin 1' range, the Queen Lane intake will remain a 'Bin 2' facility based on the results from the first round of compliance sampling as mandated by PADEP regulations. The PWD Queen Lane Water Treatment Plant will continue to employ options from the 'Microbial Toolbox' including achieving individual and combined filter effluent performance requirements to maintain in compliance with LT2 regulations. Additionally, PWD will continue ongoing initiatives outlined in the WCP through its existing Source Water Protection Program framework.

In 2018, PWD will continue efforts toward goals outlined in the WCP. These include continuing addressing WWTP effluent, agricultural land runoff and animal vectors as priority sources of *Cryptosporidium*, as well as expanding education and outreach in the watershed through SWPP initiatives. It also includes completing WCP actions that specifically reduce *Cryptosporidium* the watershed. Specific focus will be on the following:

- Continued partnership with SAN and PDE for project facilitation and collaboration
- Continued support for research surrounding *Cryptosporidium* in Philadelphia source water and collaboration with Lehigh University.
- Continued funding towards SAN administration and the SAN Coordinator position
- A $100,000 contribution to SRRF for 2018 project grants
- Involvement with the SAN Pathogens and Point Source Workgroup to track wastewater discharge related changes in the watershed
- Involvement with the SAN Agriculture Workgroup to identify and contribute to agricultural BMP and CNMP implementation in the watershed
- Geese management at Fairmount Park properties and PWD facilities

PWD also intends to investigate the potential to expand Watershed Control Plan efforts into the Delaware River watershed.

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Appendix A: 2016-2020 SAN Strategic Plan

Schuylkill Action Network

Strategic Plan

2016-2020

Table of Contents

SAN Drinking Water Protection History

Following the passage of the Clean Water Act and the Safe Drinking Water Act in the early 1970s[1], we started to think very differently about our rivers and streams and how they impact our daily lives. The Schuylkill River, which was once seen as a place to dispose waste, is now a vital resource for our quality of life. As the largest single tributary and source of fresh water to the Delaware River, the Schuylkill River is also an important component of the Delaware Estuary. The river provides opportunities for recreation, helps to meet our energy needs, and is a major source of freshwater to the Delaware Estuary, a major economic driver for the region. However, one of its most important benefits is something we all rely on every day, drinking water.

More than 2 million people get their drinking water from the river and streams in the Schuylkill watershed, making protecting it a very important goal for water suppliers. Over a decade ago, the Philadelphia Water Department (PWD) embarked on a very ambitious effort to identify and prioritize all of the potential pollution threats to the Schuylkill River, which provides about half of the city's drinking water. This process led to the creation of a protection plan for the river, laying out a roadmap for addressing these threats. One of the primary goals of this plan was to create a mechanism for regional coordination across geographic, regulatory, and jurisdictional boundaries. The Schuylkill Action Network (SAN) was created shortly thereafter to help accomplish this goal. The SAN takes a watershed-wide approach to protecting drinking water sources by partnering with upstream communities, other regional water suppliers, businesses, governments, and watershed protection groups.

Strategic Plan Background

Since its inception, the SAN has regularly produced a Strategic Plan to help guide the network's future growth and direction. The SAN 2016-2020 Strategic Plan (the "Plan") was developed through an effort of the SAN Planning Committee to serve as a guide for the next five years. The Plan was informed by the SAN's original goals and purposes, past priorities and long-term agenda items, as well as the current and ongoing work of its various workgroups, committees, and partners.

[1] The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972. *http://www.epa.gov/laws-regulations/summary-clean-water-act*.
The Safe Drinking Water Act (SDWA) was established in 1974 to protect the quality of drinking water in the U.S. This law focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. *http://www.epa.gov/laws-regulations/summary-safe-drinking-water-act*

The SAN facilitated a variety of processes for gathering new input from partners and watershed stakeholders during the strategic planning update process. Early in 2015, the Planning Committee and Executive Steering Committee (ESC) initiated the planning process by identifying key themes for the new plan. During the summer of 2015, the Planning Committee held regional strategic planning listening sessions in Reading and Philadelphia and engaged members online through a webinar meeting. Several online surveys developed for water suppliers, recreational users, and the general public were distributed throughout the watershed to garner additional input. In total, over 300 SAN partners and stakeholders provided responses. All solicited feedback was organized by the SAN Planning Committee and incorporated into new strategies and objectives which are reflected in the Plan below.

The Plan is a tool crafted to guide and coordinate the SAN's work over the next five years and to communicate the SAN's intentions to the surrounding community of partners, potential partners, and funders. Planning is a fluid process and this plan was designed to be regularly revisited – and revised – as needed as part of the work planning process. The Plan is supported and further detailed by the yearly workplans for each SAN workgroup/committee.

The SAN is a voluntary partnership dedicated to meeting its mission and vision for the Schuylkill River. The deadlines, actions, and commitments of this Plan are subject to the availability of sufficient resources and funding to carry them out. The SAN leadership will periodically review the progress of the Plan, make adjustments as needed to reflect the latest priorities, needs and available resources, and continue to work toward the vision and mission of the SAN at an efficient and feasible pace.

Overview of SAN Strategic Goals

Strategic Goal	**Workgroup / Committee Responsible**
To advance drinking water and watershed protection for the Schuylkill River and its tributaries by **facilitating communication and decision making** on a regional, state, and federal level. Work collaboratively to **ensure the availability of resources, expertise, and commitments** to support the work.	Executive Steering Committee
Focus efforts on improving watershed management, especially activities that will **enhance the quality and flow of Schuylkill waters** for the protection of public health and aquatic resources. Create and maintain an effective network that **maximizes the resources of its membership** to protect and restore the Schuylkill watershed.	Planning Committee
Maximize reduction and/or treatment of **abandoned mine drainage** discharges.	Abandoned Mine Drainage (AMD) Workgroup
Maximize reduction and/or prevention of **agricultural impacts** to water quality.	Agricultural Workgroup
Improve **public support** for watershed protection actions.	Education & Outreach Workgroup

Engage recreational users of the watershed in activities that lead to **increased awareness** and advancement of watershed protection and restoration strategies.	Recreation Workgroup
Facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding **point source compliance programs** and **drinking water protection** strategies.	Pathogens/Compliance Workgroup
Maximize reduction and/or prevention of **stormwater runoff** pollution.	Stormwater Workgroup
Promote a **sustainable landscape** in the Schuylkill River watershed through strategic conservation and efficient land resource use to protect the integrity of water supplies for future generations.	Watershed Land Protection Collaborative Workgroup

Vision

The Schuylkill watershed is a healthy ecosystem and a foundation for a thriving network of communities in southeastern and central Pennsylvania. It is the largest source of fresh water to the Delaware River and an important natural resource of the Delaware Estuary. Residents recognize themselves as citizens of the watershed and they value its unique cultural and natural resources. Reflecting this common value, residents, businesses, non-profit organizations, and governments actively work to address current and past threats to drinking water sources and watershed health while working to protect these natural resources from new stress. Members of the Schuylkill Action Network share information, expertise, and technology to help each other achieve this shared vision of clean water and a healthy environment for the Schuylkill River and its tributaries. Management practices, restoration efforts, and protective measures are implemented using a sustainable source of funding to improve and protect the water resources and water quality of the Schuylkill River watershed.

Mission

The mission of the Schuylkill Action Network is to improve water resources in the Schuylkill River watershed by working in partnership with local watershed organizations and land conservation organizations, businesses, academics, water suppliers, recreational communities, local governments, and regional, state, and federal agencies to transcend regulatory and jurisdictional boundaries in the strategic implementation of protection measures. The SAN seeks to achieve this mission through enhanced communication and collaboration and, more specifically, by working cooperatively with interested parties to:

- Support existing efforts and implement actions to restore and protect water quality in the Schuylkill River watershed;
- Promote the long-term coordinated stewardship and restoration of the watershed and educate others regarding their roles in protecting the watershed and water supplies;
- Transfer the experience and lessons learned to other communities; and
- Enhance intergovernmental communication and coordination by working together on the identification and resolution of environmental issues with shared regulatory responsibility.

SAN Objectives

To improve the quality of drinking water as indicated by:

- Reduction in annual pollutant loadings to source water due to drinking water protection efforts.
- Participation of Schuylkill River water suppliers in SAN workgroups and events directly supporting utility's Source Water Protection Plans and Source Water Protection Plan goals.

To improve watershed health as indicated by:

- Increased efforts to achieve healthy and resilient aquatic ecosystems.
- Promoting the restoration of impaired stream miles and continuing to further advance the protection of stream miles through the network's many collaborative efforts and watershed strategies.

To improve public value as indicated by:

- Significant improvement in public perception of the Schuylkill River as a vital regional natural resource that should be protected.
- A return to the river by the public for the purposes of recreation, sport, and enjoyment.

Key Strengths of the SAN

Overview

During the strategic planning process, SAN members were asked to describe the services provided by the SAN that they value most. These services should be maintained and/or improved by the SAN in order to achieve a shared vision for a clean and healthy Schuylkill watershed. The following themes represent this feedback and are incorporated throughout the goals, strategies, and objectives of the SAN leadership and workgroups.

Resource

The SAN provides valuable resources and information related to the Schuylkill watershed. This has been a primary objective of the SAN since its inception, and achieved by utilizing the SAN website as a clearinghouse of information on Schuylkill-related topics, documents, reports, guides, photos, and more. Maintaining this benefit of the SAN is important for the watershed community and is embedded as a key element of the strategies for the next 5 years. The SAN should also continue to look for additional opportunities to serve as a resource for its partners that will add value to the shared work throughout the watershed.

The SAN's key strengths as a resource include being:

- A leading source for information on watershed related issues or materials;
- Supportive, and possessing a high level of watershed knowledge and expertise;
- A resource for assisting partners in obtaining funding necessary to complete their priority projects. For example: partners submit many multi-organizational grant applications, focus on sub-award projects coordinated by the Partnership for the Delaware Estuary, and provide letters of support for SAN priority projects.

Networking and Collaboration

One of the primary goals of the SAN is to serve as a platform for individuals, organizations, agencies, utilities, schools, businesses, and others to come together to share resources, information, and strategies that improve the health of the watershed.

The SAN's key strengths in networking/collaboration include:

- Effective collaboration with partners;
- Welcoming and engaging members;
- Strategically planning events and meetings;
- Bringing together a variety of stakeholder groups. For example: environmental nonprofits, water utilities, and governments;
- Having geographical diversity among its partners;
- Continuously developing the SAN and including new members/partners;
- Providing professional connection and networking.

Issue-focused Action

The SAN is largely structured around issue-driven workgroups, tasked with addressing the most pressing problems in the watershed. This approach is valued by SAN partners in that it represents a prioritized approach and leads to high quality projects. In the strategic plan, strategies have been developed to ensure that issue-driven work continues and is expanded when possible.

The SAN's key strengths in maintaining issue-focused action include:

- The SAN's focus on many different aspects of water, while maintaining a central emphasis on watershed health and clean and safe drinking water;
- Linking together drinking water, waste water, recreation, societal issues, and economics;
- Defining clear objectives;
- Taking proven approaches to solving problems;
- Identifying tools to protect and restore the watershed.

Watershed Improvements

The SAN has positively impacted the environmental conditions of the watershed, as well as communities in the watershed, despite limited money, resources, and staff. This is especially highlighted in the Agricultural and Abandoned Mine Drainage workgroups where water quality improvements are very noticeable. Throughout this strategic plan, the SAN will focus on achieving watershed improvement results.

The SAN's key strengths in achieving watershed improvements include:

- Fostering positive environmental change;
- Positively impacting communities in the watershed;
- Clearly communicating what progress looks like to its members;
- Achieving goals despite limited money, resources, and staff;
- Identifying tools to protect and restore the watershed.

Education and Outreach

The SAN works to integrate education in many of its watershed restoration and protection goals. In addition to maintaining an Education and Outreach Workgroup, the SAN strives to implement actions that increase the understanding of and affinity for the Schuylkill Watershed across all of its work. Education and outreach is also a key focus in many of the SAN's partners' missions. When possible, education and outreach should be further embedded throughout SAN initiatives and projects with the goal of increasing public awareness and care for the watershed.

The SAN's key strengths in education and outreach include:

- Making the connection between upstream and downstream waters;
- Including strong, clear messages about clean water in outreach materials;
- Creating and managing the Schuylkill Action Students program.

Data and Monitoring[2]

In order to advance the restoration and protection efforts of the SAN, it is important to document the extent and impact of activities. This is largely accomplished through water quality monitoring efforts. Data collection and monitoring is a key element of many SAN workgroup strategies. The SAN will work to acquire resources for monitoring and to connect local monitoring activities with larger regional monitoring and data collection and modeling efforts. A primary goal of the SAN will be to provide a mechanism for sharing data among partners to

[2] In the previous strategic plan, data and monitoring was listed as a separate team. The SAN is now integrating basin-wide monitoring through the Delaware River Watershed Initiative.

assist in identifying priority areas for program implementation, reducing contamination, and protecting public health.

The SAN's key collaborative monitoring and data collection efforts include:

- Abandoned mine drainage monitoring efforts completed by the Schuylkill Headwaters Association, Schuylkill Conservation District, United States Geological Survey, and the Army Corps of Engineers.
- Agriculture monitoring efforts by the Delaware River Watershed Initiative (DRWI).
- Conservation monitoring efforts by the DRWI

Additional monitoring strategies of the SAN include:

- Provide guidance and support to workgroups for determining and measuring workgroup objectives.
- Provide guidance and support to the SAN partners for integrating watershed monitoring information into the SAN website and other outreach tools.
- Support the maintenance of key monitoring stations, such as the USGS gauge station at Norristown and other USGS gauge stations located upstream of drinking water intakes.
- Coordinate watershed monitoring and analysis needs with current or new initiatives through the Delaware River Watershed Initiative and with the Academy of Natural Sciences.
- Support water suppliers in their efforts to better coordinate and share water quality data and information.
- Encourage the involvement of colleges and universities in helping the meet additional monitoring needs in the Schuylkill River watershed.
- Identify opportunities and provide support for connecting data and monitoring activities of the Delaware Valley Early Warning System with SAN watershed outreach and planning efforts.

Water Suppliers

Since the inception of the SAN, the SAN has been actively involved in water suppliers' source water protection planning and implementation efforts.

The SAN should continue to:

- Maintain and update the water suppliers list on the SAN website.
- Share relevant information with the water suppliers listserv.
- Participate in water supplier source water protection meetings.

EXECUTIVE STEERING COMMITTEE

TO ADVANCE DRINKING WATER & WATERSHED PROTECTION FOR THE SCHUYLKILL RIVER & ITS TRIBUTARIES BY FACILITATING COMMUNICATION & DECISION MAKING ON A REGIONAL, STATE, & FEDERAL LEVEL;

&

BY WORKING COLLABORATIVELY TO ENSURE THE SAN HAS THE NECESSARY RESOURCES TO SUPPORT ITS WORK.

Objectives

1. *Leadership* - Provide leadership on issues, policies, and practices influencing drinking water and watershed protection.
2. *Visioning* - Increase the SAN's ability to advance a progressive agenda by communicating opportunities, challenges, and needs.
3. *Collaboration* - Facilitate collaboration among public and private interests in drinking water protection. Work to secure strategic partnerships with public and private entities to support restoration and protection efforts.
4. *Sustainable Operational Funding* - Support the investigation and acquisition of resources needed to meet the operational needs of the SAN.

Strategy

The SAN Executive Steering Committee (ESC) provides support, leadership, and oversight of the overall goals and objectives of the network, working to collaborate on strategies and practices that will advance the SAN's primary mission of drinking water protection while supporting efforts to connect this work to other water resource protection needs. The ESC provides direction to the SAN from a regional, state, federal, and utility perspective. The ESC is represented by members of Pennsylvania Department of Environmental Protection, U.S. Environmental Protection Agency, Delaware River Basin Commission, Philadelphia Water Department, the Partnership for the Delaware Estuary, and the Schuylkill River Heritage Area. The ESC will work together to prioritize and articulate strategies that encourage the above agencies and organizations to strengthen their commitment to the restoration and protection goals of the SAN for the Schuylkill River watershed. Over the next 5 years, the ESC will explore the engagement of 3-5 new strategic partners from among public and private entities to support the restoration and protection of the Schuylkill River. The ESC will assist with the facilitation of strategic planning and goal setting in for the SAN and approve updates to the SAN Strategic Plan on at least a 5-year cycle. The ESC will provide guidance on decision making and prioritization for investments of agency/organizational time to meet the objectives of the SAN and its Strategic Plan. The ESC will provide guidance to the SAN workgroups, when needed, to prioritize work and set goals for achieving its overall mission.

PLANNING COMMITTEE

FOCUS EFFORTS ON IMPROVING WATERSHED MANAGEMENT, ESPECIALLY ACTIVITIES THAT WILL ENHANCE THE QUALITY AND FLOW OF SCHUYLKILL WATERS FOR THE PROTECTION OF PUBLIC HEALTH AND AQUATIC RESOURCES.

&

CREATE AND MAINTAIN AN EFFECTIVE NETWORK THAT MAXIMIZES THE RESOURCES OF ITS MEMBERSHIP TO PROTECT AND RESTORE THE SCHUYLKILL WATERSHED.

Objectives

1. Secure funding of $500,000 per year or more to support watershed restoration/protection and partnerships, with at least 50% coming from sustainable sources.
2. Increase the number of participants contributing to the Schuylkill River Restoration Fund each year.
3. Maintain operational funding necessary for the day to day operations of the SAN.
4. Redesign the SAN website to better serve the needs of workgroups, partners, and the general public.
5. Increase the participation and diversity of the SAN membership.
6. Oversee the development of a Recreation Workgroup and strategic plan element until it becomes established.
7. Serve as a facilitator for improving the processes that guide restoration and protection efforts in the Schuylkill River watershed.
8. Provide guidance and take action to remove barriers that impede watershed restoration and protection.

Strategy

In order for the SAN to achieve long-term success in restoring and protecting the health of the Schuylkill watershed, it is important that the Planning Committee continues its focus on maintaining the health of the network, providing guidance and resources to SAN partners for workgroup priorities. Since its creation in 2003, the SAN has successfully developed a system of prioritizing and implementing projects that advance drinking water protection in the watershed. In doing so, the SAN has been able to establish itself as a leader in the watershed and provide a forum for communicating and advancing discussions on activities that impact the watershed's natural resources. Over the next five years, the SAN must continue to secure resources for the watershed; create opportunities for networking and collaboration; maintain focus on the most pressing watershed issues; lead watershed outreach; and advance the goal of achieving watershed protection and improvements.

In order to maintain network health and promote a progressive drinking water protection agenda for the Schuylkill watershed, the SAN Planning Committee will work to secure resources, facilitate communication among its partners, and eliminate barriers to better watershed management. The Planning Committee will continue the goal of acquiring both sustainable funding for watershed implementation projects, as well as securing long-term funding to cover the operational expenses of the network. The Planning Committee will look for opportunities that will leverage resources and provide positive outcomes in priority watersheds that align with both the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).

The Planning Committee will continue to create opportunities that engage watershed stakeholders and encourage the sharing of information and resources throughout the network. This includes working collaboratively with the Education and Outreach Workgroup to redesign the SAN website. Also, through the various SAN outreach channels, including the SAN website and social media sites, workgroup and network-wide meetings, and SAN publications, the Planning Committee will direct needs-driven information and resources to its members.

The Planning Committee will focus specifically on the following strategies:

1. Continue to strengthen the SAN communication infrastructure to maintain active communication among SAN members (website, social media, newsletters, and meetings) and provide more needs-focused support to SAN workgroups.
2. Implement elements of the SAN Fundraising Strategy, securing both public and private funding for SAN priority projects, with a goal of establishing an annual fund of $500,000.
3. Investigate new fundraising strategies for the SRRF and operational SAN funding.
4. As needed, convene meetings of a Watershed Practices Implementation Committee with the goal of examining the processes and policies that guide watershed management and developing and presenting strategies that improve them (See Appendix C).
5. Support SAN partners as they continue their assessment of the impacts of climate change on the Schuylkill River watershed and Delaware Estuary and identify linkages between workgroup activities and climate change adaptation recommendations.
6. Provide support to SAN workgroups in projects that engage municipalities and water utilities in watershed restoration, protection, and planning.
7. Work cooperatively with SAN partners to encourage and support regional collaborative watershed planning efforts that integrate the Clean Water Act and Safe Drinking Water Act programs.
8. Support drinking water protection activities within the City of Philadelphia, including education and outreach projects, planning initiatives, and other relevant endeavors, and disseminate information to upstream communities.
9. Engage recreational users in the SAN through events, projects, and the establishment of a new Recreation Workgroup; increase awareness of need for protection efforts among the users of the River.
10. Continue to integrate SAN's connection with the Delaware River Watershed Initiative through both the Middle Schuylkill and Schuylkill Highland's clusters, as well as through watershed-wide efforts of this initiative.
11. Continue to support partners and leverage funding by providing letters of support.
12. Explore the feasibility of developing a *State of the Schuylkill* report to effectively communicate water quality improvements and conditions in the watershed.
13. Consider the relationship of flow and water quality as it relates to SAN Goals.
14. Coordinate with the Partnership for the Delaware Estuary (PDE) on its freshwater mussel recovery program.

ABANDONED MINE DRAINAGE (AMD)

MAXIMIZE REDUCTION AND/OR TREATMENT OF ABANDONED MINE DRAINAGE DISCHARGES.

Objectives

1. Reduce surface water infiltration into the Pine Knot mine-pool to lessen discharge.
2. Reduce legacy coal silt from streams.
3. Remediate AMD pollution for Pine Knot/Oak Hill mine pool complex.
4. Remove 92 tons of iron, 6 tons manganese, 7 tons aluminum annually from discharges and streams.
5. Improve the pH of mine discharges/streams to pH 6.0 or above as needed to support fisheries and aquatic life.
6. Convert 15 miles of streams to healthy habitat to support fisheries and aquatic life over the next 5 years.
7. Increase partner participation so at least two or more partners are actively involved in every AMD project.
8. Complete 5 AMD remediation projects over the next 5 years.
9. Maintain existing AMD projects so they continue to function properly in removing metals and improving pH.

Strategy

Abandoned Mine Drainage (AMD) is one of the primary sources of pollution in the headwaters of the Schuylkill River and the biggest source of metals downstream. It is responsible for 24% of water quality impairments in the watershed. AMD is created deep below the ground in abandoned mines where streams, groundwater and stormwater fill tunnels that were once kept dry by active pumping operations. Water and oxygen react with lingering iron sulfide (pyrite) producing metal-laden and sometimes highly acidic discharges that exit the tunnels in telltale orange and silver plumes, easily visible in regional surface waters. AMD interferes with vegetative growth and reproduction of aquatic animals by armoring the streambed with deposits of iron and other metals. Acidity and metals impair both surface and ground drinking water resources and quickly corrode pipes and industrial mechanisms. Legacy mining also causes sediment pollution as silt from coal refuse piles flows into nearby creeks and streams.

Over the next five years, the AMD Workgroup will continue to implement projects that reduce the impact of legacy mining practices on the water quality of the Schuylkill River. The workgroup will target priority discharges by designing and constructing AMD treatment systems with the most current treatment technologies; implementing projects that keep unpolluted water clean by reducing surface water infiltration into mine pools; and assisting with projects that utilize best practices for mine land reclamation, including programs that promote reclamation through reforestation. The workgroup will also work to direct new investments into their work, largely by securing resources from the PA Department of Environmental Protection's Title IV Set-Aside Program. The workgroup will explore options for utilizing this funding to construct a treatment system for the Oak Hill/Pine Knot discharge, the most pressing AMD issue in the Schuylkill watershed.

The workgroup will also improve stream habitat, which will result from AMD abatement work and in-stream habitat improvements. The workgroup will continue to assess the impact of their activities through project tracking, biological and chemical monitoring, and ongoing oversight of existing and future treatments systems. The workgroup will maintain and strengthen relationships with all stakeholders, including government agencies, landowners, mining operators, NGO's, and local governments.

The AMD Workgroup will focus specifically on the following strategies:

1. Implement elements of the West Branch Qualified Hydrologic Unit Plan (QHUP) and utilize Abandoned Mine Land (AML) set-aside funding and implement projects under this program.
2. Construct treatment system(s) to address metals and pH loading from the Oak Hill/Pine Knot Mine pool.
3. Investigate completion of additional QHUPs for additional stream reaches impacted by AMD.
4. Maintain focus on reducing surface water infiltration into the Pine Knot Mine pool, working with partners to identify the best opportunities for implementing projects.
5. Implement in-stream restoration practices that will improve habitat for fisheries and aquatic life.
6. Promote, support, and demonstrate best practices for mine land reclamation, focusing on techniques promoted by the Appalachian Regional Reforestation Initiative (ARRI).
7. Continue to assess and address AMD treatment system maintenance needs.
8. Continue to monitor the impact of AMD treatment systems in the watershed.
9. Provide support to the SAN Planning Committee as it works to address the gaps and barriers in local, regional, state, and national processes that focus on issues related to AMD and legacy mining impacts on source water.

AGRICULTURE

MAXIMIZE REDUCTION AND/OR PREVENTION OF AGRICULTURAL IMPACTS TO WATER QUALITY.

Objectives

1. Rehabilitate and/or buffer 5 miles (26,000 feet) of streams over the next 5 years.
2. Through the Berks County Conservation District and Berks Nature, complete 20 conservation and nutrient management plans annually.
3. Through Natural Resource Conservation Services (NRCS), complete 25 conservation plans (2,500 acres) annually.
4. Monitor water quality (quarterly) and aquatic life (annually) of streams downstream of completed agriculture restoration projects.
5. Through the NRCS, complete 15 Comprehensive Farm Management plans over the next 5 years.
6. Advance restoration goals of the Middle Schuylkill Implementation Plan as part of the Delaware River Watershed Initiative (DRWI).
7. Create and continue to populate database of farm best management practices (BMPs) completed in Berks County.
8. Evaluate impact of agriculture BMPs on stream health and communicate results to the watershed community.
9. Develop and maintain involvement in funding programs and initiatives to support current and future agriculture restoration activities.

Strategy

Agricultural runoff is a primary source of pollution in streams and rivers in the Schuylkill watershed and is responsible for over 30% of the watershed's water quality impairments. Pollutants carried in agricultural runoff include soil, nutrients, pesticides, bacteria, and other substances, all of which may increase water treatment costs and degrade aquatic habitats. Runoff from animal operations can contain manure, depositing high nutrient values and potentially disease-causing bacteria and pathogens into the local waterways. Nutrients cause excessive plant growth and algae blooms in waterways, which deplete the water of dissolved oxygen as the plant materials die. The presence of pathogens in source water may increase the cost and complicate the processes of downstream drinking water treatment.

Over the next five years, the Agriculture Workgroup will complete projects that reduce the impact of agriculture runoff on drinking water sources in the Schuylkill watershed. Through a collaborative approach, the workgroup will engage key partners and watershed stakeholders in the strategic implementation of agriculture BMPs, conservation and nutrient management plans, and progress monitoring. To accomplish the above agenda, the workgroup will identify and secure resources; support and help guide decisions on agriculture related programs; and continue to work with and strengthen its relationship with farmers, water utilities, and local watershed and conservation organizations.

The workgroup will also advance efforts of the DRWI, working to complete key elements of the Middle Schuylkill Cluster implementation plan. The workgroup will monitor the impact of its investments by regularly monitoring water quality of agriculture impacted streams. The workgroup will also catalogue all BMP projects completed that are contributing to improvement in the watershed.

The Agriculture Workgroup will focus specifically on the following strategies:

1. Continue to update and map priority farms for workgroup assistance.
2. Continue to maintain focus on BMP implementation on farms in priority subwatersheds that will have the greatest impact on improving drinking water sources.
3. Identify and secure funding from new sources, including programs such as the Pennvest NPS pollution program, Schuylkill River Restoration Fund, DRWI, and others to allow for greater leveraging of farm bill appropriations in the watershed.
4. Maintain involvement with the DRWI to substantially complete agriculture restoration projects in the Middle Schuylkill Cluster.
5. Strengthen relationships with water suppliers in priority subwatersheds and pursue joint ventures for implementing BMPs on priority farms/sites.
6. Utilize resource of the Conservation Reserve Enhancement Program (CREP) in the Delaware River watershed to restore priority streamside habitat.
7. Document agriculture BMP investments and successes in the watershed, including load reduction modeling results, and promote to watershed stakeholders.
8. Report gaps and barriers in local, state and regional programs for mitigating agricultural impacts to the Planning Committee and provide support for addressing them.
9. Expand restoration activities in Lehigh, Montgomery, and Chester counties.
10. Complete and implement the Lower Maiden Watershed Implementation Plan, securing additional federal funding for agriculture restoration in this area.
11. Continue to support and share data and other pertinent water quality and project information with Philadelphia Water Department and other water suppliers in support of their watershed planning efforts associated with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2)/ Watershed Control Plan.

EDUCATION AND OUTREACH

IMPROVE PUBLIC SUPPORT FOR WATERSHED PROTECTION ACTIONS.

Objectives

1. Redesign and enhance the SAN website to better serve the needs of workgroups, partners, and the general public.
2. Increase engagement of the watershed community through social media (Facebook, Twitter, and Instagram) by 50% in 5 years (500 new combined followers).
3. Improve public perception of and/or connections with the Schuylkill watershed.
4. Post project descriptions, pictures, and/or videos on the SAN website for every completed workgroup project.
5. Increase media coverage of SAN events, projects, and activities (10 media hits per year).
6. Increase applicants for the Schuylkill Scholastic Drinking Water Awards program.
7. Increase number of cleanups, volunteers, and trash removed from the watershed through the *Schuylkill Scrub* initiative (700 cleanups over 5 years).
8. Develop a litter sampling protocol for *Schuylkill Scrub* volunteers to conduct and track types of litter found throughout the watershed.

Strategy

One of the most important aspects of ensuring the long-term protection of the Schuylkill watershed is raising awareness as to the resources it provides to residents. In the Schuylkill watershed, residents are accustomed to turning on a tap and receiving clean, safe drinking water, with little or no thought given to the source of that water or its availability. However, clean water cannot be taken for granted; polluted water is everyone's concern. Through concentrated public education and outreach efforts, people can discover how their decisions and daily actions directly impact the water they drink, the recreation they enjoy, regional wildlife habitat, human health, and sustainability for future generations. Education and outreach are necessary to raise public awareness of the problems and of the local management options to fix them. Ideally, SAN outreach efforts foster an appreciation and awareness of local water resources, inspiring stewardship and meaningful changes in the daily actions of residents.

Over the next five years, the SAN Education and Outreach (E&O) Workgroup will continue to generate the support and awareness necessary for the long-term protection and restoration of the Schuylkill watershed. To accomplish this, the E&O Workgroup will promote SAN projects and successes, watershed news and events, restoration and protection priorities, and individual opportunities for watershed action through the SAN website, social media, media outlets, and within the network. The E&O Workgroup will support the efforts of all the SAN workgroups. The E&O Workgroup will maximize these efforts, aiming to increase its reach by utilizing social media tools and resources. The workgroup will also partner more closely with the Philadelphia Water Department, advancing city-wide watershed outreach initiatives and finding opportunities to replicate them in upstream communities. The workgroup will also continue to support school-based watershed activities through its annual Schuylkill Scholastic Drinking Water awards programs and by assisting with workgroup school-based programs. The workgroup will lead engagement activities through the *Schuylkill Scrub* initiative, serving as a tool for watershed residents to take action in improving the health of the Schuylkill watershed. To accomplish the above agenda, the workgroup will identify and secure resources; support and help guide decisions on outreach-related activities; and continue to identify new opportunities for working on collaborative projects that increase watershed awareness and appreciation (such as Keep Pennsylvania Beautiful's Great American Cleanup of PA and EPA's Trash Free Waters program).

The Education and Outreach Workgroup will focus specifically on the following strategies:

1. Redesign the SchuylkillWaters.org website and continue to facilitate internal communication among SAN members, provide opportunities for online sharing of information among watershed professionals, and support public advocacy for protecting and restoring Schuylkill Waters.
2. Recognize, expand, promote, and support watershed education initiatives and schools/teachers/students as they implement water quality restoration, protection, and awareness projects.
3. Provide assistance to SAN workgroups on educational elements of their restoration and conservation activities.
4. Provide assistance to SAN Recreation Workgroup on all SAN outreach tools and messaging.
5. Maximize use of social media tools for outreach campaigns that aim to influence public perceptions/attitudes/behavior of watershed residents, encouraging them to view the watershed as a valuable resource.
6. Work with the Philadelphia Water Department to model drinking water protection education and outreach projects in the City of Philadelphia and disseminate to upstream communities for replication and collaboration.
7. Provide audience-specific education to different communities, making linkages between their community and water quality.
8. Host workgroup projects tours for specific audiences (ex. MS4 project tour to exhibit models for other municipalities to follow).
9. Develop a marketing strategy, using clear, concise, and uniform messaging.
10. Develop a simple brochure about SAN and separate brochures about each workgroup ready for partners to use and share.
11. Highlight local leaders in the watershed (farmers, teachers, township employees, etc) in outreach materials to promote and encourage replication of model watershed management practices.
12. Develop public education materials to targeted stakeholders not currently involved with the SAN and disseminate this information to watershed related/reliant business and community organizations.
13. Develop school outreach programs, including contests and games, to engage students in learning and caring about the Schuylkill watershed.
14. Assist workgroups in communicating SAN current and past accomplishments to build support from community leaders, elected officials, and corporate partners for future SAN activities.
15. Use key messaging received from feedback in the Strategic Plan General Public survey in all outreach materials.
16. Promote more citizen science involvement in PDE's freshwater mussel recovery program.

PATHOGENS AND POINT SOURCE

FACILITATE AND STRENGTHEN COMMUNICATION AND COORDINATION AMONG REGULATORY AGENCIES, DOWNSTREAM WATER USERS, AND BASIN STAKEHOLDERS REGARDING CLEAN WATER ACT AND SAFE DRINKING WATER ACT GOALS

Objectives

1. Provide educational opportunities to wastewater utilities on inflow and infiltration management, drinking water protection, and other clean water initiatives.
2. Track progress of projects addressing unsewered communities (on-lot malfunctions and wildcat sewer discharges).
3. Develop an outreach strategy to increase wastewater treatment operators' participation in the SAN.
4. Share information and facilitate discussion with wastewater and drinking water utilities on emerging contaminants and watershed issues.
5. Characterize conditions and treatment technologies of wastewater treatment plants (WWTPs) in the Schuylkill watershed (e.g. UV treatment for *Cryptosporidium*).
6. Track Act 537 Planning initiatives throughout the watershed.

Strategy

Over the next five years, the SAN Pathogens and Point Source Workgroup will maintain the current level of coordination and communication provided by wastewater treatment compliance practitioners, identifying opportunities to improve compliance and reduce threats to downstream water suppliers and other river users. The workgroup will maintain a focus on reducing illegal discharges, supporting and promoting the Delaware Valley Early Warning System (EWS), and supporting planning efforts aimed at reducing pathogen introduction in the watershed. Additionally, the workgroup will also provide assistance in coordinating support for increased pathogen monitoring efforts in the watershed.

The SAN Pathogens and Point Source Workgroup will focus specifically on the following strategies:

1. Promote funding opportunities, such as Pennvest, to wastewater and drinking water utilities.
2. Utilize the permit and compliance process to minimize discharges from wastewater treatment and encourage/require upgrades.
3. Implement a strategy to address any remaining and unidentified wildcat sewers.
4. Improve discharger/water supplier communication of events through use of the Delaware Valley EWS to minimize water quality threats to the Schuylkill River.
5. Assist the Philadelphia Water Department in the implementation of their LT2 Watershed Control Program Plan for the Queen Lane intake.
6. Support efforts that provide wet weather and inflow and infiltration management education to WWTP operators.
7. Explore options to improve monitoring at strategic locations in the watershed: downstream of point sources that could influence the water quality profile at drinking water intakes.
8. Characterize conditions of WWTPs in the Schuylkill watershed through Philadelphia Water Department's Sanitary Survey.
9. Continue to update information on wastewater treatment technologies and systems throughout the watershed (e.g. Chapter 94 reports).
10. Investigate evolving source water issues, such as Harmful Algal Blooms (HABs) and emerging contaminants and develop a better understanding of what these issues mean for water supplier's source protection strategies.

RECREATION WORKGROUP

ENGAGE RECREATIONAL USERS OF THE WATERSHED IN ACTIVITIES THAT LEAD TO INCREASED AWARENESS AND ADVANCEMENT OF WATERSHED PROTECTION AND RESTORATION STRATEGIES.

Objectives

1. Work with the SAN Planning Committee to improve and finalize the Recreation Workgroup strategic plan section and yearly workplans.
2. Initially invite at least 25 potential partners and 5 new partners annually, to participate in the newly formed Recreation Workgroup.
3. With the Education and Outreach work group, develop and implement an outreach strategy for the recreational community along the Schuylkill River.
4. Increase recreational engagement in the watershed.
5. Implement watershed restoration projects in close proximity to high traffic recreation sites (e.g. trailheads and boat launches).
6. Improve public perception of the Schuylkill River watershed as a safe, clean, and fun place to recreate.

Strategy

Within the last decade, recreational use and access to the Schuylkill River and its tributaries has increased remarkably. In 2009, 800,000 people used the Schuylkill River Trail. In 2015, that number grew to 2 million users, an increase of 150%. Also that year, the Schuylkill River Trail was voted the "*Best Urban Trail* " by *USA Today*. To capitalize on this success, the SAN Recreation Workgroup will focus on changing public perspective on the Schuylkill River, underscoring its transformation from a once heavily polluted river to a significantly cleaner and safer recreational resource. The Recreation Workgroup will do this by developing an outreach strategy for the recreational community that will heavily focus on experiential learning, as well as capture cultural and heritage aspects of the waterways.

Over the next 5 years, the SAN Recreation Workgroup will increase support for protection and restoration of the Schuylkill watershed by educating recreational users about the history and progress of the Schuylkill River and the SAN. The workgroup will work with existing recreational groups, such as rowing clubs, kayaking clubs, and hiking groups, to implement an outreach strategy for the entire recreational community along the Schuylkill River. The workgroup will strategically identify opportunities for connecting restoration and conservation projects with important recreational areas in the watershed. With the Education and Outreach Workgroup, The Recreation Workgroup will develop clear, concise messaging and innovative events to connect users to watershed protection and restoration efforts.

The SAN Recreation Workgroup will focus specifically on the following strategies:

1. Collaborate with the SAN Education & Outreach Workgroup, specifically the Schuylkill River Trash Task Force, to develop citizen science litter monitoring/sampling protocols for the *Schuylkill Scrub*.
2. Promote the use of reusable water bottles instead of single-use bottles.
3. Develop simple outreach materials with clear, concise messaging about the SAN and its connection to recreation for partners to use at recreational (and other outreach) events.
4. Attend at least four recreational events a year to promote the SAN and increase membership.
5. Pilot use the Schuylkill Acts & Impacts environmental curriculum as a model for the Schuylkill Sojourn during 2016-2020.
6. Develop a webpage on the SAN website that lists recreational events/opportunities in the Schuylkill watershed.
7. Promote existing recreational events on the SAN's newly formed recreational webpage and social media sites.
8. Develop educational signage in parks, along trails, at bike and boat rentals, and at boat ramps.

9. Increase public access to the Schuylkill River and its tributaries.
10. Expand and improve connection of the Schuylkill River Trail network.

STORMWATER

IMPROVE MANAGEMENT OF STORMWATER TO REDUCE AND/OR PREVENT POLLUTION FROM RUNOFF.

Objectives

1. Complete 15 stormwater BMPs, including riparian buffer restoration projects, on priority headwater streams.
2. Conduct workshops, tours and educational events for watershed stakeholders on best practices for stormwater management.
3. Develop an outreach strategy to increase municipality participation in the SAN and encourage more watershed based collaboration.
4. Perform targeted outreach and provide support to municipalities for better stormwater management.
5. Support implementation and documentation of stormwater BMPs and green infrastructure by workgroup partners.
6. Identify new partners/sites that are working to complete stormwater management projects.
7. Implement 10 stormwater improvement practices on school campuses within the next 5 years through the Schuylkill Action Students program.
8. Apply for funding for at least 3 stormwater improvement practices on school campuses annually through the Schuylkill Action Students program.

Strategy

Pollution carried by stormwater poses a serious threat to the health of the Schuylkill River, contributing to over 30% of the impairments to water quality in the watershed. Polluted stormwater degrades the quality of our river with sediment, excess nutrients, bacteria and pathogens, and debris. Stormwater runoff can lead to increased point and non-point source impacts along the Schuylkill River during storm events. Addressing stormwater runoff requires a multifaceted approach that involves engaging all stakeholders, including municipalities, state and federal governments, homeowners, businesses, schools, planners, developers, and water suppliers.

Over the next five years, the SAN Stormwater Workgroup will focus its efforts on activities that will reduce the volume and velocity, and improve water quality, of stormwater runoff. Focusing on priority watershed areas, the workgroup will implement both outreach and implementation projects including technical assistance to municipalities to improve their stormwater management strategies; dissemination of information on BMPs for innovative stormwater practices; implementation of on-the-ground projects that reduce runoff; and provision of a forum for stormwater practitioners to share information and resources for managing stormwater. The SAN will collaborate with the PWD to promote *Green City, Clean Waters* efforts to upstream communities.

The workgroup will continue to advance its focus on implementing innovative stormwater improvement projects on school campuses. Through the SAN's Schuylkill Action Students program, the workgroup will complete projects that will serve as demonstration projects for the schools' communities and be a catalyst for additional projects in the future. The workgroup will also work to identify and secure resources to accomplish this agenda.

The Stormwater Workgroup will focus specifically on the following strategies:

1. Implement stormwater BMPs and riparian buffer restoration projects on priority first and second order headwater streams through partner programs such as Treevitalize and the Schuylkill Action Students program.
2. Secure funding annually and complete innovative stormwater projects through the Schuylkill Action Students program.
3. Support and promote the implementation of stormwater BMPs and green infrastructure through outreach, education, and technical assistance in priority watershed areas.
4. Assist municipalities to better understand, navigate, and fulfill their stormwater management responsibilities by providing technical assistance and support in priority areas.
5. Work with the SAN Planning Committee to apply for and secure funds to implement stormwater BMPs and explore feasibility of stormwater authorities through new funding mechanisms such as the PENNVEST Nonpoint Source (Green Infrastructure) Program.
6. Integrate more closely with stormwater activities of the Delaware River Watershed Initiative.
7. Collaborate with the Philadelphia Water Department to disseminate information on the *Green City, Clean Waters* initiative to other communities in the watershed.
8. Implement projects designed for managing runoff to maintain stream base flows, reduce flashiness of streams and improve groundwater recharge.
9. Report gaps and barriers in local, state and regional programs for mitigating stormwater impacts on source water to the Planning Committee and provide support for addressing them.

WATERSHED LAND COLLABORATIVE

PROMOTE A SUSTAINABLE LANDSCAPE IN THE SCHUYLKILL RIVER WATERSHED THROUGH STRATEGIC CONSERVATION AND EFFICIENT LAND USE/MANAGEMENT TO PROTECT THE INTEGRITY OF WATER SUPPLIES FOR FUTURE GENERATIONS.

Objectives

1. Maintain or increase the pace of priority lands protected in the watershed (4,853 acres per 5 year period).
2. Permanently protect at least 400 acres annually of priority watershed lands in the Schuylkill Highland Cluster.
3. Protect and restore water quality advanced through completion of proposed projects, including: land protection, stewardship, and adoption of improved municipal policies.
4. Advance conservation goals of the Schuylkill Highlands Implementation Plan as part of the Delaware River Watershed Initiative.
5. Monitor water quality (quarterly) and aquatic life (annually) of streams downstream of completed conservation projects.
6. Maintain or increase the pace of priority lands protected in the Delaware Valley Regional Planning Commission (DVRPC) area to keep pace with priority lands developed (approximately 2,345 acres per 5 year period).
7. Support and work with the Schuylkill River Restoration Fund to administer a land transaction assistance program for the protection of priority lands.
8. Communicate successes of land protection projects to the watershed community.

Strategy

One of the greatest threats to source water in the Schuylkill watershed is the loss of open space. When undeveloped land is converted to hardscapes such as roads, parking lots, buildings, etc, water quality is impacted by both the introduction of new pollutants and a loss of the watershed's filtering capacity. Undeveloped land generally does not contribute pollutants to our water sources, and when covered with natural grasses, wetlands, plants, shrubs and trees, it serves as a filter, removing pollutants before they get deposited into our water bodies. Water quality improvement is one of the most powerful benefits of preserving open space.

Over the next two decades, development is expected to increase by 40% in the Schuylkill watershed. While it is both impossible and unnecessary to stop all development from occurring, it is critical that development is directed away from the most sensitive watershed areas. The Watershed Land Collaborative (WLC) will work with key watershed stakeholders to implement projects and promote actions that will lead to the conservation of the highest priority lands for drinking water protection. The WLC will provide outreach and technical assistance to local governments in priority watershed areas and utilize planning tools such as the watershed land prioritization model to engage local decision makers in activities that will protect critical watershed lands. When appropriate, outreach efforts will also provide townships with information on other drinking water protection strategies, including surface water and wellhead protection opportunities.

The WLC will continue to advance efforts of the Delaware River Watershed Initiative and implement key conservation, engagement, monitoring, and technical assistance activities in the Schuylkill Highlands region. The success of this work will be shared with the conservation community to encourage replication in other areas of the watershed. The workgroup will also monitor the water quality impact of its accomplishments. Additionally, the WLC will provide resources to land conservation practitioners to incentivize the protection of high priority lands. The WLC will also maintain focus on the practices and policies that lead to the protection of the watershed's riparian areas.

The Watershed Land Collaborative Workgroup will focus specifically on the following strategies:

1. Continue to promote the results of the watershed land prioritization model with local practitioners.
2. Provide targeted outreach to priority townships with goal of providing technical assistance to townships for implementing conservation measures.
3. Promote riparian buffer protection.
4. Secure funding to provide transaction assistance to land trusts, local governments, and other land conservation practitioners for projects that result in the permanent protection of priority watershed land.
5. Complete land restoration activities on properties with conservation priorities.
6. Implement demonstration projects on developed lands, such as Homeowner Associations (HOAs), to promote better development and stormwater management on high quality watershed land.
7. Implement land conservation measures with priority landowners in targeted areas throughout the Schuylkill watershed.
8. Continue to promote and utilize resources for land conservation activities through the Delaware River Watershed Initiative.
9. Transfer best practices and successful programs of the Schuylkill Highland Cluster to other areas of the watershed.
10. Engage new landowners by offering educational and recruitment events focusing on conservation and stewardship in targeted areas throughout the watershed.
11. Develop and update prioritization mapping to identify the most valuable land to protect in the watershed.
12. Implement professional-level monitoring programs with volunteers, such as the Schuylkill Water Stewards program, to assess the impact of conservation and stewardship practices.
13. Provide support to the SAN Planning Committee as it works to address the gaps and barriers in local, regional, state, and national processes that focus on issues related to protection of priority watershed lands.

LIST OF APPENDICES:

Appendix A: Background on the SAN's Organizational Development

Background on the SAN's Organizational Development (presented in a separate MSWord file) provides a brief history of the SAN's organizational development resulting in how the Network functions today.

Appendix B: Yearly Workgroup Workplans

Yearly workgroup workplans together provide detailed information on the SAN's strategies and activities. These workplans are presented as a series of eight files, one for each workgroup and corresponding goal area.

Appendix C: Watershed Practices Implementation Committee Guidelines

The WPIC overview guide explains the purpose and general function of the initiative.

Appendix A:
Background on SAN Organizational Development

Creation of SAN

The Schuylkill Action Network (SAN) is a collaborative network of over 100 partners working together to improve water resources in the Schuylkill River watershed. The SAN seeks to achieve this vision by working in partnership with local watershed and land conservation organizations, businesses, academics, water suppliers, recreational communities, local governments, and regional, state, and federal agencies.

In response to source water assessment efforts in 2003, the Philadelphia Water Department (PWD) sought help from the Environmental Protection Agency (EPA) Region III to develop a network of stakeholders that would include various agencies and organizations working to protect Schuylkill watershed resources. The EPA led the creation of the Schuylkill Action Network to address major threats to drinking water in the Schuylkill watershed, including pollutants from agriculture, abandoned mines, stormwater, and sewage.

The SAN was structured as a series of integrated workgroups or committees to address the identified threats to the Schuylkill River. The original workgroups include: Abandoned Mine Drainage, Agriculture, Stormwater, and Pathogens/Compliance Workgroups. Each workgroup was designed to meet regularly, under the leadership of a volunteer chairperson, to discuss watershed issues and plan and implement projects of strategic importance related to these topics. These workgroups were designed to represent the core of the SAN and the vehicle by which most of the SAN's work is accomplished. Workgroup membership and meetings were created to be open and accessible to anyone.

In addition to the workgroups, the SAN included an Executive Steering Committee (ESC), Planning Committee, Education/Outreach Committee, and Data Team to guide and support the activities of the workgroups. The ESC met semi-annually to provide high-level guidance and buy-in from the major public agencies, while the Planning Committee met monthly to provide more hands-on strategic direction to the SAN and help insure good internal communication. The Education/Outreach Committee and Data Team provided support services, benefitting all SAN workgroups and members. Figure 1 depicts the original organization of SAN workgroups and their responsibilities as of 2004.

Evolution of SAN

Over time, the organization of the SAN has evolved in several critical ways. In 2004, a subcommittee of the Stormwater workgroup was convened to address the recommendations of the Schuylkill River Watershed Conservation Plan. This was a critical first step for the SAN, taking a preventative approach to drinking water threats. The Schuylkill River Conservation Plan led to a successful Pennsylvania Department of Environmental Protection *Growing Greener* grant to prioritize land for preservation based on drinking water protection.

Also in 2004, the PWD and the Partnership for the Delaware Estuary (PDE) submitted a successful Targeted Watershed Grant proposal to the EPA to fund a series of projects in the Schuylkill watershed. This funding ($1.15 million of federal funds, leveraging an additional $1.49 million in match from various sources) has been critical in allowing the SAN to take action on the ground. It is also an example of the SAN at its best: a diversity of organizations and agencies leveraging their individual strengths/skills to bring new resources to the watershed and tackle widespread and complex problems in a targeted, strategic way. Under this grant, local organizations

acted as project managers and received and managed project funds for implementation of projects. Projects included abandoned mine drainage remediation, stormwater management improvements, agricultural improvements, and educational pilots and case studies. This grant provided funding for the SAN to implement a set of selected projects from 2004 to 2008, during which time the SAN leadership cultivated new financial resources to continue and expand on this model of implementation.

In August 2005, the Planning Committee began the process of strategic planning by taking a critical look at SAN's organizational structure and how it could be improved to enable and encourage more stakeholder leadership within the SAN. As part of this effort, several important decisions were made, including:

- ***The decision to add a non-governmental position at the ESC level*** for more balanced representation. Based on this decision, the PDE joined the SAN ESC in the beginning of August 2006.
- ***The decision to maintain a federal lead for the ESC*** in order to provide credibility to the collaborative approach and influence for stakeholder involvement.
- ***The decision to expand Planning Committee membership to include representatives from each of SAN's workgroups*** to provide a mechanism for additional stakeholder involvement and better communication across groups.
- ***The decision to focus on the Schuylkill River Congress as the primary outreach event for the SAN each spring, and hold the SAN Annual Workshop each fall.***

In spring 2006, the SAN engaged the Institute for Conservation Leadership (ICL) to lead a stakeholder input process to inform the strategic growth and direction of SAN.

The following critical decisions were made by the SAN leadership in August 2006 in response to the ICL's recommendations:

- ***The decision to elevate the Watershed Land Collaborative (WLC) to full workgroup status*** in an effort to make the connection between land and water management more explicit. As a result, the WLC was reinvigorated and met quarterly, which re-engaged land conservation interests in the watershed.
- ***The decision to devote time/effort to and get professional help for improving SAN communications,*** including exploring new resources and ideas for improving SAN's internal communication, creating a website, and exploring the feasibility of a major public outreach campaign. As a result, one of the SAN's top priorities for organizational improvement was to hire a communications consultant to provide assistance on these critical communication issues in 2007.
- ***The decision to devote time/effort to sort and identify specific policy issues that the SAN could play a role in addressing on an issue-specific basis.*** As a result, the Planning Committee evaluated the vast number of policy suggestions made by stakeholders to identify discrete actions for the SAN and its leading agencies to undertake for improvement
- ***The decision to target municipalities as a key audience in the work of both the Stormwater Workgroup and the Watershed Land Protection Collaborative.***

Also in 2006, the SAN contracted with the Environmental Finance Center (EFC) to explore the feasibility for building a sustainable financing/funding mechanism for Schuylkill Watershed protection activities. Based on interviews and research, the EFC's report outlined the scale, sources, and institutions for financing/funding and steps to fill the financing/funding gap for each of the SAN's priority areas/workgroups. The EFC also made a series of recommendations to the SAN leadership, including developing a unified restoration/protection plan, expanding community engagement with outreach/education and by working with relevant stakeholder groups, focusing on prevention, and convening an Implementation Task Force to help create a funding institution.

In 2004, the SAN launched a webpage. In 2007, the SAN created its website: www.SchuylkillWaters.org. This website serves as a clearinghouse for information on the Schuylkill Watershed, SAN projects, and provides a

public outreach component of the network. The website also features an internal component, designed to facilitate interaction amongst SAN partners, allowing for projects reports to be created and shared, news items to be shared, email between workgroups and SAN members, and the hosting of workgroup documents. Since 2007, the website was upgraded to add an interactive calendar and was integrated with social networking tools and sites.

In 2009, the SAN, through the PDE, brought on a full time coordinator to oversee the day-to-day operation of the SAN, facilitate collaboration amongst members, and advance workgroup goals by securing funding and resources for priority projects.

In 2011, the SAN updated it strategic plan for another 5 years (2011-2016). This plan renewed commitments of the SAN workgroups, integrated new initiatives and workgroups strategies into the process, and set out an ambitious agenda to strengthen SAN's presence in the watershed.

In 2013, the SAN celebrated it 10 year anniversary, which was commenced with a series of events throughout the year, including a celebration that recognized the many milestones that the SAN was able to achieve, commitments of SAN partners, and a renewal of the stakeholders that contributed to making SAN what it is today. The SAN also released a 10-year progress report that highlighted all of the workgroup accomplishments since the SAN's inception.

In 2014, the SAN secured a fellow to assist the coordinator, which has since been turned into a full time SAN specialist position. Today, SAN now has two-full-time staff members to oversee the network and assist workgroup with advancing an aggressive agenda for a clean and healthy Schuylkill Watershed.

SAN Today

Since 2003, the SAN has grown to approximately 150 organizations (over 500 people) including local watershed organizations and land conservation organizations, businesses, academics, water suppliers, recreational communities, local governments, and regional, state, and federal agencies. The SAN uses unique skills and experience of each of its partners to implement on-the-ground projects that improve water quality of the Schuylkill River and its tributaries.

Today, the SAN is composed of an Executive Steering Committee, a Planning Committee, six workgroups (Abandoned Mine Drainage, Agriculture, Education & Outreach, Pathogens/Compliance, Stormwater, and Watershed Land Collaborative) and is developing a seventh, Recreation workgroup. Figure 3 depicts the SAN's organizational structure as it is in 2016.

Over the past several years, the SAN has strived to encourage greater stakeholder participation and leadership. Because of these efforts, there are many opportunities for stakeholders to be involved in the SAN today. All workgroup meetings, times, and locations are posted on the SAN website and are open for anyone to attend. With the completion of its most recent strategic plan, an even more aggressive and inclusive agenda has been established to guide SAN through 2020. Many new partners have become part of the SAN and together, this collaborative network will continue to lead efforts to restore and protect the Schuylkill Watershed.

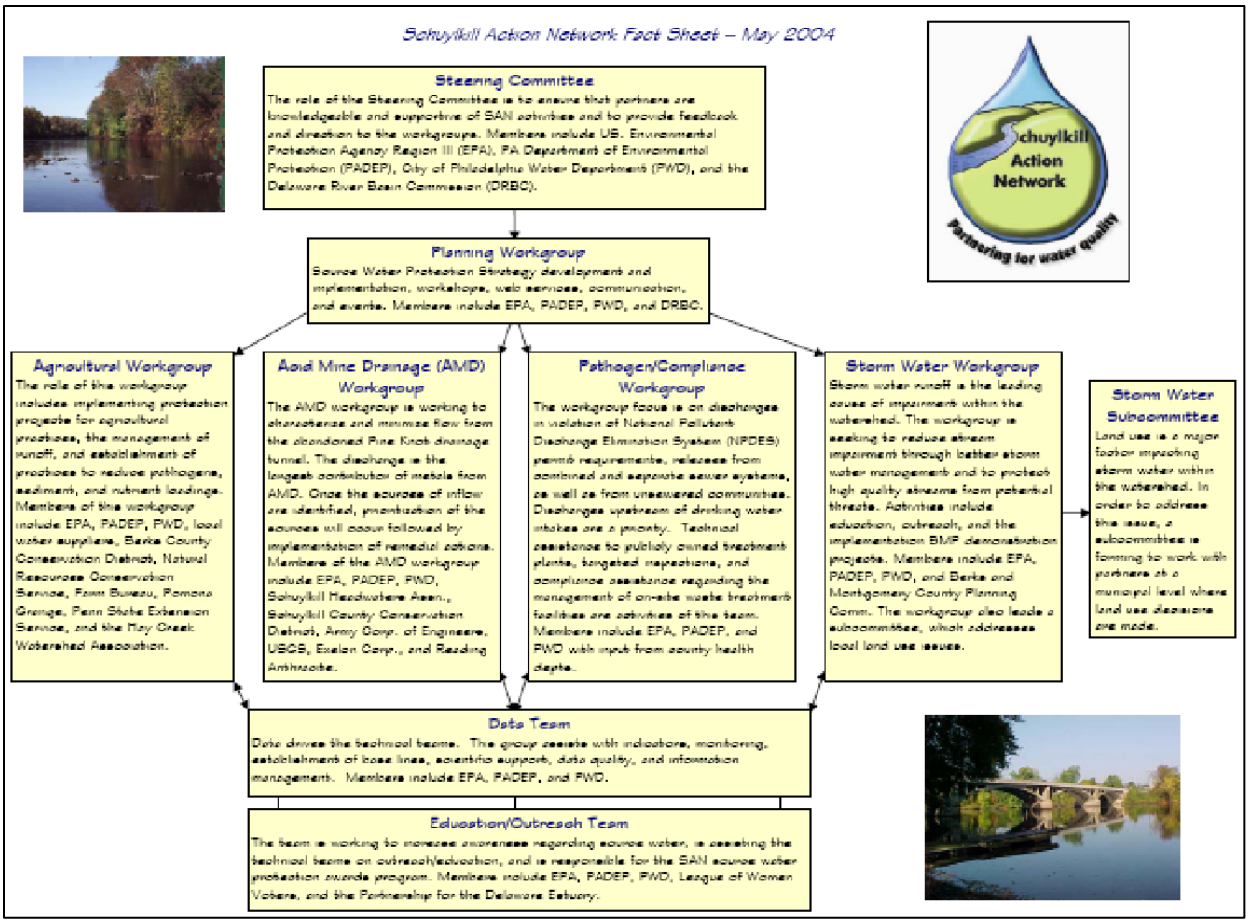


Figure 1: SAN Organizational Chart 2004

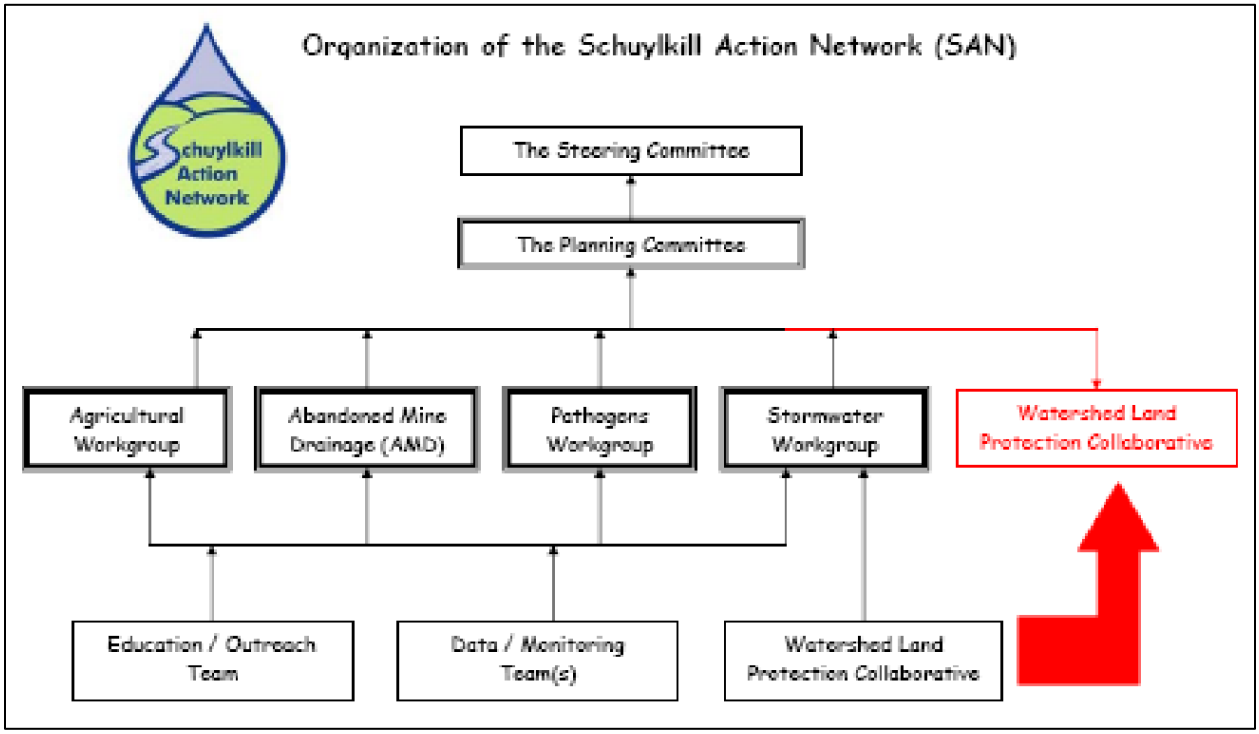


Figure 2: SAN Organizational Chart 2007

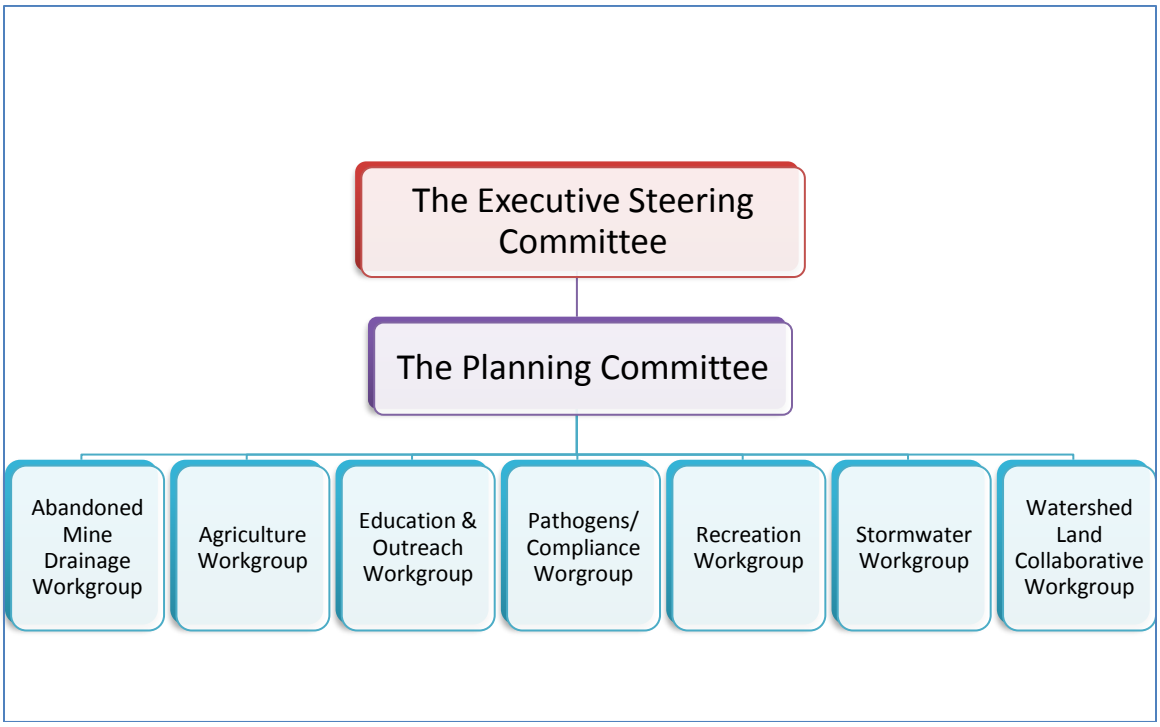


Figure 3: SAN Organizational Chart 2016

Appendix B:
Yearly Workplans

View the Workplans

The Schuylkill Action Network's workgroups can be downloaded by clicking the below links. Please note that these are the 2016 workgroups' workplans, and the links will be updated each year.

- **Abandoned Mine Drainage** -
  http://www.schuylkillwaters.org/doc_files/SAN%20AMD%202016%20FINAL%20Workplan.pdf
- **Agriculture**
- **Education & Outreach** – http://www.schuylkillwaters.org/doc_files/SAN%20E&O%202016%20Workplan.pdf
- **Pathogens & Point Source** -
  http://www.schuylkillwaters.org/doc_files/SAN%20Pathogens%20Workplan%202016%20Final.pdf
- **Planning Committee** -
  http://www.schuylkillwaters.org/doc_files/2016%20SAN%20Planning%20Committee%20Workplan.pdf
- **Recreation** – to be developed
- **Stormwater** -
  http://www.schuylkillwaters.org/doc_files/SAN%20Stormwater%20Workgroup%20Workplan%202016.pdf
- **Watershed Land Collaborative**

Appendix C:
Watershed Practices Implementation Committee

Purpose:

The SAN will take a leadership role in identifying and communicating opportunities for improving the processes that guide restoration and protection efforts in the Schuylkill River Watershed. This initiative will examine the processes, including common restoration and protection practices, watershed policies, decision making structures, procedures, and guidance documents with the intent of identification of gaps and barriers that impede the improvement of watershed management. When warranted, the effort will result in the formation of recommendations and strategies for eliminating these gaps and barriers.

Process:

A subset of SAN Planning Committee members will take the lead role in identifying specific issues that impede or frustrate restoration and protection efforts in the Schuylkill Watershed. The committee will meet as needed to discuss issues and develop recommendations. The recommendations will be reviewed by the Planning Committee and forwarded to the Executive Steering Committee (ESC) for additional action if warranted.

Dissemination:

For the purpose of both gathering and disseminating relevant information, a new section on the SAN website will be created to foster dialog among the SAN membership relating to improving policies and decision-making processes for watershed management, restoration and protection. This section will support the website purpose as a clearinghouse for watershed related information and platform for workgroup communication.

Appendix B: SAN Pathogens and Point Sources and SAN Agriculture Workgroups

2017 Work Plans and Meeting Minutes

Schuylkill Action Network (SAN)
Agricultural Workgroup
2017 Workplan

Strategic Goal: Maximize reduction and/or prevention of agricultural impacts to water quality.

Strategies / Actions	Timing	Lead
Strategy 1: BMP Implementation Support and implement agricultural best management practice (BMP) with funding, information, expertise, and collaborative problem solving.		
Strategic Plan alignment: *Objectives 1, 2, 3, 5, 9 and Strategies 2, 3, 5, 6*		
Actions:		
• Provide input and support for successful completion of BMP installations.		
o Continue/finalize BMP implementation in selected subwatersheds:	Ongoing	
▪ *Middle Schuylkill RCPP Initiative*		NRCS
▪ *Maiden Creek/Hollinger farms; NRCS/NFWF project*		BN
▪ *Maiden Creek/Zettlemoyer farms; NRCS/NFWF project*		BN
▪ *Maiden Creek/Moyer farms; NRCS/NFWF project*		BN
▪ *Maiden Creek/Durkin farms; NRCS/NFWF project*		BN
▪ *Maiden Creek/Kunkel farms; NRCS/NFWF project*		BN
▪ *Maiden Creek/Don Rice farms; NRCS/NFWF project*		BN
▪ *Saucony Creek/Da. Weaver farms; NRCS/NFWF project*		BN
▪ *Saucony Creek/Berger; NRCS/EQIP project*		BN
▪ *Moselem Creek/Heffner farms; NRCS/NFWF project*		BN
▪ *Manatawny Creek/Youse farms; NRCS/EQIP project*		BN
▪ *Manatawny Creek/Alderfer farms; NRCS/EQIP project*		BN
▪ *Cacoosing Dam removal – buffer project*		BN
▪ *Loump Farm – manure storage and stormwater controls*		BCCD
▪ *Zimmerman – manure storages and stormwater controls*		BCCD
▪ *Meyers horse farm; SRRF project*		BCCD
▪ *ADD STROUD PROJECTS*		STROUD
▪ *Note: BN projects use NFWF funds as well as SRRF funds and BWRF funds*		All
• Investigate funding and leveraging of existing funding for BMP installation on priority farms.	Ongoing	All

• Explore options for submitting an application for the Regional Conservation Partnership Program.	2017	Workgroup
• Develop new conservation and nutrient management plans as needed.	Ongoing	Workgroup
• Work with farm and forest landowners and the Watershed Land Collaborative Workgroup to explore opportunities for using conservation easements for long-term protection.	Ongoing	Workgroup
• Provide support and continue development of potential projects that advance Source Water Protection in the watershed (specifically with the creation of the Berks County Source Water Protection Plan).	Ongoing	Workgroup
Strategy 2: Communication Provide a forum for partner and agency communication and coordination around agricultural projects and issues and the formulation of creative new approaches for solving agricultural related problems.		
Strategic Plan alignment: *Objective 6 and Strategies 1, 4, 8, 9, 10*		
Actions: • Convene quarterly meetings of the Agriculture workgroup, incorporating guest speakers and/or site-visit opportunities whenever appropriate and feasible. Continue to identify key partners and expand workgroup.	Quarterly	SSM/PDE
• Develop an annual/final report of Ag team accomplishment (present at SAN annual workshop in fall) and create an annual work plan.	4Q 2017	SSM/PDE
• Provide workgroup information for posting on the SAN website and social media sites.	Ongoing	All
• Provide coordination of the Middle Schuylkill Cluster in the William Penn Foundation Delaware River Watershed Initiative, utilizing the SAN Ag workgroup as vehicle for collaboration and action. o Participate in the DRWI Phase 2 development of the implementation plan for the Middle Schuylkill Cluster.	Ongoing	PDE/BN/Stroud
• Explore opportunities for leveraging Farm Bill appropriations through development of conservation plans (or in other ways).	Ongoing	NRCS
• Expand efforts to include a focus on restoration activities in Lehigh, Montgomery, Lebanon, and Schuylkill, and Chester counties.	Ongoing	All
• Complete and implement the Lower Maiden Watershed Implementation Plan, securing additional federal funding for agriculture restoration in this area.	2Q 2017	PDE/Stroud
Strategy 3: Media		

Promote agricultural BMP successes and understanding of agricultural water quality issues and solutions to target audiences in the watershed.		
Strategic Plan alignment: *Objective 6 and Strategies 1, 4, 8, 9, 10*		
Actions:		
• Cultivate and take advantage of opportunities for press and other "free-media" coverage of agricultural issues/problems/solutions.	Ongoing	All
• Provide presentations and education to key stakeholder groups on effective Ag BMPs and practices (e.g. BCCD Innovative Ag workshop, MCCD manure management workshops, Keep Farming Conference).	Ongoing	All
• Continue to promote the Agriculture BMP Guide in connecting restoration work with Source Water Protection.	Ongoing	All
• Utilize the Saucony Creek Watershed Report to expand partnerships and leverage funding for agricultural BMPs.	Ongoing	All
Strategy 3: Monitoring Monitor the impacts of agricultural BMP installations on stream water quality.		
Strategic Plan alignment: *Objective 4, 7, 8 and Strategy 11*		
Actions:		
• Continue GIS analysis/documentation of BMPs in priority areas (Maiden Creek), and throughout watershed.	Ongoing	Stroud/PDE
• Implement quarterly chemical monitoring and annual macroinvertebrate sampling at select sites in the Maiden, Tulpehocken, and Upper Perkiomen Creek Watersheds as described in the Middle Schuylkill Monitoring Plan.	Ongoing	BCCD/Stroud
• Implement quarterly chemical monitoring and annual macroinvertebrate sampling at select sites in the Maiden Creek Watershed as described in the EPA section 319 Maiden Creek Monitoring Plan.	Ongoing until 2020	BCCD
• Provide support to watershed partners coordinating volunteer water quality monitoring programs (e.g. Berks Ambassador program, Master Watershed Stewards).	Ongoing	Workgroup
• Work with PWD to identify additional opportunities for *Cryptosporidium* sampling in the Maiden Creek Watershed.	Ongoing	PWD/BN
• Work with DEP-Central Office on requirements for reassessing and delisting impaired streams-improving waters program.	Ongoing	PDE/ PWD
• Improve and expand the of watershed-wide data collection project for SAN.	3Q 2016	Workgroup
• Coordinate monitoring plans and share data.	Ongoing	PDE/Stroud/NRCS/BN/BCCD

Objectives: How will we measure success?

- Implementation of expanded monitoring programs in key watershed areas.
- Maintain involvement in the Delaware River Watershed Initiative's Middle Schuylkill cluster.
- Work with SAN partners to develop criteria for estimating reduction of nutrients from BMPs.
- Rehabilitate and/or buffer 5 miles (26,000 feet) of streams over a 5 year period (until 2021).
- Through the Berks County Conservation District and Berks Nature, complete 20 conservation plans with appropriate manure/nutrient management component annually.
- Through Natural Resource Conservation Services (NRCS), complete 25 conservation plans (2,500 acres) annually.
- Through the NRCS, complete 15 Comprehensive Farm Management plans over a 5 year period (until 2021).
- Support the Berks Source Water Protection Committee in encouraging drinking water systems to implement pollution reduction in source water and stormwater within their protection zones.

Notes:

- Agriculture Work Group Chair generally takes lead on "Ongoing" activities.
- BCCD = Berks County Conservation District
- BN = Berks Nature
- Coordinator = SAN Coordinator/PDE representative
- DEP = Pennsylvania Department of Environmental Protection
- EPA = US Environmental Protection Agency Region III
- LCCD = Lehigh County Conservation District
- MCCD = Montgomery County Conservation District
- PDE = Partnership for the Delaware Estuary
- PWD = Philadelphia Water Department
- RAWA = Reading Area Water Authority
- SSM = Spotts, Stevens and McCoy
- Stroud = Stroud Water Research Center
- WBWA = Western Berks Water Authority

Schuylkill Action Network Agriculture Workgroup
February 22, 2017 Meeting Notes

INTRODUCTIONS/NEW MEMBERS

Review of November 2016 Meeting Notes

Special Update: SAN/Kutztown Nitrate Monitoring Project

I. Update on grant requests/funding efforts

Berks Watershed Restoration Fund (Berks Nature) – Kutztown, RAWA contributions. Received well water data from Saucony Creek Brewery.

National Fish & Wildlife Fund (Berks Nature/Stroud) – March submittal, need letters of support.

USDA programs (NRCS) – Working through ranking process - $1M in EQIP, about 70% in Schuylkill watershed. About $500,000 of Regional Conservation Partnership Program dollars in Berks – 2-4 projects. CSP applications coming in. Conservation Innovation grant – MCCD is purchasing a seeder for rental.

Schuylkill River Restoration Fund Recipients (Berks Nature) – Letters of Intent due to SRHA.

Growing Greener Grant 2017 Program (DEP) – The review process will be initiated in the spring, no specific dates yet.

PACD Mini-Grants (BCCD/MCCD/LCCD) – A Manure Management regulations for equine operations is scheduled for March 6 from MCCD; MCCD finished up the golf course brochure, and an editable copy is available from District staff. BCCD will be running a manure management workshop this spring.

II. Projects in Progress

Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – Planning phase 2017 – meeting for Middle Schuylkill Cluster for focus areas. Plan will be submitted in June.

Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) – BCCD finishing up 3 projects from the 2014 round. 2015 round mushroom plans for Giorgio in progress.

Wyomissing Creek Watershed Coalition (BCCD) – Center for Watershed Protection developing a report for TMDL – 2.2M lbs of sediment reduction. Will submit a Letter of Intent for SRRF funding for streambank restoration.

Topton/Toad Creek project (BCCD) – E&S plans in review; a meeting with Reading High School is planned for assessment of project.

Lower Maiden Watershed Implementation Plan (PDE) – The draft plan has been sent to DEP for review; plan also sent to EPA for review.

Crypto monitoring (PWD/Lehigh) – Project with Lehigh students will be wrapping up this spring.

Berks County SWP Plan – Last steering committee meeting scheduled for Thursday May 18.

NACD Urban Ag – MCCD working on an urban Ag restoration project with Greentreks; guide should be completed by end of summer.

III. **Education/Outreach**

Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – No report

Stroud workshops – No report

Source Water Collaborative (EPA) – Annual Meeting delayed. Learning Exchange webinars will continue; American Water is a new partner.

IV. **Planning**

Executive Steering Committee – transitioning with new leadership at EPA and DEP.

2017 Workplans – review the draft Ag Workplan; PDE will edit and provide final draft.

V. **Other Workgroup Updates**

Stormwater/Schuylkill Action Students (PDE) – Ongoing projects – Green Master plan; Montessori school in Montgomery County, Perkiomen Watershed Conservancy

Education/Outreach (PDE) – Schuylkill Scrub is coming up in April, Schuylkill Street Art; Scholastic Drinking Water awards; SAN website will be updated later in 2017; Schuylkill Sojourn is scheduled for 1st week in June; Watershed Congress scheduled for March 11; SAN Progress Report is available

Pathogens (DEP) – Senate Committee meeting held on Pharmaceuticals in water

VI. **Other Notable Items**

- ChemSweep is scheduled for Berks County in 2017
- PACD Clean Water Farm awards open for nominations
- BCCD seedling sale this spring
- Scott Pruitt named as EPA Administrator
- Envirothon them is Ag Soil

NEXT MEETING:

Wednesday May 17, 10 AM at Berks Ag Center

Schuylkill Action Network Agriculture Workgroup
May 17, 2017 Meeting Agenda

INTRODUCTIONS/NEW MEMBERS

Review of February 2017 Meeting Notes

I. Update on grant requests/funding efforts

Berks Watershed Restoration Fund (Berks Nature) – - Proposal for RAWA and Kutztown accepted; new conservation plan for the Borough Farm. SOTE has sustainability lecture in June "Beer and Farming".

National Fish & Wildlife Fund (Berks Nature/Stroud) – PDE applied for a Cornerstone grant for $500,000. Closing out RCPP contracts.

USDA programs (NRCS) – trying to get everything on the ground

- Environmental Quality Incentive – 35 new contracts for $1.6M; $4.5M on books for BMP installation
- Conservation Stewardship- 5 applications, most cover crops to reduce tillage
- Regional Conservation Partnership Program
- Conservation Innovation – Ches Bay focus

Schuylkill River Restoration Fund Recipients - Berks Nature – 2 applications for 3 farms; BCCD- 1 application; LCCD-1 application

Growing Greener Grant 2017 Program (DEP) – Application review ended 5/12; DEP is prioritizing applications; tentative August announcement

PACD Mini-Grants (BCCD/MCCD/LCCD) – BCCD-sports club outreach in summer; Backyard Basics

5-Star Urban Grants (EPA) – No news from EPA.

II. Projects in Progress

Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – PDE needs to submit draft plan on June 1. WPF will review, then Final Plan due in August. Funding starts February 2018.

Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) – Cleaning up old projects; majoring of Loumpe work in 2018.

Wyomissing Creek Watershed Coalition (BCCD) – Center for Watershed Protection is a partner. Conducting stream assessments in May. Working on MS4/TMDL.

Topton/Toad Creek project (BCCD) – Close to receiving permit for Toad Creek. PennDOT has mitigation requirements for I-78.

Lower Maiden Watershed Implementation Plan (PDE) – DEP and EPA staff are reviewing plan. May conference call scheduled to address comments.

Crypto monitoring (PWD/Lehigh) – finished monitoring in March 2017. End of year report due in June.

Berks County SWP Plan – Final Report is in progress, expected completion by end of June.

NACD Urban Ag – MCCD-No report.

DEP Pesticide Sampling – Central Office may be able to add another site.

III. **Education/Outreach**

Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – No report

Stroud workshops – No report

Source Water Collaborative (EPA) – The Learning Exchange featured topic is Nutrient Pollution; the feature webinar is Messaging Source Water Protection in Agricultural Communities. EPA wants to feature the Ag BMP/Nitrate study soon.

BCCD held 2 management workshops, which were well-attended.

IV. **Planning**

Executive Steering Committee – ESC conference call scheduled 5/31. Pat Patterson is the new Southeast Region Director.

V. **Other Workgroup Updates**

Stormwater/Schuylkill Action Students (PDE) – developing program with DRWI in Phase II.

Education/Outreach (PDE) – Protecting Our Waters awards went to Miquon, Schuylkill Haven, Chester Springs schools. Schuylkill Street Art in Berks was for Fleetwood. Stormwater medallions – the bass was chosen with green background. $3.11 per 150.

Pathogens (DEP) – developing a flyer on what not to put down a drain.

Recreation – SRHA is new chair

Schuylkill Action Network Agriculture Workgroup
August 9, 2017 Meeting Agenda

INTRODUCTIONS/NEW MEMBERS

Review of May 2017 Meeting Notes

I. Update on grant requests/funding efforts

Berks Watershed Restoration Fund (Berks Nature) – No current applications; all funding awarded.

National Fish & Wildlife Fund (Berks Nature/PDE/Stroud) – PDE was notified of a $500,000 Cornerstone grant for 2 years of on-the-ground projects; $415,000 for projects in Middle Schuylkill cluster.

USDA programs (NRCS) – wrapped up funding on 40 contracts for about $1.8M. About $1.0M anticipated for 2018, the application deadline is in October.

- Environmental Quality Incentive
- Conservation Stewardship – received 5 applications
- Regional Conservation Partnership Program – no new funding
- Conservation Innovation Grant – out of State office
- Conservation Reserve Enhancement Program – now in Delaware Basin; re-enrollment at 75%; about 1,000 acres in Blue Marsh can be re-enrolled in 2018.

Schuylkill River Restoration Fund Recipients (Berks Nature/Berks CD/Lehigh CD) – Berks Nature signed 3 contracts with farmers; land transaction project for Hay Creek. Lehigh CD received $24K for Bennicoff Farm. Berks CD received grant for streambank stabilization in the Irish Creek.

Growing Greener Grant 2016 Program (DEP) – Still waiting for announcement, hopefully after Labor Day.

PACD Mini-Grants (BCCD/MCCD/LCCD) – No report.

5-Star Urban Grants (EPA) – No report.

Mitigation Projects (Berks Nature/BCCD) - companies handling funds that are being generated as result of disturbance of streams, wetlands, endangered species habitat by highways, pipelines, wind turbines, etc. Restoration and/or conservation easements projects/proposals in Berks are considered for the use of these funds

II. Projects in Progress

Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – Next phase planning request submitted in June, and PDE received comments from WPF for more detail. A final submittal planned for September.

Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) – Stroud completing 2013 grant in Berks for buffer vouchers.

Wyomissing Creek Watershed Coalition (BCCD) – Final TMDL available for comment. Document can be downloaded at http://www.co.berks.pa.us/Muni/Mohnton/Documents/WCWC%20TMDL_Part%201.pdf

Topton/Toad Creek project (BCCD) – No report.

Lower Maiden Watershed Implementation Plan (PDE) – Needs new name...still in DEP/EPA review. PDE is seeking a "reference" watershed for comparison to Lower Maiden.

Crypto monitoring (PWD/Lehigh) – waiting for final report; genotyping the *Cryptosporidium* as originating from cattle.

Berks County SWP Program – completed in June. Electronic copies will be available. Discussing any security issues with posting on BC Planning Commission website. Reading Area Water Authority is working on a 10-year update to their 2007 approved plan.

NACD Urban Ag (MCCD) – No report

III. **Education/Outreach**

Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – No report

Stroud workshops – No report, but proposed with Cornerstone grant.

Source Water Collaborative (EPA) – key objective is a call to action through Learning Exchange. Themes will include emergency notification and land conservation.

Schuylkill Sojourn – Took place June 3-9; theme was "Protect the Schuylkill". The Sojourn Steward was a Berks Nature intern.

IV. **Planning**

Executive Steering Committee – will meet prior to the SAN Annual Conference.

2017 Annual Conference – Friday, November 3 at RACC.

2017 Bus Tour – planned for September 20, see Virginia for details and availability.

V. Other Workgroup Updates

Stormwater/Schuylkill Action Students (PDE) – this program will be written into the DRWI planning phase.

Education/Outreach (PDE) – updates to the SAN website are planning; more details at conference.

Pathogens (DEP) – the workgroup plans to produce a flyer on electronic sources

Recreation (SRHA) – new workgroup. Planning a larger public meeting in Spring 2018.

VI. Other Notable Items

- Kernsville Dam removal – AMD meeting discussion topic
- Berks Nature – ribbon cutting for new Angelica Center in September.
- November 5-7 – Harmful algal bloom seminar
- Berks CD – tire collection event netted 2,5,00 tires in June.
- The BCCD banquet will feature Bountiful Berks vendors at their annual banquet on October 23.
- BARN farm tour in the Maiden Creek – October 14.
- NRCS/PSU Extension/Stroud – No-Till workshop in fall for Lehigh/Montgomery counties; NRCS will provide outreach for the Saucony study.
- NRCS will host an RCPP event in 2018.
- The Berks County Master Watershed Stewards graduated their first class this year.

NEXT MEETING:

November 15, 2017 – 10AM at Berks County Agricultural Center

Schuylkill Action Network Agriculture Workgroup
November 15, 2017 Meeting Minutes

INTRODUCTIONS/NEW MEMBERS

Attendees:

- Virginia Vassalotti, PDE
- Kent Hemilright, BCCD
- Alison Aminto, PWD
- Jineen Boyle, PADEP
- Larry Lloyd, Berks Nature
- Kate Hutelmyer, PDE
- Ross Stowell, Stowell Associates
- Krista Scheirer, Aqua PA
- Joe Hebelka, PADEP
- Lamonte Garber, Stroud
- Chip Bilger, Western Berks Water Authority

Review of August 2017 Meeting Notes – no comments

I. Update on grant requests/funding efforts

Berks Watershed Restoration Fund (Berks Nature) – 2017 funds are spent out. This fund helps fund conservation and/or nutrient management plans. Larry will report out total funding amount for 2017.

National Fish & Wildlife Fund (Berks Nature/PDE/Stroud) – PDE was awarded a $500,000/2 year "Cornerstone" grant on behalf of the Middle Schuylkill Cluster; $415,000 for projects in Middle Schuylkill cluster. Berks Nature finished their 2016 grant in August. Stroud completed one grant in October and has another wrapping up in 2018.

USDA programs (NRCS) – The application deadline was October 20. NRCS now has a more rigorous screening process that will begin shortly. Nutrient management plans are becoming more critical in the screening process; may be necessary to have them completed before applications are received.

- Environmental Quality Incentive – guidelines/screening process is being updated.
- Conservation Stewardship – rolling program.
- Regional Conservation Partnership Program – wrapping up. The contracting period was 3 years and the implementation period is 5 years (until July 2019).
- Conservation Innovation Grant – no update.
- Conservation Reserve Enhancement Program – ongoing.

Schuylkill River Restoration Fund Recipients (Berks Nature/Berks CD/Lehigh CD) – BCCD is 70% completed on the 2016 grant for the Myers Farm; an access road and equine heavy use area have been implemented; still need to add gutters for stormwater management and small manure storage. BCCD has a 2017 grant to do a stream restoration project on the Irish Creek and is hoping to break ground ASAP. BN completed the 2016 projects. BN, PWD, Aqua, and PDE visited 2017 SRRF projects yesterday on a farm tour. They include Zetlemoyer (Upper Maiden) and Youse (Manatawny).

Growing Greener Grant 2016 Program (DEP) – In early Oct the awards were with the Governor's office, but no word since. BCCD applied for 2 projects in the Ches. Bay and 1 in the Schuylkill; two of the three projects have already received some funding, but would still benefit from GG dollars.

PACD Mini-Grants (BCCD/MCCD/LCCD) – BCCD developed an outreach rack card/mailer for rod and gun clubs (30 in Berks County). They are planning a dinner workshop in Dec which will include a land preservation component.

5-Star Urban Grants (EPA) – No update.

Mitigation Projects (Berks Nature/BCCD) – There are many companies handling funds that are being generated as result of disturbance of streams, wetlands, endangered species habitat by highways, pipelines, wind turbines, etc. Restoration and/or conservation easements projects/proposals in Berks are considered for the use of these funds. For example, PennDOT is expanding 78 and relocating a stream; their mitigation project will be stream restoration on the Tulpehocken. Additionally, the Conservation Fund has a project in Maiden Creek near Hawk Mountain.

II. **Projects in Progress**

Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – The final plans were submitted in September and are awaiting final approval. Phase 2 operational funding (for PDE, BN, and Stroud) will come in in Feb 2018 and last three years until 2021. During that time period, cluster partners can apply for NFWF funding for on-the-ground projects. The cluster will be exploring how to create a public plan. At the next meeting, PDE will share maps of the "focus areas," where agricultural BMP efforts will be focused in Phase 2.

Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) – BCCD wrapped up 4 farm projects from the 2014 grant; Kent will share final report. BCCD still has their 2015 project open (Georgie's mushrooms). Stroud has two GG projects – one matched with Farm Stewardship Program and the other with RCPP.

Wyomissing Creek Watershed Coalition (BCCD) – Final TMDL available for comment. Document can be downloaded at http://www.co.berks.pa.us/Muni/Mohnton/Documents/WCWC%20TMDL_Part%201.pdf. The coalition consists of 8 municipalities that are committed to investing $1.9 million over the 5 year TMDL plan period. They are considering writing a WIP.

Topton/Toad Creek project (BCCD) – This project is on hold; awaiting permit from DEP.

Lower Maiden Creek Watershed Implementation Plan (PDE) – PDE has received a reference watershed from DEP – School Run, in the headwaters of Maiden Creek. The water quality goals are similar to what was identified in the plan. PDE will be updating the plan and sending it to EPA for final review by the end of Nov. EPA 319 will be soliciting apps spring-summer 2018.

Crypto monitoring (PWD/Lehigh) – PWD is working on planning the next phase of sampling. Currently, PWD plans on bimonthly monitoring at intakes; if positive, they will send results to Lehigh University for genotyping. There was a conversation about tracking crypto in the watershed.

Berks County SWP Program – The plan was completed in June. Kent is the coordinator for the committee and the committee will meet quarterly. The first priority for the committee is to figure out how reporting to DEP can be streamlined. Kent is interested in getting more small-mid sized water suppliers involved. Chip asked what the committee can help the SAN Ag workgroup do.

NACD Urban Ag (MCCD) – MCCD is wrapping up the urban community garden outreach work in Pottstown/Norristown area.

III. **Education/Outreach**

Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – The Loverich farm received the Coservation Farm of the Year Award.

Stroud workshops – Stroud has three workshops scheduled in December. 1) Dec 7: soil health/no-till/cover crop at Shady Maple. 2) Dec 15: Ches. Bay focus; engaging anglers and hunters in water quality at Millport Conservancy. 3) Dec 19: farmer workshop at Stroud.

Source Water Collaborative (EPA) – EPA will be holding another Source Water Leadership Forum in Philadelphia on March 7-8. The purpose is to bring together source water partners across Region 3 to share best practices and explore different approaches to address common challenges that are impacting our drinking water supplies.

IV. **Planning**

Executive Steering Committee – Keep in mind the ESC for any funding, policy, program issues within the watershed. The members are senior staff at EPA, DEP, DRBC, PWD, PDE, and SRHA who can influence various issues.

2017 Annual Conference – Some feedback included: condensing the workgroup updates into Rick's introductory PowerPoint, presentations from people impacted by the SAN (teachers, farmers, water suppliers, etc.), breakout sessions by workgroup/audience, more learning-type workshop.

Progress Report – Items to include: BCCD Growing Greener report pollutant reduction estimates, SRRF & BWRF total funding amount for ag projects, map with pin-points for projects.

V. **Other Workgroup Updates**

Stormwater/Schuylkill Action Students (PDE) – This program is written into Phase 2 of the DRWI for both Middle Schuylkill and Schuylkill Highlands clusters. The next step will be to develop an outreach strategy to prioritize and reach the schools.

Education/Outreach (PDE) – New website to be launched by the end of the year. E&O workgroup is developing a signage template for projects.

Pathogens (DEP) – Geigertown will be connecting sewer to Birdsboro WWTP. The workgroup is finalizing the "What Not to Put Down the Drain" fact sheet.

Recreation (SRHA) – The workgroup is planning a Schuylkill River Recreation Summit on March 16th from 10am-1pm in Pottstown area (exact location still TBD).

VI. **Other Notable Items**

- Reauthorization of Farm Bill in 2018
- Healthy Watersheds Consortium Grant – due Feb 1, 2018
- EPA Organizational Shifts – Cosmo Servidio (former PADEP SE region chief) is now the Regional Administrator
- Pay attention to development along 78

NEXT MEETING: Wednesday, February 7, 2018 – 10AM at Berks County Agricultural Center

NEW TOPICS:

- 2018 work plan
- Middle Schuylkill Phase 2 focus area maps

Schuylkill Action Network (SAN)
Pathogens & Point Source
2017 Workplan

Strategic Goal: Facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding the Clean Water Act and Safe Drinking Water Act goals.

Strategic Actions	Timing	Lead
Strategy 1: Strengthen communication between and provide educational resources to wastewater and drinking water utilities to improve source water protection efforts.		
Strategic plan alignment: Objectives 1, 3 and Strategies 1, 4, 6		
Actions:		
• Continue discussions with PADEP regional offices on reporting events to the EWS and water suppliers.	Ongoing	All
• Promote use of the EWS at workgroup meetings, workshops, and outreach events.	Ongoing	All
o Conduct EWS demonstration session for DEP and other water users/discharges during existing DEP meeting.	3Q 2017 *(tentative)*	PWD/PDE
• Promote PA WARN.	Ongoing	All
• Promote various funding opportunities, such as Pennvest, for pathogen reduction projects throughout the watershed.	Ongoing	All
• Host tours of waste water and drinking water treatment plants.	1/year	All
Strategy 2: Facilitate data and information sharing to document wastewater treatment technologies, improvements, and other pertinent source water protection information.		
Strategic plan alignment: Objectives 2, 5, 6 and Strategies 3, 5, 7, 8, 9		
Actions:		
• Convene quarterly meetings of the Pathogens & Point Source workgroup, incorporate educational opportunities with experts in the field of pathogen research, whenever appropriate and feasible.	Ongoing	DEP
• Develop a list of potential partners, such as wastewater treatment operators, to expand and enhance the Pathogens & Point Source workgroup.	Ongoing	All
• Identify a platform for housing and updating valuable source water planning data, such as a SharePoint site.	2Q2017	PDE
• Track progress of projects addressing unsewered communities and identify partners currently working with those communities.	Ongoing	All
• Share information on publically owned treatment works' (POTW) to identify POTW that need to meter and sample flows that are not fully treated.	Ongoing	EPA/DEP
• Provide WWTP bypass/overflow event data to correlate with PWD *Cryptosporidium* data.	Ongoing	DEP/PWD

• Track WWTP upgrades, new facilities, and community sewer improvement projects through DEP Regional Offices, Part II Permits, media releases, and review of government-funded projects. • Track status of Act 537 Plan statuses and provide assistance if needed. • Build on PWD's sanitary survey by identifying other sources of data to further characterize WWTP conditions.	Ongoing 4Q 2017 Ongoing	DEP/PWD DEP All
Strategy 3: Investigate evolving source water issues, such as unregulated contaminants, and develop a better understanding of what these issues mean for water suppliers source water protection strategies.		
Strategic plan alignment: Objective 4 and Strategy 10		
Actions: • Attend and/or present at an existing water utility meeting that highlights unregulated contaminants.	When applicable	All
Strategy 4: Promote pathogen successes and understanding of pathogen water quality issues and solutions to target audiences in the watershed.		
Strategic plan alignment: Objectives 3, 4		
• Develop an annual/final report of workgroup accomplishments to present at SAN annual workshop in fall and to include in the SAN annual progress report. • Provide presentations and education to key stakeholder groups on effective wastewater and drinking water treatment. • Develop a short fact sheet for WWTPs to distribute, looking at existing fact sheets and other groups' gathered information. • Provide workgroup information for posting on SAN website and social media sites.	4Q2017 Ongoing 3Q2017 Ongoing	DEP/PWD/ PDE All All/PDE All

Objectives: How will we measure success?

- Track progress of projects addressing unsewered communities (on-lot malfunctions and wildcat sewer discharges).
- Increase wastewater treatment operators' participation in the SAN.
- Increase discharger/water supplier communication of events by using the Delaware Valley EWS to minimize threats to drinking water in the event of a discharge.

Glossary:

- CSO – combined sewer overflow
- EPA – Environmental Protection Agency
- ESC – Executive Steering Committee
- EWS – Early Warning System
- NPDES – National Pollutant Detection Elimination System
- PA DEP – Pennsylvania Department of Environmental Protection
- PA WARN – Pennsylvania Water/Wastewater Agency Response Network
- PDE – Partnership for the Delaware Estuary
- POTW – publically owned treatment works
- PWD – Philadelphia Water Department
- SNC – Significant Noncompliance
- SOP – standard operating procedure
- SSO – sanitary sewer overflow
- WWTP – wastewater treatment plant

SAN Pathogens & Point Source Workgroup Meeting Minutes

January 12, 2017 10am-12pm
PADEP – Reading District Office

Attendees:

- Virginia Vassalotti, PDE
- Craig Ebersole, PADEP
- Kevin Buss, PADEP
- Steven Flannery, PADEP
- Kate Hutelmyer, PDE
- Joe Hebelka, PADEP
- Beth Ventura, PWD
- Beth Garcia, EPA
- Erick Ammon, PADEP
- Jared Sabitsky, PADEP (via phone)

1. **Introductions** – The group went around and introduced themselves.

2. **2017 Workplan** – Virginia went through the Pathogens workgroup portion of the 5 Year Strategic Plan and compared it with the 2016 annual workplan. This was a starting point for the 2017 workplan update. Virginia reviewed that each strategy and action would fit within the main categories: 1) educational opportunities for wastewater and drinking water utilities; 2) information sharing; 3) unregulated contaminants; 4) education to non wastewater and water suppliers. The updated workplan can be downloaded here. The workgroup identified some other organizations/groups to reach out to for involvement and guidance: Eastern PA Operators Association, PA Water Environmental Association, Reading Area Water Authority, Berks County Water and Sewer Authority, and the Partnership for Clean Water.

3. **PWD Schuylkill Watershed Control Plan/Sanitary Survey** – Ongoing

4. **PWD Chapter 94 Data** – Ongoing. For PWD's sanitary survey and chapter 94 data, it would be beneficial if the workgroup developed a place to house data sharing information.

5. **Algae Info** – PWD is looking for new places to sample HABs.

6. **Emerging Contaminants** – No updates

7. **Quarry** – There is a potential quarry expansion near Kutztown.

8. **Delaware Valley EWS** – Lower Maiden pipe burst report – force main break was reported twice, on Nov 22 and Dec 19.

9. **WWPTs Flyer/Brochure** – This will be the workgroup's main focus in 2017.

10. **BCWSA Activities** – Aquapalooza was held in the fall with over 600 students attending.

11. **PENNVEST** - $148 million loan to Reading (largest in the region).

12. **EPA** – SWC leadership forum attendees now have a SharePoint site.

13. Watershed News

- SRRF announcement
- Watershed Congress Along the Schuylkill – March 11th
- PDE is working on revisions to the Comprehensive Conservation Management Plan (CCMP) for the Delaware Estuary
- DE River Basin Act was passed – largely for habitat protection

14. Other Items

- PDE is working on the 2017 Progress Report
- The Schuylkill Scrub is starting in March
- The Schuylkill Street Art Contest begins in early February

15. Next Meeting Date – Thursday, April 13th

SAN Pathogens & Point Source Workgroup Meeting Minutes

April 13, 2017 10am-12pm
PADEP – Reading District Office

Attendees:

- Virginia Vassalotti, PDE
- Beth Ventura, PWD
- Joe Hebelka, PADEP
- Kevin Buss, PADEP
- Beth Garcia, EPA (on phone)

1. **Introductions –** Joe kicked off the meeting with explaining that it would be useful to get more information on what everyone does at their organization/agency. This will be useful in guiding the path of the Pathogens workgroup, as well as provide crucial information for the upcoming SAN Executive Steering Committee (ESC) call.

    - Kevin is in the Clean Water Program at DEP and does inspections for those who discharge to streams (WWTPs and some storm sewers). Majors WWTPs are inspected annually and smaller scale once every two years. Berks and Northern Lancaster is Kevin's territory.

2. **Review Last Meeting Minutes** – No outstanding issues. Joe mentioned that reaching out to Eastern Pennsylvania Water Pollution Control Operators Association (EPWPCOA) should be one of the goals of the workgroup. Janet Serfass, on the stormwater workgroup, should have a connection there and Jason Coyle is a member as well.

3. **2017 Workplan Final Approval** – The workplan was approved by everyone. Virginia discussed two items listed on the workplan - holding an EWS training and creating a SharePoint site. Chris Gillam does emergency management out of Reading office and may be someone to reach out to about existing DEP meetings/trainings where we can hold an EWS training. Additionally, DEP staff can talk to other staff at SE and NE to see if there's any other meetings we can piggyback on. Beth G. mentioned getting in touch with Cathy at EPA since she set up a SharePoint site for source water collaboratives.

4. **WWTPs Flyer/Brochure** – Virginia announced that PDE has funding to design a fact sheet by June 30th. This can be an electronic fact sheet at first and printed if we find other funding sources. The focus will be on what not to put down the drain (not only toilet). Joe shared various fact sheets to use as a starting point. Beth V. suggested creating a survey for WWTPs to fill out about the top 5-10 things that cause issues in their treatment plants. This survey can be distributed to BCSWA and other WWTPs for feedback. Beth G. suggested highlighting the connection between wastewater and source water. The survey was later created and can be filled out here: https://www.surveymonkey.com/r/SAN-WWTP-Fact-Sheet

5. **PWD Schuylkill Watershed Control Plan/Sanitary Survey** – No major update on the Schuylkill watershed control plan. Beth V. announced that under the Safe Drinking Water Act, water suppliers serving more than 100,000 people are required to monitor crypto for 2 years**.** In the first round, the Queen Lane intake had elevated levels of cryptosporidium and

was put in "Bin 2" for needing to develop a watershed control plan. The second round of sampling was completed and Queen Lane is in "Bin 1" (an improvement since the first sampling). However, Baxter (on the Delaware River) was put in Bin 2 and PWD will need to develop a watershed control plan for the Delaware. PWD is in the preliminary stages planning for developing this plan.

6. **PWD Chapter 94 Data** – No update.

7. **Algae Info** – No workgroup update. Announced the EPA monthly Freshwater HABs Newsletter is out.

8. **Emerging Contaminants** – Last year, Jesse Goldberg was working with Amy Williams at DEP to do sampling in 5 sites (Port Clinton, Maiden Creek, Tulpehocken Creek, Hay Creek, Schuylkill River in Pottstown). DEP is interested in conducting more sampling this year and maybe adding more parameters. Joe will put the group in touch with Amy to learn more about the goal of this study and share potential monitoring locations.

9. **Quarry** – No update. Move to under DEP updates.

10. **Delaware Valley EWS** – Covered in agenda item #3 – 2017 workplan final approval. Kevin asked if Fish and Boat Commission has been involved and if they should be moving forward.

11. **BCWSA Activities** – The annual conference is on July 26th with a focus on safety-related issues.

12. **Berks County SWP Plan** – The committee is reaching out to Aqua PA to see if they're interested in participating. Additionally, the group is looking for funding for a coordinator to manage the committee. SSM is developing a map comparing all the source water protection areas for each water supplier in the county as part of the plan.

13. **Funding**

- **PENNVEST** – No update
- **Berks County and tri-county areas to see over $2.3 million in state money**
    - West Pottsgrove to replace sewers
    - Kutztown to replace meters Municipal Authority to replace Kutztown University meters
    - Topton to replace sewer pipe linings and repair manholes
    - West Reading sewer replacements
    - Womelsdorf Sewer Authority for WWTP improvements and pipe repairs
    - Leesport to replace water main
    - Upper Pottsgrove to replace sewer lining
- **CFA to Accept Applications for Act 13 Water-Related, Recreation Grants Feb 1 to May 31**

14. **EPA**

- Handling Wet Weather Flows at Wastewater Treatment Plants – Friday, May 5th
- EPA developed a lot of tools – EPA Drinking Water MAPs 2.0
- Route to Resilience Tool
- National Study of Nutrient Removal and Secondary Technologies
- Protective Action Guides and Planning Guidance for Radiological Incidents
- Possible Funding Sources for Managing Cyanobacterial Harmful Algal Blooms and Cyanotoxins in Drinking Water
- Sampling Guidance for Unknown Contaminants in Drinking Water

15. DEP

- Jan 24, 2017 Aggregate Advisory Board – Regulatory, Legislative and Technical Committee
- PA Bulletin – Availability of Technical Guidance Feb 4

16. Watershed News

- DRBC Dockets – Cambridge Lee Industries; Myerstown Borough WWTP; NGK Metals Corporation
- DRBC Water Resource Program Report 2017-2019
- Lancaster County Plant is First in the Nation to Use Recycled Glass in Reed Beds
- Sewer authority drafts emergency response reports for basin commission
- Greater Pottsville Area Sewer Authority reviews inflow issues
- Reading officials plan dedication of sewer plant reconstruction
- Over 6,100 tons of trash and debris found on Fritz's Island in Reading
- Lower Heidelberg doesn't like wastewater treatment fees
- Permit modification for Western Berks landfill stirs concern
- West Penn submits sewage plan to DEP
- Geigertown Area Join Sewer Authority seeks appraisal
- Centre Township on-lot septic users to get letter
- Exeter Township in request sewer plant proposals
- PUC issues emergency order at Berks Wastewater Treatment Plant
- April 29th National Prescription Drug Take Back Day
- Drinking Water and Wastewater Grades Show Little Improvement in New ASCE Report Card
- AWWA Annual Conference and Exposition
- NWQMC Webinar Series

17. Other Items – Virginia announced that the SAN Executive Steering Committee (ESC) is having a conference call at the end of the month and she will be giving a highlight of 1-2 main projects/initiatives for each workgroup. The pathogens workgroup will highlight what not to put down the drain fact sheet and its focus on data sharing.

18. **Next Meeting Date** – Wednesday, July 19th 10am-12pm

SAN Pathogens & Point Source Workgroup Meeting Minutes

July 19, 2017 10am-12pm
PADEP – Reading District Office

Attendees:

- Virginia Vassalotti, PDE
- Kelly Anderson, PWD
- Chris Anderson, PWD
- Joe Hebelka, PADEP
- Kevin Buss, PADEP
- Beth Garcia, EPA

1. **Introductions**

2. **Review Last Meeting Minutes**

    - Joe spoke with someone from Eastern Pennsylvania Water Pollution Control Operators Association (EPWPCOA) to get them involved in the workgroup.

    - Joe asked PWD if they would be interested in hosting a workshop for the EWS. Kelly mentioned that PWD is updating the website for EWS and that after it is complete may be a good time to hold a workshop. It would be a short training, only about 30 minutes, and could be tagged on to an existing meeting. The group suggested holding it at SE regional office in Norristown. Beth G. suggested that we could always hold it as a webinar.

3. **WWTPs Flyer/Brochure** – Virginia handed out the text and layout document that was created by Laura. PDE will plan to have Frank design the piece in an electronic format originally and then can get printed if we think necessary. Everyone thought it had great information. Some comments included:

    - Include anything that goes down the drain, not only flushing toilets (kitchen sink, bathroom sink, shower, etc.)

    - If it's not water, water, or TP it doesn't belong!

    - Cut back details about what are the worst things to flush

    - Include infographics and images

    - Tie back to the Delaware watershed

    - Include motor oil with FOGs

4. **PWD Schuylkill Watershed Control Plan/Sanitary Survey** – PWD completed LT2 monitoring in April. Queen Lane is now in "Bin 1" meaning there are not elevated levels of cryptosporidium. However, now Baxter, on the Delaware River, is in "Bin 2" meaning there is elevated levels of cryptosporidium. PWD is exploring options for developing a watershed control plan for the Delaware. As of now, it seems like the focus will be in Bucks County.

5. **PWD Chapter 94 Data** – No update. PWD will be looking to get data from Bucks County as well.

6. **Algae Info**

    - EPA Region 3 is hosting an algae summit in summer/fall. It's still in the early planning phases, with more details to come.

    - EPA Releases Recommendations for Cyanobacteria and Cyanotoxins in Recreational Waters.

7. **Emerging Contaminants**

    - Last year, Jesse Goldberg was working with Amy Williams at DEP to conduct atrazine sampling in 5 sites (Port Clinton, Maiden Creek, Tulpehocken Creek, Hay Creek, Schuylkill River in Pottstown). Unfortunately, this year DEP doesn't not have the resources to do any sampling in the Schuylkill.

    - April 29th National Prescription Drug Take-Back Day

    - What's your EDC Footprint?

8. **Quarry** – Quarry outside of Kutztown wants to increase water discharge from 5,000 gallons/minute to 8,000 gallons/minute.

9. **Delaware Valley EWS** – Covered in agenda item #2.

10. **BCWSA Activities** – The annual conference is on July 26th with a focus on utility workplace safety. On Sept 22 BCWSA will be holding a tabletop exercise with a wastewater focus.

11. **Berks County SWP Plan** – The plan has been completed an approved by DEP. The plan does not supersede all of the individual water suppliers' plans. Now the group is working on determining sustainable funding for a part-time coordinator.

12. **Funding**

    - **PENNVEST** – No update

13. **EPA**

    - EPA held its states source water protection meeting. There was a continued emphasis on CWA and SDWA integration. Previously, EPA created a checklist for integration, which is now being implemented.
    - Source Water Collaborative is continuing its learning exchange
    - Water Utility Response On-The-Go app and website
    - Transdisciplinary Research into Detecting and Controlling Lead in Drinking Water
    - **Webinars:**
        - July 19 – Drinking Water Preparedness Best Practice
        - July 25 – Water Loss Management to Reduce Non-Revenue Water
        - Aug 22-24 – 14th Annual EPA Drinking Water Workshop – small systems challenges and solutions (in Cincinnati, OH)
        - Aug 29 – ASDWA CWA-SDWA Webinar: Creative Uses of Clean Water Funding for Drinking Water Benefits

14. **DEP**
    - Under PA-G3 permit, all industrial stormwater permittees must update their permits.

- PA's Source Water Protection Technical Assistance Program (SWPTAP) will be continuing with SSM Group

15. Watershed News

- DRBC Dockets
  - Cambridge-Lee Industries renewal of industrial process water and non-contact cooling water discharges
  - Myerstown Borough renewal of existing WWTP and its discharge
  - NGK Metals Corporation
  - Borough of Phoenixville renewal of existing WWTP and its discharge
  - Rivercrest Homeowners Association renewal of existing WWTP and its discharge
- Money for street repairs in Womelsdorf might come from Berks County Conservation District
- Emergency sewer repairs to cost Lenhartsville about $5,000
- Maxatawny Township Resident fined six figures for refusing to connect to sewer
- Marion Township group wants supervisors cited over sewers
- Kutztown University students suggest way to reduce costs at wastewater treatment plant
- Maxatawny Township keeps sewer plant but must pay Kutztown nearly $725,000 panel rules
- Concrete poured for sewage plant upgrade in Reading - $148 million, largest wastewater project in PA
- If Exeter Township sells sewer plant, how the money could be spent
- Franconia plans for public sewers in Morwood area
- W. Penn may use grants for sewers
- Sinking Spring council Oks study at wastewater treatment plant
- National Water Monitoring News from National Water Quality Monitoring Council

16. Other Items

- Roadmap to a Secure and Resilient Water and Wastewater Sector – developed by Water and Wastewater Sector Strategic Roadmap Work Group
- Social Marketing Guide to Reduce Sanitary Sewer Overflows – developed by Ridge to Reefs
- Sept 20 – AWWA Webinar on funding mechanisms for source water protection programs
- The SAN Annual Meeting will be held on November 3rd
- SAN is working on updating its website, to be launched in mid-November.
- PDE received the $500,000 Cornerstone grant to do agricultural restoration in the Middle Schuylkill cluster with Berks Nature and Stroud.
- PDE has filled the Director of Outreach position. Renee Brecht started on July 18th.

17. **Next Meeting Date** – Thursday, October 19th 10 AM – 12 PM

SAN Pathogens & Point Source Workgroup Meeting Minutes

October 19, 2017 11am-1pm
PADEP – Reading District Office

Attendees:

- Virginia Vassalotti, PDE
- Joe Hebelka, PADEP
- Kevin Buss, PADEP
- Erick Ammon, PADEP
- Craig Ebersole, PADEP
- Tess Schlupp, PennVEST

1. **Introductions**

2. **Review Last Meeting Minutes** – no edits.

3. **SAN Annual Meeting** – Joe will be presenting on behalf of the Pathogens workgroup. Updates will include key strategies and goals from the yearly workplan, stats from the Delaware Valley Early Warning System, and the development of the *What Not to Put Down the Drain* fact sheet.

4. **WWTPs Flyer/Brochure** – Virginia handed out the updated fact sheet. No comments were made during the meeting. Joe suggested sharing it with Berks County Water and Sewer Association, as well as with DEP staff that work with WWTPs. The most updated version can be found here: http://www.schuylkillwaters.org/doc_files/SAN_New_Flushing_Flyer_F2.pdf

5. **PWD Schuylkill Watershed Control Plan/Sanitary Survey** – No update from PWD. From last meeting: PWD completed LT2 monitoring in April. Queen Lane is now in "Bin 1" meaning there are not elevated levels of cryptosporidium. However, now Baxter, on the Delaware River, is in "Bin 2" meaning there is elevated levels of cryptosporidium. PWD is exploring options for developing a watershed control plan for the Delaware. As of now, it seems like the focus will be in Bucks County.

6. **PWD Chapter 94 Data** – No update.

7. **Algae Info**

    - On Aug 24th the Office of Science and Technology Policy submitted the "Harmful Algal Blooms and Hypoxia Research Plan and action Strategy: An Interagency Report" to Congress.
    - EPA Region 3 is hosting an algae summit from Dec 5-7.
    - EPA Freshwater HABs newsletters
    - 9th Symposium of Harmful Algae: November 11-17 in Baltimore, MD

8. **Emerging Contaminants –** The group discussed inviting DRBC to a meeting to see how a mini-workshop could be hosted for water suppliers in the Schuylkill.

    - Injecting manure instead of spreading on surface reduces estrogen loads article.
    - Soil filters out some emerging contaminants before reaching groundwater article.
    - National Prescription Drug Take Back Day – October 28.

- Berks, Pottstown nonprofit to offer drug disposal days.
- Billions are drinking water contaminated with plastic – and US has it the worst, study finds.
- These Great Lakes fish are swimming in Prozac – and scientists are "very concerned" article
- Manganese Rider in budget bill shifts responsibility for cleaning up water from the discharger to water companies, other water users.

9. **Quarry** – Quarry outside of Kutztown gets OK to expand operations near Kutztown, increasing water discharge from 5,000 gallons/minute to 8,000 gallons/minute.

10. **Delaware Valley EWS** – PWD is working on updating the website.

11. **BCWSA Activities** – Tabletop exercise October 20.

12. **Funding**

- **PENNVEST**
  - New Executive Director, Brion Johnson
  - Replacing lateral lead lines and stormwater BMPs = new focus for PennVEST
  - On-lot septic replacement program – Homeowner Septic Program
  - Funding riparian buffers through DCNR grant
  - Reading WWTP
  - Chester City stormwater authority - $1 million PennVEST loan

13. **EPA**

- EPA Enforcement and Compliance History Online (ECHO): more unresolved violations to be seen publicly
- UCMR training – Nov 6 & 8
- EPA issues final cleanup plan for BoRit asbestos superfund sites in Montgomery County – Whitpain Township (park), Ambler Borough (pile), and Upper Dublin Township (reservoir)
- EPA backs PA plan to improve water quality

14. **DEP**

- PA will have more options for septic systems – change in section 5 of Act 537

15. **Watershed News**

- Reading planners want salvage yard checked for permits
- Water woes continue for Bally residents
- Fight over labeling of "flushable" wipes headed to federal court
- Farm Bill provides an opportunity to grow partnerships that protect drinking water
- Marion Township residents voice objections to sewage plan
- Loan, grant will help pay for Geigertown Area Joint Authority's sewer project
- 30 properties included in upgrade of sewer system in Alsace Township – low pressure sewer main on Pricetown Road

- Kuztown, Maxatawny sewer dispute settled
- No zoning decision on Maxatawny chicken barns
- Amity Township to refinance two outstanding bond issues
- DRBC Dockets
    - ArcelorMittal Plate, LLC in Conshohocken: renewal of 1.2 mgd
    - Robeson Township Municipal Authority: renewal of 0.3 mgd
    - North Coventry Municipal Authority: renewal
    - Giorgio Foods, Inc.: upgrade existing → 0.5 mgd
    - DTE Midstream Appalachia, LLC natural gas pipeline in Borough of Birdsboro and Union, Amity, Oley, and Rockland Townships (Berks County): Birdsboro Pipeline Project

16. Other Items

- The SAN website will be completed by the end of 2017. There will be a new grant directory feature on the website.

17. **Next Meeting Date** – Wednesday, January 10th 10am-12pm at DEP Reading

Appendix C: Wildcat Sewer Update

Current Progress of Efforts in Schuylkill River Watershed to Improve Wastewater Planning and Infrastructure

Discharger	Municipality	County	Stream	Update	Sources
Blythe Township	Blythe Township	Schuylkill	Silver Creek and Schuylkill River	The municipalities of Middleport Borough, New Philadelphia Borough, Blythe Township and Schuylkill Township joined together to form the Schuylkill Valley Sewer Authority (SVSA) and completed an Act 537 plan. A new sewage treatment plant with the capacity to treat 550,000 gallons per day and over 30 miles if sewage pipe was construction using SVSA funds and an over $18 million combined loan and grant package from PENNVEST. The new wastewater treatment plant began discharging treated effluent in June 2006. As of 2009, 1432 customers were connected to the SVSA WWTP, and 69 were not connected. Of those customers not connected, most were abandoned properties, buildings being foreclosed on or were being pursed legally to force connection.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; PENNVEST. www.pennvest.pa.gov
Village of Cumbola	Blythe Township	Schuylkill	Schuylkill River		
Middleport Borough	Middleport Borough	Schuylkill	Schuylkill River		
New Philadelphia	New Philadelphia Borough	Schuylkill	Silver Creek and Schuylkill River		
Schuylkill Township	Schuylkill Township	Schuylkill	Schuylkill River & tributaries		
Village of Brockton	Schuylkill Township	Schuylkill	Schuylkill River		
Village of Delano	Delano Township	Schuylkill	Pine Creek	Delano has public sewer. In 2007, Delano Township received a nearly $3 million grant and loan package from PENNVEST to construct three miles of sewer lines and a pump station to convey sewage to Northeast Schuylkill Joint Municipal Authority which was previously being discharged to Delano Creek, a branch of Pine Creek.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Governor Rendell Announces $61 Million Investment to Help Protect Pennsylvania's Waterways, Public Health; Promote Community Revitalization Efforts." April 17, 2007. PRNewswire. www.prnewswire.com
Minersville	Minersville Borough	Schuylkill	West Branch Schuylkill River	Minersville has public sewer. Minersville Sewer Authority received over $4 million loan from PENNVEST to construct almost two miles of sewer and stormwater lines and replace about one mile of water mains to eliminate a continuous discharge of	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Governor Rendell Announces Funding to Protect Pennsylvania's Waterways, Public Health; Promote Community Revitalization Efforts." Jul 18, 2006. PRNewswire. www.prnewswire.com

				untreated wastewater to the West Branch Schuylkill River.	
Village of Llewellyn	Branch Township	Schuylkill	West Creek and West Branch Schuylkill River	The Village of Llewellyn has public sewer. Branch-Cass Regional Sewer Authority recived an over $16 million loan and grant package from PENNVEST to construct over 28 miles of sewer collect lines and a 450,000 gallons per day wastewater treatment plan to serve portions of Branch, Cass and New Castle Townships and mitigate wildcat sewers and malfunctioning on-lot systems discharging untreated sewage into local streams. In 2010, Branch-Cass Regional Sewer Authority was acquired by the Schuylkill County Municipal Authority (SCMA).	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "PA Gov. Schweiker Administration Announces $94 Million in Loans and Grnts for Clean-Water Projects." Nov 14, 2001. PRNewswire. www.prnewswire.com; Schuylkill county Municipal Authority. www.scmawater.com
Deer Lake Municipal Authority (acquired by Schuylkill County Municipal Authority in 2008)	Deer Lake Borough	Schuylkill	Pine Creek	In 2011, Schuylkill County Municipal Authority (SCMA) received grant and loan funding from PENNVEST to expand its Deer Lake wastewater treatment plant and construct several miles of sewerage collection lines. The project would eliminate several small, inadequate wastewater treatment plants and discharges from wildcat sewers and malfunctioning on on-lot septic systems to locate streams. Expansion and construction began in 2013. The wastewater treatment plant was completed and operational in September 2014. SCMA was awarded the Governor's Award for Environmental Excellence from PADEP in 2015 for completion of the project.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Pennsylvania Governor Corbett Announces $99 Million Investment in Water Infrastructure Projects in 20 Counties." Jul 20, 2011. PRNewswire. www.prnewswire.com; Schuylkill county Municipal Authority. www.scmawater.com

New Ringgold Municipal Authority	New Ringgold Borough	Schuylkill	Little Schuylkill and Koenig Creek	In 2001, the Borough of New Ringgold received a loan from PENNVEST to design sewage collection lines and a WWTP to eliminate malfunction on-lot septic systems contaminating local drinking water wells, Koenig Creek and the Little Lehigh. The Borough of New Ringgold received over $1.4 million in loans and grants in 2004 and over $2.6 million in loans and grants in 2005 from PENNVEST to install approximately 3 miles of sewage collection lines to eliminate the use of malfunctioning on-lot septic systems that are contaminating a local stream and drinking water wells. The WWTP was completed in 2006.	"PA Gov. Schweiker Administration Announces $94 Million in Loans and Grants for Clean-Water Projects." Nov 14, 2002. PRNewswire, www.prnewswire.com "PENNVEST Initiates Brownfield Program Approves $97 Million for Water Projects," Mar 24, 2004. PRNewswire. www.prnewswire.com; "PENNVEST Approves $100 Million for Water Projects." Mar 23, 2005. PRNewswire. www.prnewswire.com; "2014 Chapter 94 Annual Report Borough of New Ringgold Sewage Treatment Plant." 2014. *Chapter 94 Municipal Wasteload Management Report.*
West Hamburg	Tilden Township	Berks	Schuylkill River	In 2008, Tilden Township received a $5.3 million loan from PENNVEST to construct nearly six miles of sewage collection and transmission lines, three pump stations and other facilities to eliminate the use of wildcat sewers and malfunctioning on-lot septic systems discharging untreated and inadequately treated sewage into areas draining to the Schuylkill River.	"Governor Rendell Announces $72 Million in Water Infrastructure Investments." Apr 14, 2008. PRNewswire. www.prnewswire.com
Virginville	Richmond Township	Berks	Maiden Creek, Sacony Creek	Richmond Township received a $1.6 million loan in 2008 and over $1.7 million in loans and grants in 2001 to construct a new WWTP, pump station, and sewage collection lines to serve 247 homes in the township, where malfunctioning on-lot septic systems are contaminating local wells. The Richmond-Virginville WWTP was completed in 2013.	"Governor Rendell Announces $66 Million Investment in PA's Water Infrastructure," Oct 27, 2008, PRNewswire, www.prnewswire.com; "Governor Corbett Announces $84 Million Investment in Water Infrastructure Projects in 14 Counties," Oct 26, 2011, PRNewswire, www.prnewswire.com; Steckbeck Engineering and Surveying, Inc., *Facebook.* www.facebook.com

Strausstown	Strausstown Borough	Berks	Tributaries to Blue Marsh Reservoir	In 2002, Strausstown Borough received a loan from PENNVEST to design a sewage collection and treatment facility to serve Strausstown Borough and portions of Upper Tulpehocken Township, where wildcat sewers and malfunctioning on-lot septic systems are contaminating almost half of the local drinking water wells. In 2007, Strausstown Borough received $3.65 million in loans and grants from PENNVEST to construct the wastewater collection and treatment system to serve both the Borough of Strausstown, as well as Upper Tulpehocken Township. The construction of approximately 3 miles of sewage collection lines and a 65,000-gallon per day wastewater treatment plant was completed in November 2009.	"Pennsylvania Gov. Schweiker Administration Announces $95.5 Million in Loans and Grants for Clean Water Projects." Mar 20, 2002. PRNewswire. www.prnewswire.com; "Governor Rendell Announces $69 Million in Clean, Safe Water Infrastructure Investments." Oct 23, 2008. PRNewswire. www.prnewswire.com; "Borough of Strausstown, Berks County, Sewage Treatment Plan, Municipal Wasteload Management." 2012. *Annual Report for 2012 DEP Rules and Regulations, Chapter 94.*
Lenhartsville	Lenhartsville Borough	Berks	Furnace Creek, Maiden Creek	Lenhartsville Borough received over $1.3 million in 2002 and over $1.6 million in 2004 in loans and grants from PENNVEST to construct a new sewage treatment plant and collection system to eliminate the use of on-lot septic systems contamination drinking water wells and local streams, including Furnace Creek and Maiden Creek. The new sewage treatment plant went online in July 2005.	"Pennsylvania Governor Schweiker Announces $3 Billion Milestone for Funding of Clean Water Projects in Pennsylvania." Nov 20, 2002. PRNewswire. www.prnewswire.com; "PENNVEST Initiates Brownfields Program, Approves $97 Million for Water Projects." Mar 24, 2004. PRNewswire. www.prnewswire.com; PENNVEST. www.pennvest.pa.gov; "Borough of Lenhartsville Waste Water Treatment and Conveyance Facilities." 2012. *Title 25 Chapter 94 Municipal Wasteload Management Annual Report.*
Sassmansville	Douglass Township	Mont-gomery	Schlegal Run and Middle Creek	In 1999, 20 houses were cited by the Montgomery County Health Department for failing sewage systems. In 2007, Berks-Montgomery Municipal Authority completed a $2.3 million project constructing a pump station and sewerage lines to serve a	"Douglass (Mont.) Oks Sassamansville Sewer Project." The Mercury News; Berks-Montgomery Municipal Authority Sewer Revenue Bonds. Apr 20, 2015. McElwee & Quinn Financial Printing. www.mcelweequinn.com.

				community of Sassmansville which is located in Douglass and New Hanover Townships.	
Village of Branchdale	Reilly Township	Schuylkill	Muddy Branch	The Village of Branchdale has wildcat sewers and failing on-lots. Alfred Benesch has worked on an Act 537 Plan for them but it is not affordable.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015
Tamaqua	Tamaqua Borough	Schuylkill	Wabash Creek	Tamaqua Borough hired Alfred Benesch and Company to investigate wildcat sewers in Wabash Creek. A total of 101 connections were investigated - 17 had abandoned lines to Wabash Creek and were connected to the municipal sewer system. Five properties are not connected, four of which are vacant, abandoned properties with water service shut off. The remaining property is illegally discharging into Wabash Creek and has been issued several Notice of Violation Tickets and is being processed through the court system.	(Rob Jones, Tamaqua Public Works, personal communication, May 22, 2015)
South Tamaqua*	**West Penn Township**	**Schuylkill**	**Little Schuylkill**	Act 537 planning in Walker and West Penn Townships is ongoing. The existence of wildcat sewers and malfunctioning on-lot disposal systems has been confirmed. In 2016, West Penn and Walker Townships continued to work with Rettew Associates and PADEP on Act 537 planning and creating a financially feasible plan to address 30 residences in five areas in need of sewage disposal. Possible solutions include five community on-lot sewage disposals or new or repaired individual on-lot sewage disposals. **In March 2017, Walker Township's Board adopted a resolution to**	"Wildcat Sewers Exist in West Penn Township." Times News, LLC.. Apr 5, 2013.. http://www.tnonline.com/2013/apr/05/wildcat-sewers-exist-west-penn-township; "WestPenn-Walker Twp.. Sewage Plan Advances." Times News, LLC.. Mar 6, 2016. http://www.tnonline.com/2016/mar/05/west-penn-walker-twp-sewage-plan-advances **"Walker Twp. submits sewage facility plan to DEP" Times News, LLC. Jun, 3, 2017. https://www.tnonline.com/2017/jun/03/**

				advance its revised Act 537 plan to the state. In June 2017, the revised sewage facilities plan was submitted to the PADEP. The plan includes a maintenance ordinance that requires residents to have their on-lot septic systems pumped and inspected every three years. The 30 residences would either repair or replace their current system.	**walker-twp-submits-sewage-facility-plan-dep**
Albany	Albany Township	Berks	Maiden Creek	Unknown	
Port Indian	West Norriton	Mont-gomery	Schuylkill River, main stem	Unknown	

***Updated from news sources**

Appendix D: Schuylkill Action Network Annual Meeting

Schuylkill Action Network (SAN) 2017 Annual Workshop

Friday, November 3th, 9:30 am – 3:00 pm
Reading Area Community College
Reading, Pennsylvania

***One Schuylkill, Many Solutions* Program Agenda**

9:30-10:00	**Registration**
10:00	**Welcome** Rick Rogers, SAN Executive Steering Committee Chair, EPA Region III
10:15	**Meeting Overview**
10:20	**SAN Workgroup Updates** (10 mins each) o 10:20: Agriculture – Lyn O'Hare, SSM Group o 10:30: Abandoned Mine Drainage – Alexa Kramer & Bill Reichert, Schuylkill Headwaters Association o 10:40: Education & Outreach – Virginia Vassalotti, Partnership for the Delaware Estuary o 10:50: Pathogens & Point Source – Joe Hebelka, PA Department of Environmental Protection o 11:00: Recreation – Tim Fenchel, Schuylkill River Heritage Area o 11:10 Stormwater – Chris Anderson, Philadelphia Water Department o 11:20 Watershed Land Collaborative – Kate Hutelmyer, Partnership for the Delaware Estuary
11:40	**Introduction to Topical Sessions – *One Schuylkill, Many Solutions***
11:45	**A Return to the River in Manayunk** Kay Skyora, Manayunk Development Corporation
12:10	**Lunch and Networking**
12:50	**SAN MVP Award Announcement**
1:00	**Introduction to Afternoon Session – *One Schuylkill, Many Solutions***
1:05	**Recreation & Water Quality Along the River** Sarah Chudnovsky, 2017 Sojourn Steward
1:30	**Saucony Creek Success Story** Eric Grindrod, SSM Group & Larry Lloyd, Berks Nature
1:55	**Break**
2:10	**Clean Water, Good Beer: Partnerships with Local Breweries** Virginia Vassalotti, Partnership for the Delaware Estuary; Tim Fenchel, Schuylkill River Heritage Area; & Ryan Beltz, Perkiomen Watershed Conservancy
2:25	**New SAN Website "Sneak Peak"** Virginia Vassalotti, Partnership for the Delaware Estuary
2:45	**Workshop Wrap-up / Questions**
3:00	**Adjourn**

10th Anniversary of the Schuylkill Watershed Initiative Grant

Stormwater Basin Naturalization
Streambank Restoration

- SAN Bus Tour visited two original sites
  - Spring Ford High School
  - Brookside Country Club
- 2004-2007: $1.15M EPA grant; leveraged $1.5M overall $3M
- Over 40 projects
  - Acid mine drainage
  - Agricultural remediation
  - Stormwater runoff improvements
- Started the SAN!

Schuylkill River Restoration Fund

SRRF grant announcement at Meadowood Retirement Community

- 2017: $364K awarded; $1.2M leveraged for 11 projects
- Over 95 projects since 2006
  - Acid mine drainage
  - Agricultural remediation
  - Stormwater runoff improvements
  - High priority land protection
- **$3.3 million contributed from sponsors; $5.9 M leveraged funds for total of $9.2M**

Schuylkill River Restoration Fund

- **A SPECIAL THANKS TO THE SPONSORS:**
  - Exelon Nuclear Corporation
  - Philadelphia Water Department
  - Aqua Pennsylvania
  - Partnership for the Delaware Estuary
  - Mom's Organic Market

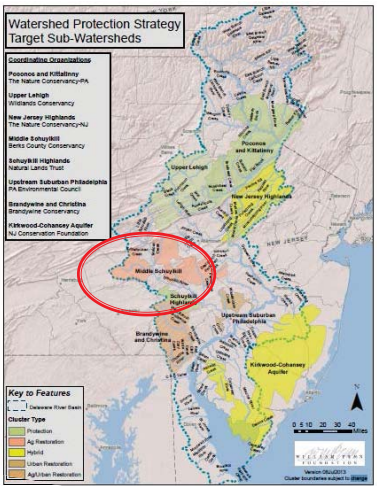
and the Delaware River Basin Commission

The William Penn Foundation - Delaware River Watershed Initiative

Phase 1: 2013-2016
- $35M+ William Penn Foundation
- **8 watershed clusters**
  - **Middle Schuylkill $882K**
  - **Schuylkill Highlands $1.7M**

Planning year: 2017
- Same clusters
- Fund ongoing projects
- Develop 6 year plan

Phase 2: 2018-2021
- **Middle Schuylkill $1M**
- **Schuylkill Highlands $1.9M**
- Fund for 3 year with additional 3 years possible



Schuylkill Trail Investments

- Trail Goal: 130 miles Philadelphia-Schuylkill County
  60 miles complete
- $6.7M Bartram's Mile- Opened April 2017
- $1.2M trail expansion to Pottstown- October 2017

47th "Head of the Schuylkill" Regatta

- Since 1874, the Head of the Schuylkill is the **largest regatta** in Philadelphia, 2nd largest in the US
  - 240 rowing organizations; 9K rowers; 40K spectators; 350 volunteers
- **US Rowing's "Row for Clean Water"**
- 3rd year: PWD partner to provide reusable water bottles
  - Permanent water kiosks for refills along Kelly Drive and Schuylkill River
  - Goal: Full reliance on reusable water bottles
    - A Model for other regattas and events
- **19th Annual Schuylkill SOJOURN- 2017**
  - 112 miles; 221 kayakers

One Schuylkill: SAN Workgroup Solutions

Agriculture

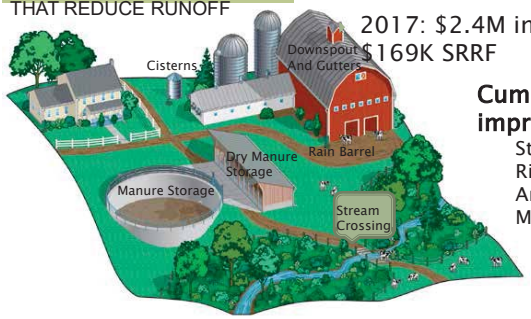
- **Investments in Ag Solutions**:
  - USDA National Water Qual Initiative ($691K)
  - William Penn Foundation ($1.5M)
  - Regional Conservation Partnership Program ($13 M basin-wide, $1.2M PA)
  - Schuylkill River Restoration Fund ($100,000-$200,000 annually)
  - Possible 319 funding through WIP

2017: $2.4M invested; 18 projects; $169K SRRF

Cumulatively 257 farm improvement projects!!

Streambank fencing
Riparian buffer plantings
Animal crossings
Manure storage basins

AN EXAMPLE FARM SHOWING AGRICULTURAL PRACTICES THAT REDUCE RUNOFF

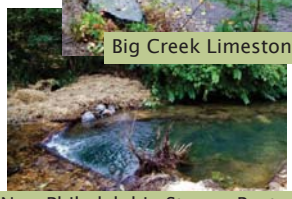


Abandoned Mine Drainage

- Treatment systems
  - Silver Creek
  - Mary D Borehole
  - Bell Collery
- Habitat Restoration
  - Big, Dyer, and West Creeks
    - Limestone dosing to increase Ph level to support aquatic life
  - New Philadelphia
- In past 3 yrs. $1.3M invested; 11 projects
- **Cumulatively more than $14 million invested into nearly 46 projects**

Treatment Ponds

Big Creek Limestone Dosing



New Philadelphia Stream Restoration

Pathogens and Point Source

- Outreach
  - Focus on sharing information among partners and developing new partners
  - Improve discharger/water supplier communication of events and the use of the Early Warning System

Delaware Valley Early Warning System

- Featured in AWWA's source water protection guidance
- System: 11 yrs.; 359 users across 50 organizations
- Major updates to user interface
- **Over 284 water quality events since inception**

Land Protection

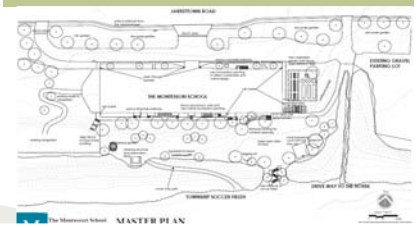
- Delaware River Watershed Initiative
  - $1.7M Schuylkill Highlands cluster
  - 2,036 acres protected
  - Continue to train "Schuylkill Water Stewards" voluntary water quality monitoring program
- **Land Transaction Assistance Program**
  - 2017, 3 grants protecting 242 acres
  - **Cumulatively, 16 grants protecting 1,746 acres of high value land**
  - 17.5% of Schuylkill Watershed is permanently protected

Stormwater

- 2013–2017: $513K SRRF for 16 stormwater projects
- **Cumulatively $21 million invested in over 200 projects**
  - Swales, Rain gardens
  - Naturalized basins
  - Green roofs
  - Tree plantings along stream
  - Streambank stabilization
- Schuylkill Action Students
  - 23 projects since 2011
  - $220K grants with $127K leveraged support
  - Stormwater solutions on school campuses

Rain Garden BMP

SAS Project: Final Montessori School Plan



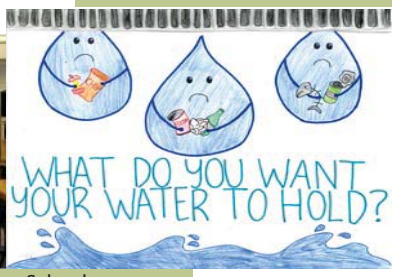
Education & Outreach

Schuylkill Scrub

Schuylkill Scrub Stats

Schuylkill watershed:
1,752 cleanups
28K volunteers
784K lbs of trash!

Street Art Contest 1st place



2017 Protecting Our Water Award Miquon School

Recreation

- 2016–2021 Strategic Plan
  - New workgroup formed based on feedback during strategic planning listening sessions
- Vision
  - Engage recreational users of the water in activities that lead to increased awareness and advancement of watershed protection and restoration strategies
- Example: SAN Sponsored Sojourn Steward to perform water quality testing

Sojourn Steward

SAN KEYS TO SUCCESS

✓ **Leverage Resources**
Continue to leverage a multitude of funding programs and multiply the benefit, e.g. NWQI, CREP, SRRF, DRWI Phase 2($2.9M: Middle and Schuylkill Highlands clusters)

✓ **Collaboration**
- Keep working to expand partnerships, e.g. Recreation workgroup
- Continue SAN leadership in clusters

SAN KEYS TO SUCCESS

✓ **Visible Projects**
- Continue focus on sponsoring on the ground projects with tangible results
  - ➢ Over $413M overall investment in the past decade

✓ **Outreach**
- New SAN website
- Social Media
- Materials– guides
- Events e.g. Scrub, Street Art

SAN SALUTES YOU!

Ag Workgroup 2017 Update

Delaware River Watershed Initiative

- The Middle Schuylkill Cluster was very active with DRWI funding and partners – this update focus is on work in the Manor Creek Watershed in Berks County.

SSM

Examples of Projects in Manor Creek

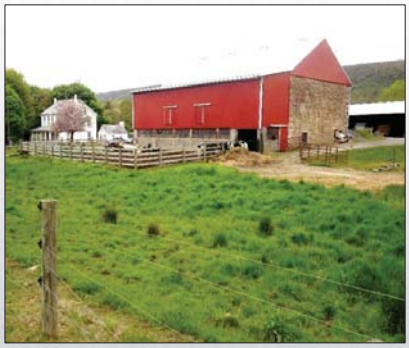
- ❑ Inadequate or no liquid manure storage
- ❑ Hauling/spreading manure DAILY
- ❑ 3 farm operations
- ❑ Conduit to groundwater

FAILED PRACTICES

SSM

Examples of Projects in Manor Creek

- ❑ Heavy-use and barnyard areas
- ❑ No containment of manure
- ❑ Stormwater runoff contact
- ❑ Surface and groundwater vulnerable to contaminated stormwater



FAILED PRACTICES

SSM

Examples of Projects in Manor Creek

- ❑ Inadequate dry manure storage and outdoor stacking
- ❑ Stormwater runoff contact
- ❑ Surface and groundwater vulnerable to contaminated stormwater

FAILED PRACTICES

SSM

- ❑ Engineered cement liquid manure storage
- ❑ Fenced 6-month storage capacity
- ❑ Manure transfer from barn for proper timing of application

INSTALLED PRACTICES

SSM

- Engineered dry manure storage
- 4-month storage capacity in stack shed, and 2-month capacity in bedded pack
- Allows proper timing of application

INSTALLED PRACTICES

SSM

- Cemented barnyard/heavy use area
- Curbed perimeter and gravity sloping to direct contaminated stormwater into storage or collection tank

INSTALLED PRACTICES

SSM

- Streambank fencing and riparian buffer installation
- 2,530 feet of streambank fencing with 50' riparian buffer
- 1,480 feet of stream length
- 2.9 acres of buffer area

INSTALLED PRACTICES

SSM

- Grassed waterway directing stormwater from heavy use areas and manure storage areas.
- This will minimize soil erosion and movement of nutrients.

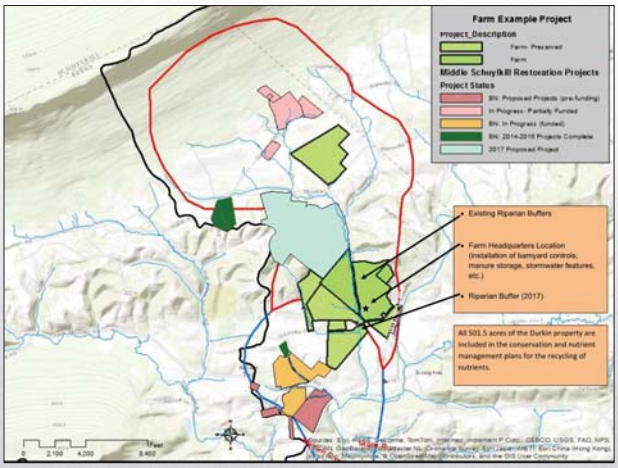
INSTALLED PRACTICES

SSM

- Series of projects are modeled on the success of work and partnerships in the Saucony Creek.
- Stay Tuned!

Future Work in Manor Creek Watershed

SSM



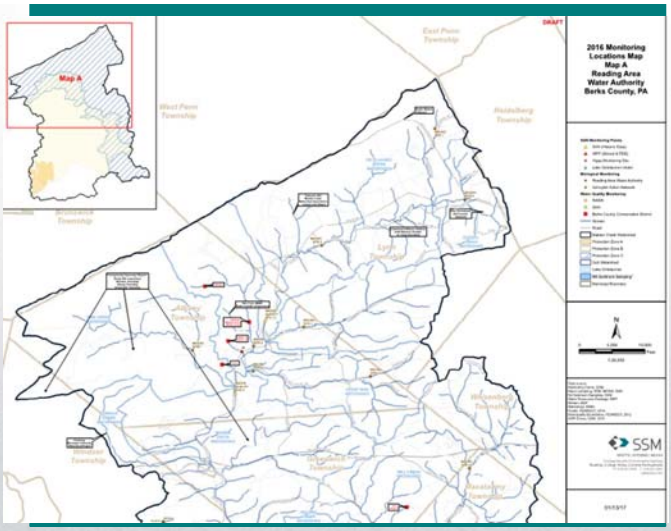
SSM

Maiden Creek Water Quality Monitoring

- With the full support of Reading Area Water Authority, the monitoring partners decided to combine resources and create maps that included all the chemical and biological monitoring points in the Maiden Creek Watershed.

- The maps include project sites in the Schuylkill Watershed Initiative Grant, the Berks County Conservation District, and sites from the DRWI.
- The group plans to meet in early 2018 to update the maps.

SSM



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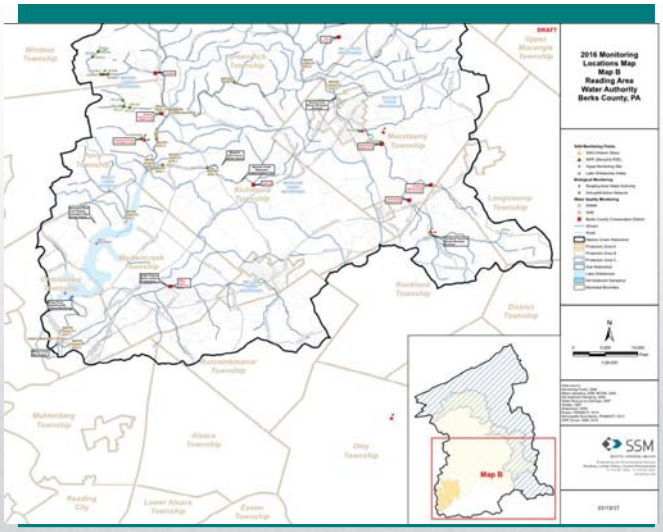


SSM

Berks County Source Water Protection Program

In 2016, the Berks County Water & Sewer Association and the Berks County Planning Commission were interested in developing a County-wide program to combine source water protection and stormwater management activities.

Organizations then can provide assistance that crosses both watershed and municipality boundaries. This was accomplished with some funding from SWPTAP.

69 Community Water Systems in Berks County – serves 70%

- 17 CWS covered by an Approved plan
- 4 systems have a plan in progress
- 6 small systems (<500 people) with completed plan
- 2 small systems have a plan in progress

- 29 systems with Plan in Berks County, covers 266,000 people

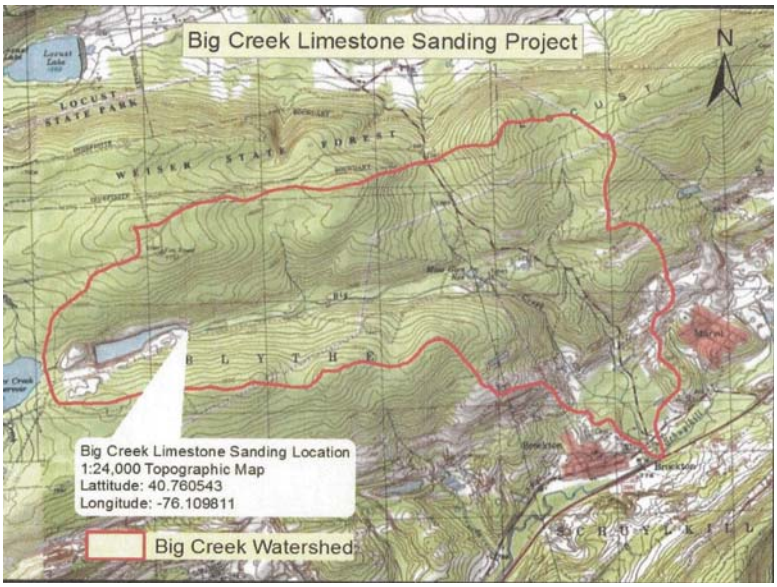
SSM

QUESTIONS?

SSM

Big Creek
Limestone Sanding Project

Schuylkill Action Network
Abandoned Mine Drainage Workgroup



Big Creek Watershed Coldwater Conservation Plan

Prepared for:
Schuylkill Headwaters Association, Inc.

With Funding BY:
Coldwater Heritage Partnership

Prepared by:
RETTEW Associates, Inc.
950 East Main Street, Suite 220
Schuylkill Haven, PA 17972
(570) 385-2270

Big Creek Watershed

- Drainage area encompasses 3.67 square miles
- Includes approx. 8.46 miles of streams
- Water quality designation of CWF, MF
- Not a naturally reproducing trout stream (PFBC)
- Historic land use includes anthracite coal mining and timber harvesting
- Currently used as a municipal water source and for outdoor recreation

Limestone Sanding Formulas

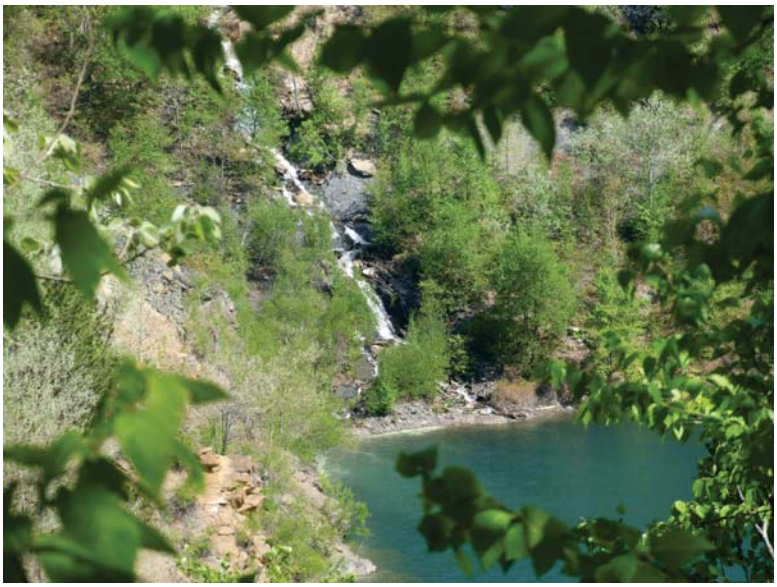
- West Virginia Formula
- Clayton Formula
- Virginia (Downey) Formula
- USGS (Chuck Cravotta) Formula

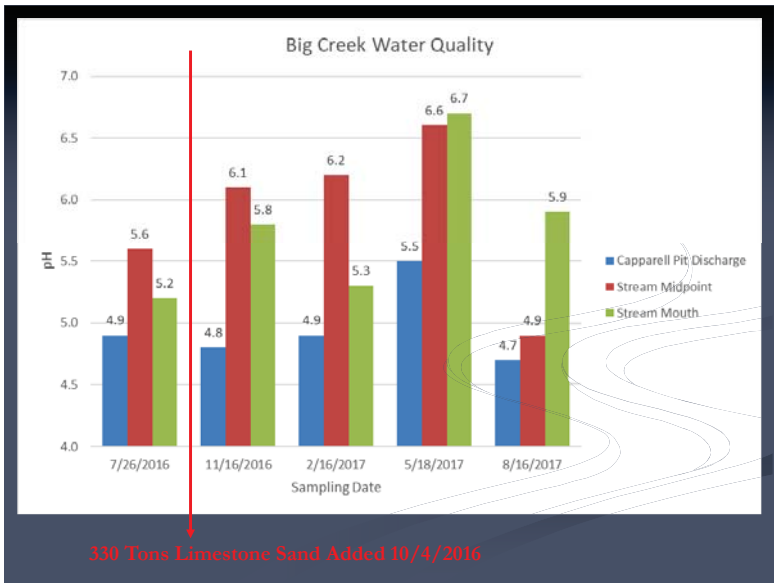
West Virginia formula

- Drainage area encompasses 3.67 square miles
- Multiplied by 0.05 tons/acre
- = limestone sand applied (tons)
  - 640 acres / square mile = 2,349 acres
  - 2,349 ac. X 0.05 = 118 tons

All of the literature indicates the dosage should be doubled in the first year / application

High purity limestone delivered from State College




Big Creek Water Quality
7.0
6.5
6.0
5.5
5.0
4.5
4.0
pH
4.9
5.6
5.2
4.8
6.1
5.8
4.9
6.2
5.3
5.5
6.6
6.7
4.7
4.9
5.9
7/26/2016
11/16/2016
2/16/2017
5/18/2017
8/16/2017
Sampling Date
Capparell Pit Discharge
Stream Midpoint
Stream Mouth
330 Tons Limestone Sand Added 10/4/2016

Education and Outreach Workgroup

2017 SAN Annual Meeting

Workgroup Chair: Virginia Vassalotti, PDE

Protecting Our Water Awards (POW)

- Formerly: Schuylkill Scholastic Drinking Water Awards
- Award 3 schools for their efforts in protecting source water

National Drinking Water Week

- First week in May
- Bridging the gap:
  - Watershed restoration and protection
    - TO....
  - Source water protection

The Miquon School

- Direct tributary of the Schuylkill in Conshohocken
- Stream restoration completed by Biohabitats
  - Funded by DEP Growing Greener and school fundraising efforts
- Leaf pack studies and watershed artwork by students

Credit: The Miquon School

Stream Restoration at the Miquon School

Credit: Biohabitats

Stream Restoration at the Miquon School

Credit: Biohabitats

Schuylkill Haven Area High School

- **Headwaters of the Schuylkill River**
- **Biology Club activities (100 students)**
  - Toured Silver Creek AMD Treatment Site
  - Planted trees
  - Volunteered at Schuylkill Scrub cleanups

The Montgomery School

- **Pickering Creek Watershed (Chester County)**
- **Trout in the Classroom**
- **Water Audits**
- **Water Quality Monitoring**

Nominate a School in 2018!

- **Nominations sent out February – March**
  - Available on SAN website
  - Survey monkey form
- **Awards given in May**
- **Any school is eligible:**
  - **Elementary-high, colleges/universities**
  - **Public and private**

Let's Collaborate

Virginia Vassalotti
Schuylkill Action Network Coordinator
(302) 655-4990, x121 | DelawareEstuary.org

Connecting people, science, and nature for a healthy Delaware River and Bay

SAN Pathogens & Point Source Workgroup Update

Chair: Joe Hebelka, P.G., PADEP

SAN Annual Meeting
Reading Area Community College
November 3, 2017

Workgroup Strategic Goal

Facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding the Clean Water Act and Safe Drinking Water Act goals.

Strategic Actions

1. Strengthen communication between and provide educational resources to wastewater and drinking water utilities to improve source water protection efforts.
2. Facilitate data and information sharing to document wastewater treatment technologies, improvements, and other pertinent source water protection information.
3. Investigate evolving source water issues, such as unregulated contaminants, and develop a better understanding of what these issues mean for water suppliers' source water protection strategies.
4. Promote pathogen and point source successes and understanding of pathogen water quality issues and solutions to target audiences in the watershed.

Workgroup Members

PENNVEST
PENNSYLVANIA INFRASTRUCTURE INVESTMENT AUTHORITY

PARTNERSHIP FOR THE DELAWARE ESTUARY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Schuylkill Action Network
CELEBRATING 10 YEARS

AQUA

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

READING AREA WaterAuthority

PHILADELPHIA WATER

A Forum for Communication around Discharge Issues

- Philadelphia Water is required by the state to do a Watershed Sanitary Survey
  - Identify sources of Cryptosporidium and pathogens in the Watershed
- Data collection for the Watershed Sanitary Survey was through the SAN Pathogens workgroup
  - WWTP flows and treatment technologies
  - Status of wildcat sewers and CSOs
  - Status of Act 537 plans (municipal sewerage planning)

Outreach Assistance for Wastewater Utilities

- Developing an outreach piece – what not to put down the drain
- Online resource through the new SAN website
- WWTP can purchase copies to print as mailers/rack cards

Early Warning System

- 2017 Updates (as of 10/10/17):
  - 16 events reported in 2017 **all reported as low risk*
  - 359 registered users
  - 50 organizations represented
  - Featured in AWWA's source water protection guidance*
- Planned for 2018
  - Major updates to EWS user interface

Delaware Valley Early Warning System

*AWWA (2017). Source Water Protection Operational Guide to AWWA Standard G300

Next Meeting

Wednesday, January 10th

10 AM – 12 PM

DEP Reading Office

SAN Recreation Workgroup

Workgroup Chair:
Tim Fenchel, Schuylkill River Heritage Area

Recreation Workgroup

- Newest workgroup
- Result of SAN Strategic Planning sessions
  - SAN 5 Year Strategic Plan (2016-2020)

Workgroup Goal

Engage recreational users of the watershed in activities that lead to increased awareness and advancement of watershed protection and restoration strategies.

Potential Projects

- Water refill stations along trails
  - Working with local water suppliers
- Educational signage along trails
- Promo video
- Develop a webpage on the new SAN website

Credit: Philadelphia Water Department

Recreation Summit

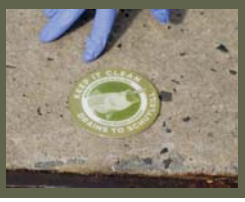
- **When**: February/March 2018 (exact date TBD)
- **Where**: Pottstown, PA
- **Why**: Gather feedback from various recreational users to guide the work for this workgroup

Anyone Can Join!

Contact:
Virginia Vassalotti at
VVassalotti@DelawareEstuary.org
OR
Tim Fenchel at tfenchel@schuylkillriver.org

STORMWATER WORKGROUP





November 3, 2017

Schuylkill Action Network Annual Meeting

A Year of Transition

- New workgroup co-chairs!
- Revised workplan
- Strategic Planning
  - Our Partners
  - Current and emerging challenges for stormwater management

Revised Workplan


Schuylkill Action Network (SAN)
Stormwater Workgroup 2017 Workplan

- Renewed Collaboration
- Prioritization
- Schuylkill Action Students
- Municipal Engagement

Strategic Planning

- Understanding our partners
- MS4
- Utilizing technology
- Greater collaboration within the SAN

Schuylkill Action Students

Engaging students in managing stormwater on school campuses

- Ongoing collaboration with E&O Workgroup
- Stormwater Workgroup responsible for technical assistance to implement BMPs
- Projects benefit MS4 communities

2017 Accomplishments

West Vincent Elementary School Basin Naturalization (Green Valleys)
Phoenixville Area Middle School Rain Garden (Green Valleys)
The Montessori School Green Master Plan and Implementation
Pottsgrove High School Garden Improvements (PDE and MCCD)

23 Projects | $220K Grant Funding | $127K Match

Pottsgrove High School

Project Steps

1. Funding from 3M
2. Pottsgrove teacher looking for project
3. Site visit by PDE and MCCD revealed failed rain garden
4. MCCD completed re-design
5. PDE coordinated education and plantings
6. School maintenance staff performed construction with MCCD oversight
7. Students performed plantings
8. PDE installed signage

Pottsgrove High School

Next Steps

- Review our list of members & partners
- Alignment of goals between organizations
- Explore new opportunities, partners & projects
- Seek project funding

Chris Anderson
Watersheds Program Manager
Philadelphia Water Department
Christopher.Anderson@phila.gov
215-683-3238

Krista Scheirer
Environmental Specialist
Aqua Pennsylvania, Inc.
KEScheirer@aquaamerica.com
610-645-1184

Watershed Land Collaborative

2017 Updates

Partnership for the DELAWARE ESTUARY

Watershed Land Collaborative

- **Work Group Mission**
  - To promote a sustainable landscape in the Schuylkill River Watershed through strategic conservation and efficient land use and management to protect the integrity of water supplies for future generations

WLC Partner Organizations

- *Partnership for the Delaware Estuary*
- *Natural Lands Trust*
- *Berks Nature*
- *Green Valleys Watershed Association*
- *French and Pickering Creek Conservation Trust*
- *National Audubon Society*
- *Montgomery County Conservation District*
- *Chester County Department of Open Space Preservation*
- *Stroud Water Research*
- *Berks County Planning Commission*
- *William Penn Foundation*
- *Philadelphia Water Department*
- *Delaware Valley Regional Planning Commission*

Work Group Goals

- **Integrate the efforts of nonprofit organizations, state and federal agencies, local governments, and others around conservation**
- **Identify high priority, high value lands throughout the watershed for preservation**
- **Diminish redundancies, improve efficiencies, and fully capitalize on resources and expertise**
- **Transfer knowledge, successes, and strategies for conservation throughout the watershed**

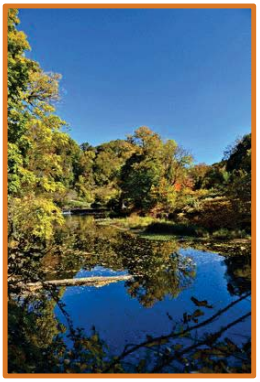


Photo Credit: Autumn Bener

WLC/DRWI Update

- **WLC & DRWI: Schuylkill Highlands Cluster**
  - Overlapping partners
    - Partnership for the Delaware Estuary, Natural Lands, Berks Nature, Green Valleys Watershed Association, French and Pickering Creek Conservation Trust, National Audubon Society, Stroud Water Research Center
  - Compatible Goals
    - Phase 1 (2014 – 2017): Permanently protect at least 1,350 acres of high priority lands
      - **To date, 2,036 acres protected through conservation easements**
      - Another 2,375 acres in development

Photo Credit: Jeff Oates

Success Story: Bryn Coed

- **Bryn Coed Farms Property – 1,505 acres total**
  - West Vincent, West Pikeland, & East Pikeland Twps. (Chester County)
    - Current zoning = almost 700 homes
    - 17% of the remaining unprotected high priority lands in the Pickering Creek watershed
    - 500 acres of mature woodland, headwaters of the Pickering Creek, high biological diversity
  - Natural Lands executed agreement of sale in Sept. 2016
    - Planned 500 acre natural preserve
    - Remaining acres converted to large conservation properties for private individuals under conservation easements

Photo Credit: Alessandra Manzotti

Photo Credit: Alessandra Manzotti

Photo Credit: Alessandra Manzotti

Photo Credit: Natural Lands

Success Story: 16 Years LLC

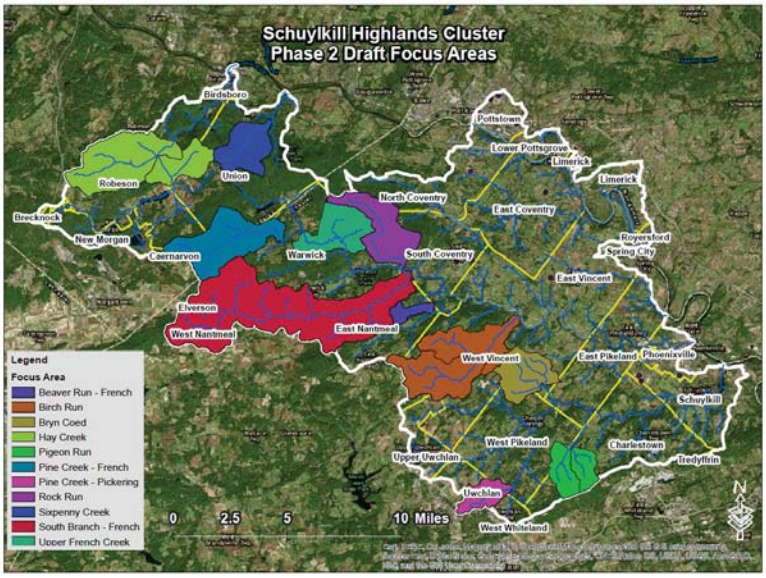
- **16 Years Properties – 100 acres total**
  - West Vincent Twp. (Chester County)
    - Two 50 acre parcels slated for high density development in 2000
    - **Directly adjacent to Bryn Coed property**
    - Acres of mature woodlands, pasture, French Creek tributaries, and potential bog turtle habitat
  - Neighbors working together
    - French and Pickering Creeks Conservation is working with three neighbors to purchase the property
      - 30 residential rights will be eliminated through conservation easement

Photo Credit: Pam Brown

Photo Credit: Pam Brown

Moving Forward

- **DRWI Phase 2 in the Schuylkill Highlands**
  - Cluster plan approved by Foundation in October
  - Goals for 2018-2021
    - Build on Phase 1 successes
    - 2,911 acres protected
      - 1,126 acres of priority forest lands
      - 8 miles of riparian buffer
    - Supported by diverse "complementary" strategies
      - Citizen Science
      - Municipal planning & ordinance work
      - School programs/outreach
      - External partner engagement



Preservation Paves the Way

- **Successful preservation lays the groundwork for restoration**
  - New opportunities for agricultural & stormwater BMP projects
    - Targeting hotspots in high quality landscapes
    - New opportunities to capitalize on partner resources & expertise, and pull new funding sources into the region
      - Partnering across SAN work groups
  - Restoration Goals for 2018-2021
    - 630 acres of agricultural lands with new BMPs
    - 10+ acres of stormwater management BMPs in urbanized landscapes
      - Commercial & Residential

Photo Credit: Carol Brightbill

Let's Collaborate

Kate Hutelmyer
Watersheds Program Manager
khutelmyer@delawareestuary.org
(302) 655-4990, x109 | DelawareEstuary.org

Connecting people, science, and nature for a healthy Delaware River and Bay

A Return to the River in Manayunk

The River and the Canal

Trails and Watershed

Kay Sykora, Destination Schuylkill River

Manayunk Development Corporation

Manayunk 1978

- Canal and Trail under reconstruction
- Original towpath under the tracks on the right
- New path being constructed with fill on the left
- Venice Island was created with fill on wetlands
- Venice Island was entirely industrial
- Last industry is in the process of leaving

The canal was seen as an Economic Opportunity for an Aging Industrial Community

But it became so much more….

Opportunity for:

- Trails
- Watershed mitigation
- Watershed interpretation
- Education
- Better quality of life
- River access
- Economic development

In the beginning the projects were mostly physical improvements

More projects

Projects continued

Education became critical

Initially people were harming the wildlife
Leaving trash and debris along the trail

Volunteers made a difference

The trails and green space became a community builder

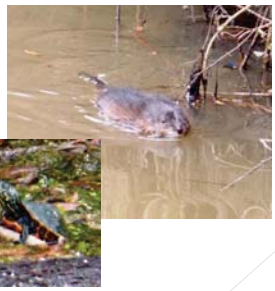
Community Planning – result of community interest

- Original planning was for the waterfront, the trails and the watershed in the Lower Northwest
- Requests from community resulted in extensive watershed preservation planning for the Shawmont area and Germany Hill
- In total 5 plans were developed around the Schuylkill Watershed and the adjacent communities.
- This work was incorporated into the City of Philadelphia's Planning for the Lower Northwest. Immediate results included:
  - Remapping of some of the zoning code in the Shawmont section
  - Resolution of zoning and land use for parts of Germany Hill

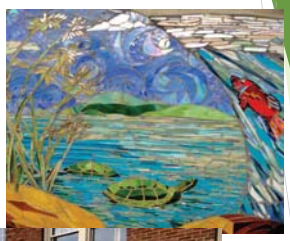
Results

Recreation on the River

Now have extensive wildlife in a very urban context… fox, wide range of birds, beaver ….cutting down trees



creative projects



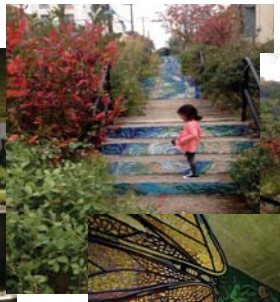
Plantings by volunteers

- Large Projects

Manayunk Bike and Pedestrian bridge

PWD Projects – Tank, Pumping Station, theater and rain gardens

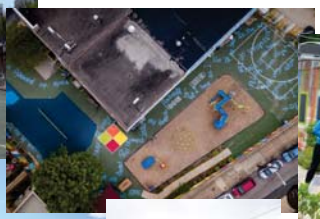
PWD Project

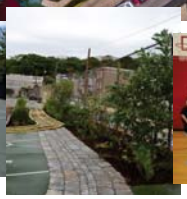


Fountain St Steps

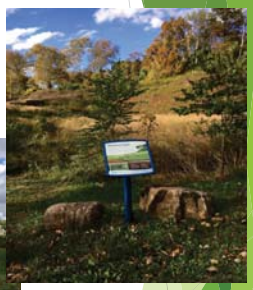
Canal Trail Murals

North Light Community Center Raingarden





Shawmont Stormwater Project



Roxborough Pocket Park

epaving a parking

Lot

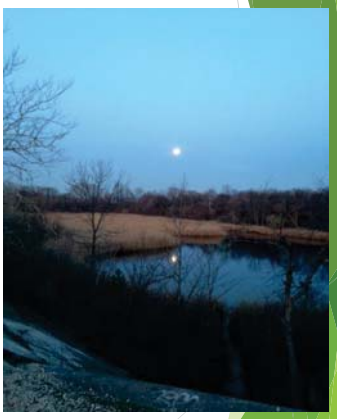
garden

Educational signage

Community gathering area

Roxborough Reservoir

- A project of many partnerships
- Schuylkill Heritage Area-planning
- Fairmount Park
- Philadelphia Water Dept.
- Local Volunteer groups



What has helped tell the story of the Watershed

- Education – initially in the 5 Manayunk Schools, but later in all the local schools.
- Planning in 3 schools and the local community center for watershed focused plans for the their school yards. Partnered with educational programming
- One school and the community center are implementing their plans
- Volunteerism – fostered and supported along the trail and local green projects.
- Murals that tell the watershed story, in many areas and most recently in Roxborough at the crest between the Schuylkill and Wissahickon.

Lets not forget Economic Development

- 7 major apartment complexes, built, being built or being planned along the trail.
- New housing being built in every square inch of the community
- Picture on the right shows:
  - Old Keeley Lumber – now condos
  - Old Blankin Yarn and NAMICO Soap – now apartments
  - At the far end of the picture the PaperWorks paper company just closed. Involves 30 acres of land.

Schuylkill Sojourn: 7 days, 200+ people, 112 miles, 1 river

Port Clinton

Auburn Desilting Basin

The Chutes!

The Chutes!

pH

Location	pH
Schuylkill Haven (morning)	7.71
Port Clinton (morning)	7.62
Port Clinton (evening)	7.55
Hamburg (lunch)	7.56
Muhlenberg (evening)	8.03
Reading (lunch)	7.87
Gibralter (evening)	7.87
Gibralter (morning)	7.82
Morlatton Village (lunch)	7.85
Pottstown (evening)	8.07
Pottstown (morning)	7.97
Mont Clare (evening)	7.88
West Conshohocken (evening)	8.08
Philadelphia Canoe Club (lunch)	8.02

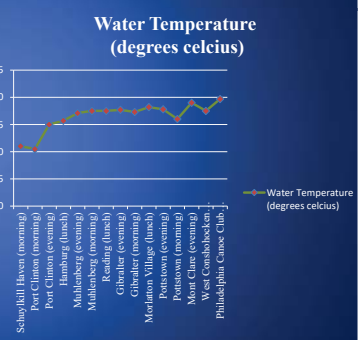
Jim Dietrich Park

Location	Dissolved Oxygren (mg/L)
Schuylkill Haven (morning)	9.6
Port Clinton (morning)	7.8
Port Clinton (evening)	8.4
Hamburg (lunch)	8.2
Muhlenberg (evening)	8
Muhlenberg (morning)	7.4
Reading (lunch)	8
Gibralter (evening)	7.4
Pottstown (evening)	6.4
Pottstown (morning)	7.2
Mont Clare (evening)	5
West Conshohocken (evening)	7.6
Philadelphia Canoe Club (lunch)	7.8

Dissolved Oxygen

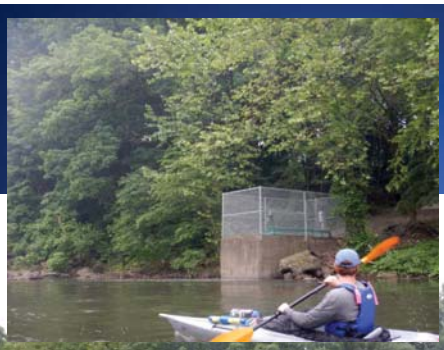
Temperature

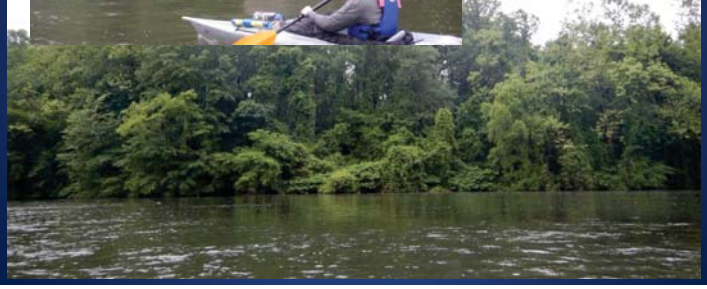
Location	Water temp(Celcius)
Schuylkill Haven (morning)	11
Port Clinton (morning)	10.5
Port Clinton (evening)	15
Hamburg (lunch)	15.7
Muhlenberg (evening)	17.1
Muhlenberg (morning)	17.5
Reading (lunch)	17.5
Gibralter (evening)	17.7
Gibralter (morning)	17.3
Morlatton Village (lunch)	18.2
Pottstown (evening)	17.8
Pottstown (morning)	16
Mont Clare (evening)	19
West Conshohocken (evening)	17.5
Philadelphia Canoe Club (lunch)	19.7



Crazy Hat Day

Lock 60 and Paddling the Schuylkill Canal

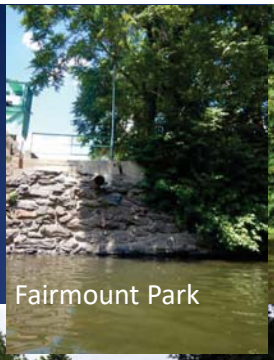




Macroinvertebrate testing in the Allegheny Creek

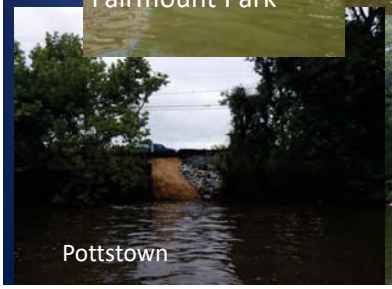
Macroinvertebrate testing in the Allegheny Creek

Reaching more urban areas



Fairmount Park

Royersford

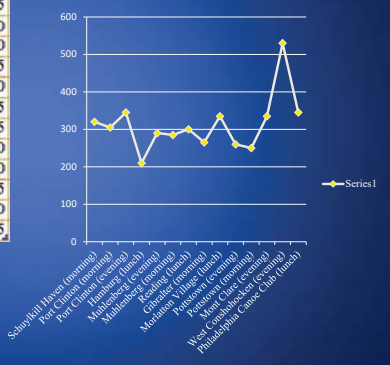


Pottstown

Reading

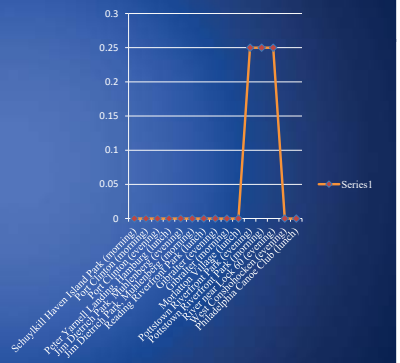
Location	Conductivity
Schuylkill Haven (morning)	320
Port Clinton (morning)	305
Port Clinton (evening)	345
Hamburg (lunch)	210
Muhlenberg (evening)	290
Muhlenberg (morning)	285
Reading (lunch)	300
Gibralter (morning)	265
Morlatton Village (lunch)	335
Pottstown (evening)	260
Pottstown (morning)	250
Mont Clare (evening)	335
West Conshohocken (evening)	530
Philadelphia Canoe Club (lunch	345

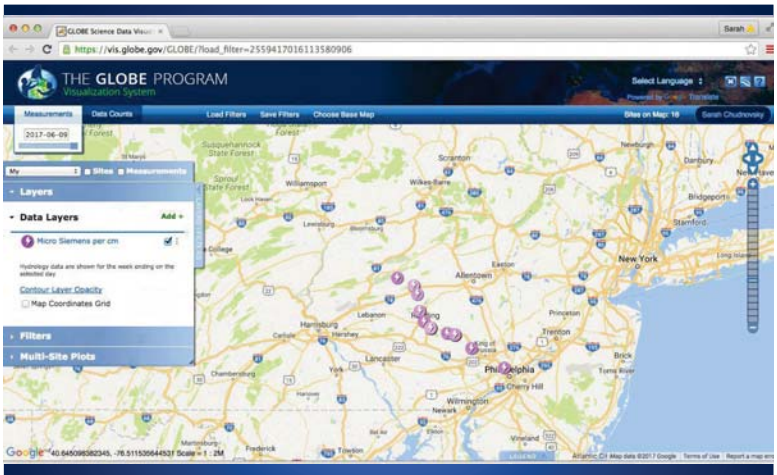
Conductivity



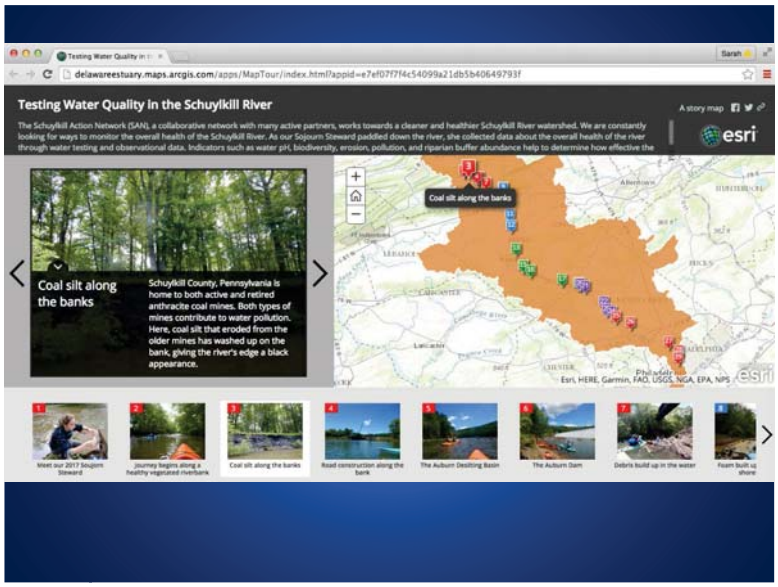
Nitrates

Location	Nitrates (mg/L)
Schuylkill Haven Island Park (morning)	0
Port Clinton (morning)	0
Port Clinton (evening)	0
Peter Yarnell Landing, Hamburg (lunch)	0
Jim Dietrich Park, Muhlenberg (evening)	0
Jim Dietrich Park, Muhlenberg (morning)	0
Reading Riverfront Park (lunch)	0
Gibralter (evening)	0
Gibralter (morning)	0
Morlatton Village (lunch)	0
Pottstown Riverfront Park (evening)	0.25
Pottstown Riverfront Park (morning)	0.25
River near Lock 60 (evening)	0.25
West Conshohocken (evening)	0
Philadelphia Canoe Club (lunch)	0

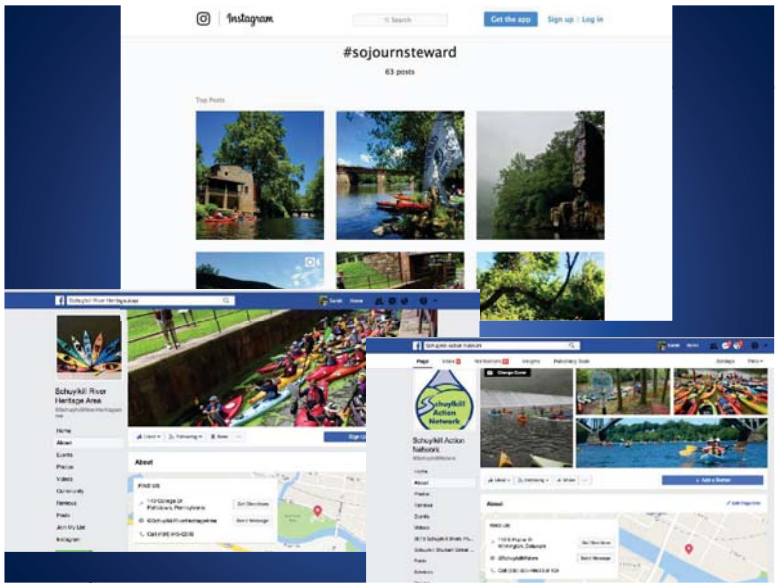




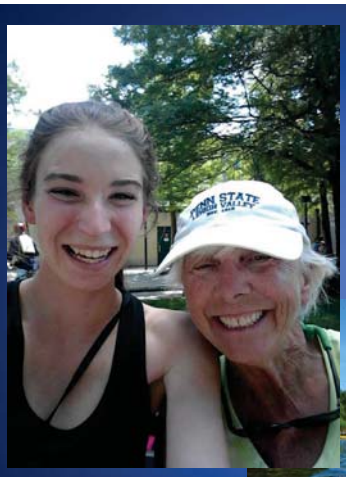
Globe.gov


Testing Water Quality in the Schuylkill River
delawareestuary.maps.arcgis.com/apps/MapTour/index.html?appid=e7ef07f7f4c54099a21db5b40649793f
Testing Water Quality in the Schuylkill River
A story map
esri
The Schuylkill Action Network (SAN), a collaborative network with many active partners, works towards a cleaner and healthier Schuylkill River watershed. We are constantly looking for ways to monitor the overall health of the Schuylkill River. As our Sojourn Steward paddled down the river, she collected data about the overall health of the river through water testing and observational data. Indicators such as water pH, biodiversity, erosion, pollution, and riparian buffer abundance help to determine how effective the
Coal silt along the banks
Schuylkill County, Pennsylvania is home to both active and retired anthracite coal mines. Both types of mines contribute to water pollution. Here, coal silt that eroded from the older mines has washed up on the bank, giving the river's edge a black appearance.
Coal silt along the banks
Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS
esri
Meet our 2017 Sojourn Steward
Journey begins along a healthy vegetated riverbank
Coal silt along the banks
Road construction along the bank
The Auburn Desilting Basin
The Auburn Dam
Debris build up in the water
Foam built up shore


Coal silt along the banks


Instagram
Get the app
Sign up | Log in
#sojournsteward
63 posts
Schuylkill River Heritage Area
About
Schuylkill Action Network
About

Philadelphia Canoe Club

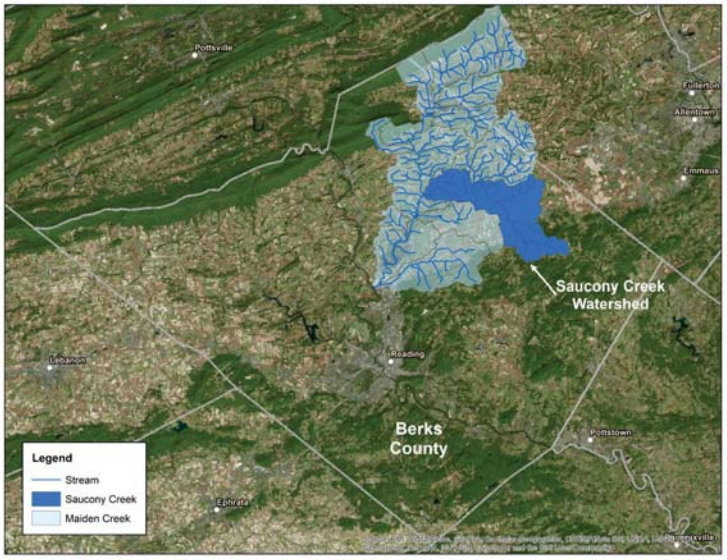


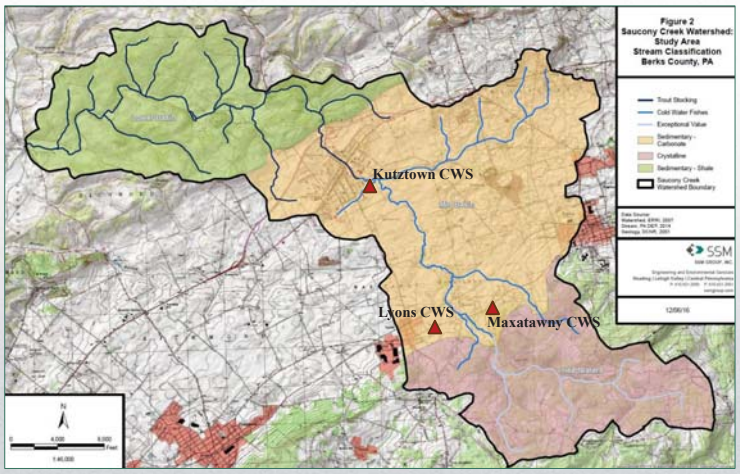
Location	Coordinates	Time (EST))	Water temp C	DO (mg/L)	Conductivity	pH	Nitrates (mg/L)
Schuylkill Haven Island Park (morning)	*Latitude 40.633096, Longitude -76.173857*	8:10	11	9.6	320	7.71	0
Port Clinton (morning)	*Latitude 40.578434, Longitude -76.028348*	19:00	10.5	7.8	305	7.62	0
Port Clinton (evening)	*Latitude 40.578434, Longitude -76.028348*	8:55	15	8.4	345	7.55	0
Peter Yarnell Landing, Hamburg (lunch)	*Latitude 40.5204, Longitude -75.9979*	13:45	15.7	8.2	210	7.56	0
Jim Dietrich Park, Muhlenberg (evening)	*Latitude 40.402926, Longitude -75.972873*	19:30	17.1	8	290	8.03	0
Jim Dietrich Park, Muhlenberg (morning)	*Latitude 40.402926, Longitude -75.972873*	8:08	17.5	7.4	285	n/a	0
Reading Riverfront Park (lunch)	*Latitude 40.333807, Longitude -75.937181*	13:15	17.5	8	300	7.87	0
Gibraltar (evening)	*Latitude 40.288942, Longitude -75.875849*	21:00	17.7	7.4	n/a	7.87	0
Gibraltar (morning)	*Latitude 40.288942, Longitude -75.875849*	9:00	17.3	n/a	265	7.82	0
Morlatton Village (lunch)	*Latitude 40.250952, Longitude -75.726494*	11:50	18.2	n/a	335	7.85	0
Pottstown Riverfront Park (evening)	*Latitude 40.241542, Longitude -75.654363*	17:40	17.8	6.4	260	8.07	0.25
Pottstown Riverfront Park (morning)	*Latitude 40.241542, Longitude -75.654363*	9:00	16	7.2	250	7.97	0.25
River near Lock 60 (evening)	*Latitude 40.145345, Longitude -75.508964*	20:40	19	5	335	7.88	0.25
West Conshohocken (evening)	*Latitude 40.073506, Longitude -75.314828*	18:45	17.5	7.6	530	8.08	0
Philadelphia Canoe Club (lunch)	*Latitude 40.013281, Longitude -75.207584*	12:00	19.7	7.8	345	8.02	0

Saucony Creek Success Story

Investing in Farms for Clean Water

SSM





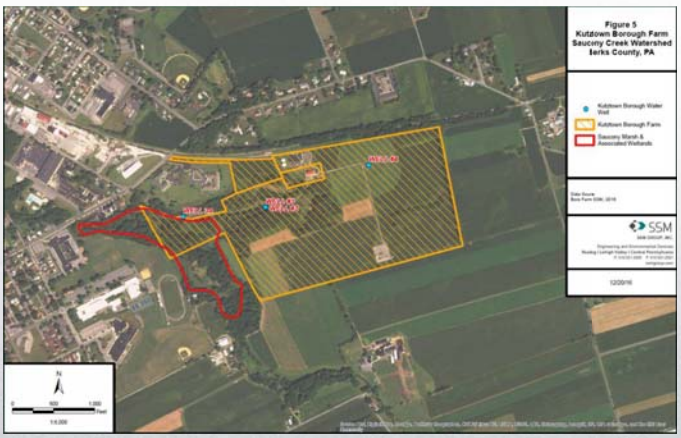
SSM

Berks Nature and the Saucony Creek

SSM

Saucony Marsh

SSM



Saucony Marsh Locations

SSM

Kutztown Borough Wells

SSM

Borough Plant - Before

SSM

Borough Plant - After

SSM

Borough Stream - Before

SSM

Borough Stream - After

SSM

Borough Well #4 - Before

SSM

Borough Well #4 - After

SSM

Neighbor Lawn and Buffer

SSM

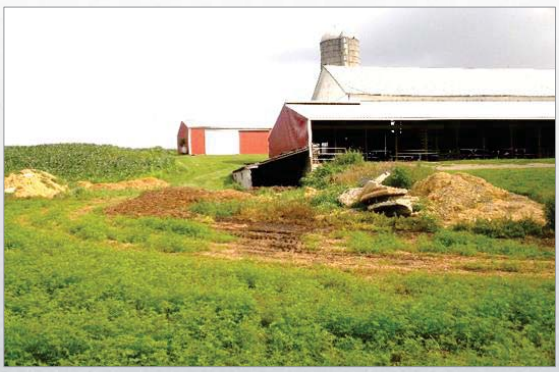
Borough Plant - After

SSM

Restoration Strategy

SSM

Manure Storage - Before



SSM

Manure Storage - After

SSM

Manure Storage- Before

SSM

Manure Storage- After

SSM

Manure Storage - Before

SSM

Manure Storage - After

SSM

Stormwater Recharge

SSM

Grassed Waterway

SSM

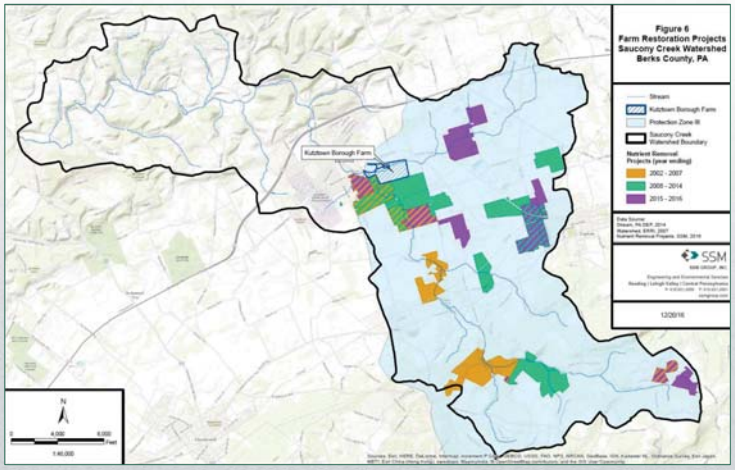
Animal Stream Crossing

SSM

Stabilized Animal Walkway

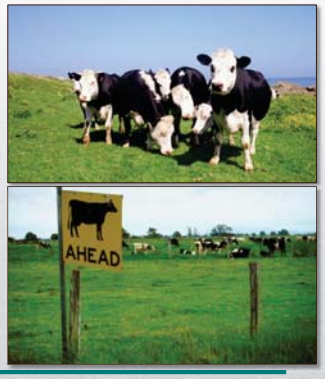
SSM

BMP Projects in Saucony Watershed



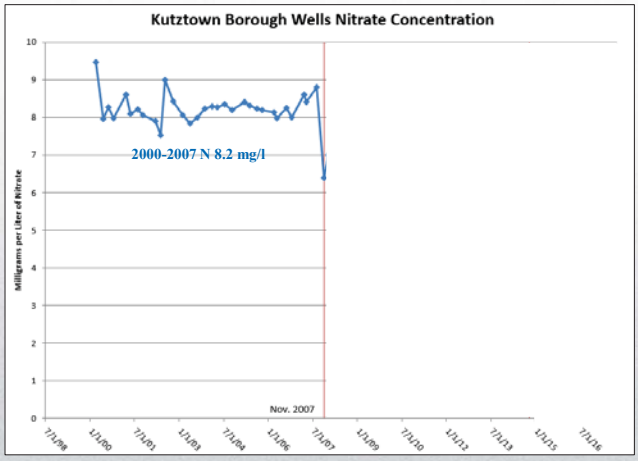
Nutrient Management Capture & Recycle

- Lactating cows – 13 gals/Animal Units/day
- Heifer – 60 lbs/AU/day
- Finishing cattle – 65 lbs/AU/day
- Saucony Watershed Nitrogen Capture in 2016: 270,000 pounds per year



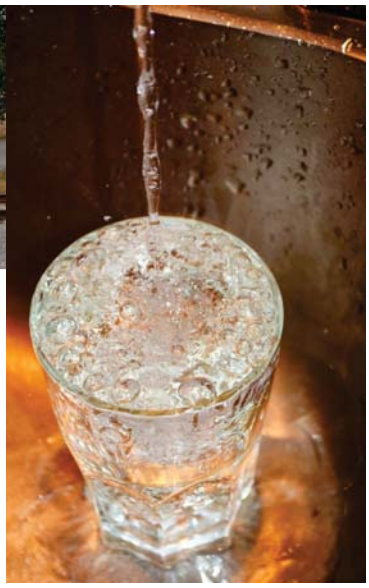
SSM

 SSM



SSM

Investing in Source Water Protection



PENNSYLVANIA SOURCE WATER PROTECTION

Safe Drinking Water Starts at the Source!

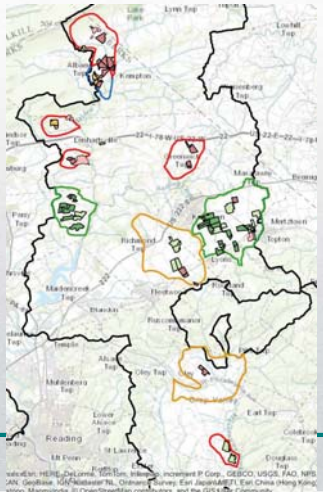
Project Funding Partners

Berks Watershed Restoration Fund

Schuylkill River Restoration Fund

SAN Agricultural Workgroup Partners and Financial Support

Middle Schuylkill Project Map



Larry Lloyd, Senior Ecologist
Berks Nature
610.372.4992
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Spotts, Stevens and McCoy
610.621.2000
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Clean Water = Good Beer

Protecting the Schuylkill River
One Beer At A Time

BEER: THE INGREDIENTS

BEER ONLY NEEDS FOUR THINGS:

WATER — 90+%

Water is the most used ingredient in beer.

It is also the most important ingredient!

The geography of the water effects how good it is for certain styles of beer, i.e. the water in England is better for making stouts, where the water in Australia better for pale ales.

HOPS

Hops is the flavouring agent used in all styles of beer, however the amount of hops varies according to the style.

Hopes is dried and pelletted for use as the flavouring agent at the start of the process – later on, Hops can be added to include more aroma and colour.

BARLEY

Barley is the grain that is malted as a source of starch.It is the starches and sugars extracted from Barley that when combined with yeast, create alcohol.

To extract the sugars, the grain is soaked in water, allowed to germinate and then dried in a kiln.

YEAST

Yeast is responsible for fermenting the sugars and creating alcohol.

It also influences the colour and flavour of the beer and effects the alcohol content.

Often yeast is filtered out of beer after fermenting, however sometimes it is left in to add cloudiness.

They're Everywhere

5,301	Breweries
- 67	Large Breweries
5,234	**Craft Breweries**

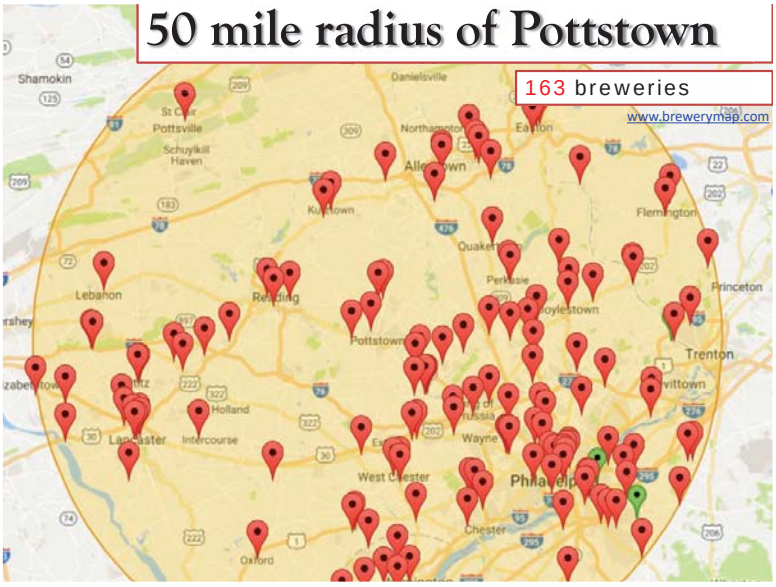
98.7%

Brewer's Association:
https://www.brewersassociation.org/statistics/number-of-breweries/

50 mile radius of Pottstown

163 breweries

www.brewerymap.com



They're growing...and making money

PENNSYLVANIA

FIND A BREWERY ▸
STATE LAWS ▸

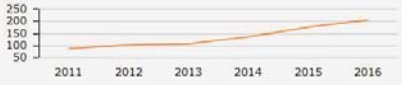
205 Craft Breweries (RANKS 7TH)

2.2 Breweries per Capita* (RANKS 25TH)
*per 100,000 21+ Adults

ECONOMIC IMPACT: **5,788** Million Economic Impact (RANKS 2ND) | **615.77** Impact per Capita (RANKS 4TH)

PRODUCTION: **3,905,620** Barrels of Craft Beer Produced per Year (RANKS 1ST) | **12.9** Gallons per 21+ Adult (RANKS 2ND)

NUMBER OF CRAFT BREWERIES OPERATING PER YEAR

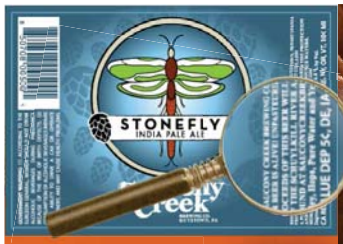


They're Creative

Events

CREATIVE MARKETING

Fun Names



From farm to pint our beer is alive! Unpasteurized keep it chilled!

"A portion of the proceeds of this beer will go towards the protection and restoration of the Schuylkill River and its source waters."

10% of all sales support for watershed restoration work in the Schuylkill Watershed

Saucony Creek Brewing Co. Kutztown, PA

- SAN Events
- Donations
- Financial support
- Philly Beer Week

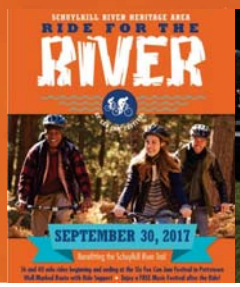
Sly Fox Brewing Company

- Proceeds from all sales benefits the Schuylkill River Trail.
- Annual release of SRT Ale occurs every Earth Day (SRT Spree Event), includes river and trail cleanups, paddling, 50k race, and live music.

AN ALE FOR THE TRAIL
Because every outdoor adventure should end with a great beer.

Sly Fox Brewing Company

- 2nd Ride for the River – 300 cyclists
- Sly Fox donates $4,000 for the Schuylkill River Trail

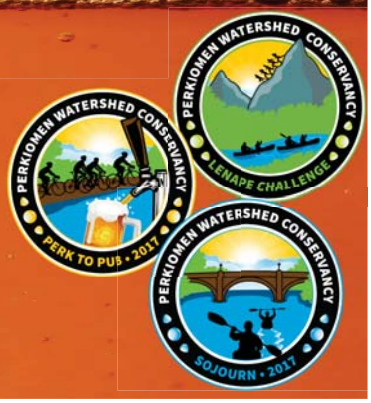


Appalachian Brewing Company

- Perkiomen Porter
  - 6 Month Program
    - (March to Aug)
  - $1.00 per pint donated to PWC
  - $1,000 in 2017
  - $1,500 in-kind donations

Appalachian Brewing Company

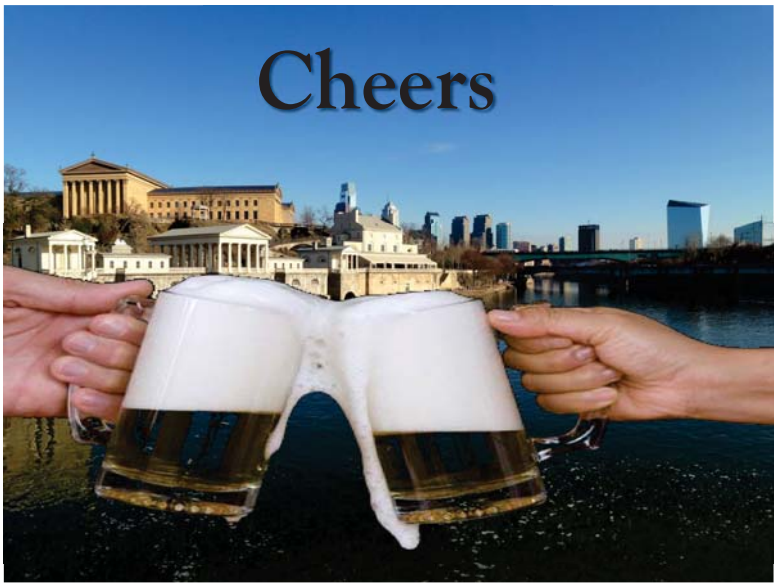
- Sponsorship of Trifecta
  - Pint / Craft Soda for all participants
    - Lenape Challenge
    - Perkiomen Creek Sojourn
    - Perk to Pub
  - Perk to Pub After-Party
- Donation to Benefit



What next?

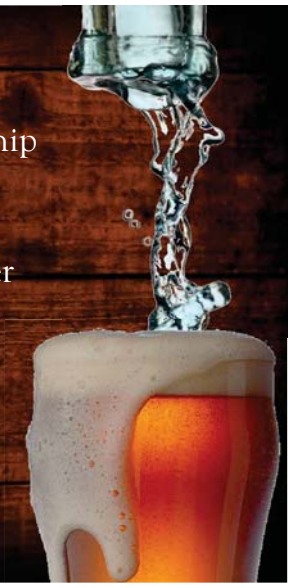
163 Craft Breweries in a 50 mile radius from Pottstown
163 opportunities for new partnerships

Cheers



PRESENTERS:

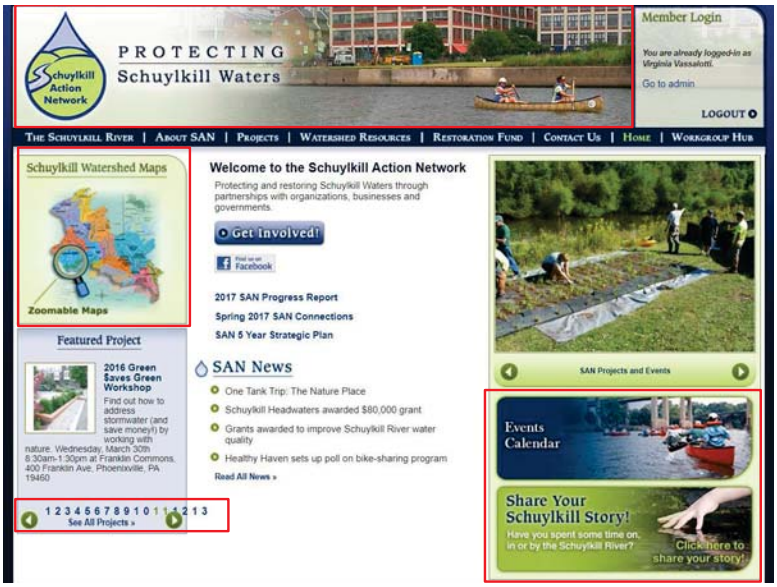
- **Virginia Vassalotti**, Partnership for the Delaware Estuary
- **Tim Fenchel**, Schuylkill River Heritage Area
- **Ryan Beltz**, Perkiomen Watershed Conservancy

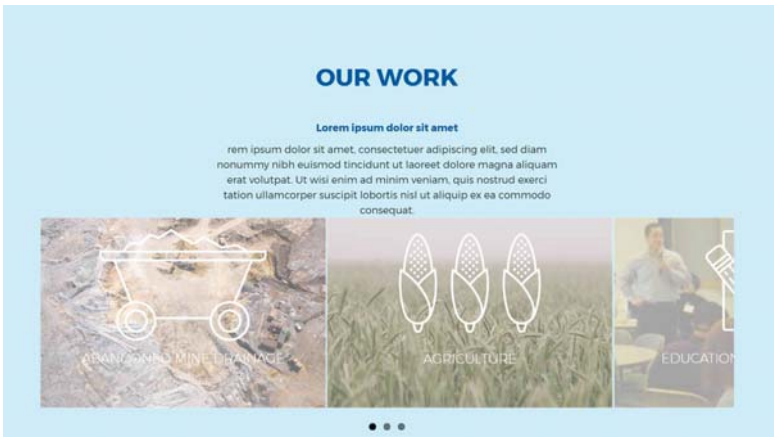


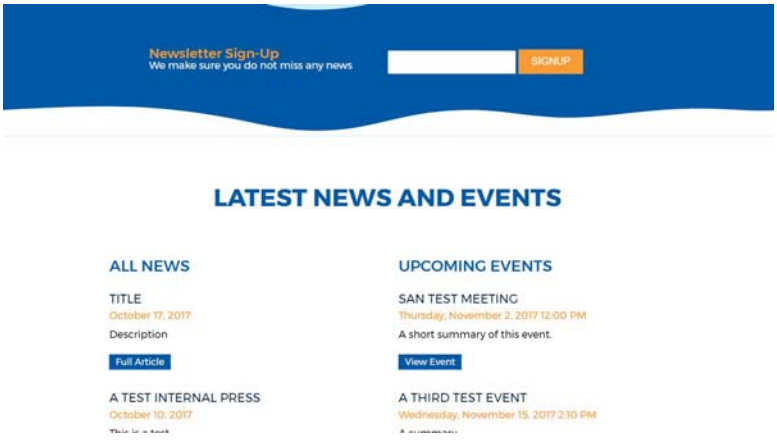
New SAN Website "Sneak Peak"

www.schuylkillwaters.org

Partnership for the DELAWARE ESTUARY

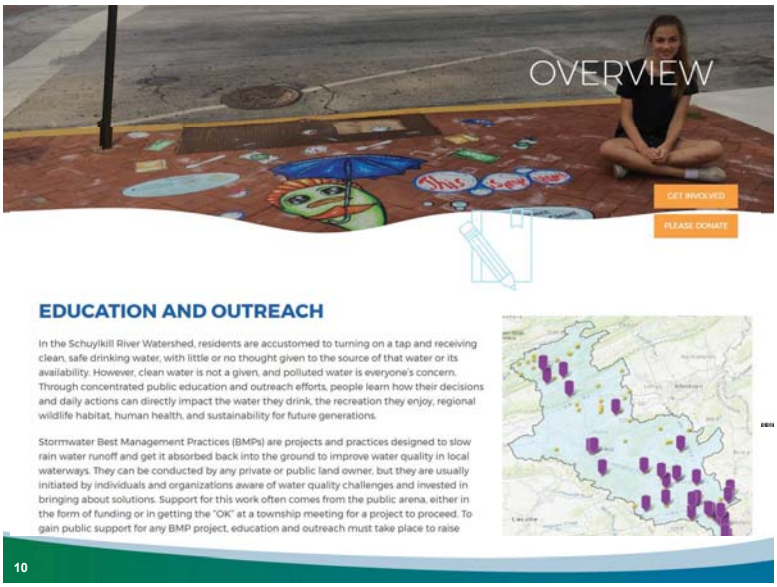


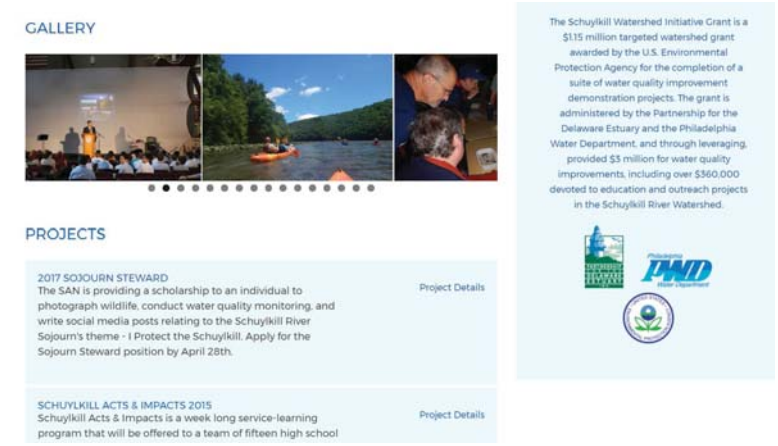


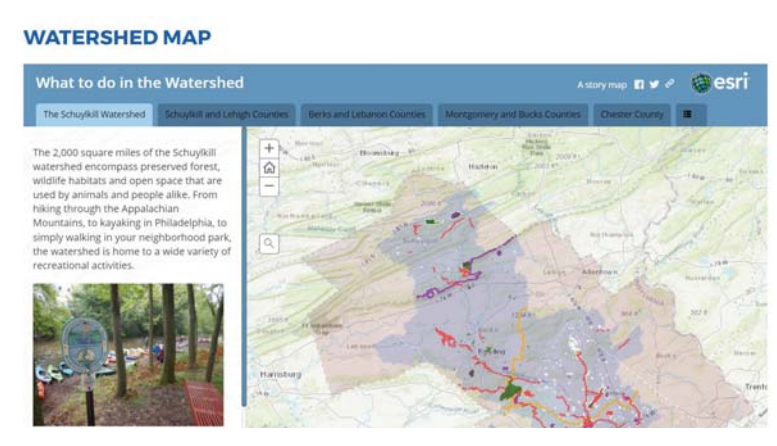


Main Menu Tabs

- **About Us**
  - About the Schuylkill
  - SAN's Mission
  - History
  - Strategic Plan
  - Meet Our Partners
- **Our Work**
  - A webpage for each workgroup
- **Resources**
  - Watershed Map
  - News
  - Grants
  - Jobs Board
  - Publications
- **For You**
  - Businesses
  - Farmers
  - Homeowners
  - Municipalities
  - Outdoor Enthusiasts
  - Teachers and Students
  - Water Suppliers
- **Get Involved**
  - Become a member
  - Volunteer
  - Events
  - Sign up for e-newsletter
  - Explore the Schuylkill
- **Contact**
- **Login**







Area of Interest

- Any -

Apply

Grant Program	Funder	Area of Interest	Eligible Region	Eligible Applicants	Award Amount	Date Due
Schuylkill River Restoration Fund The Schuylkill River Restoration Fund provides grants to government agencies and non-profit organizations for projects that improve the quality of water in the watershed. The grants focus on three major sources of pollution: stormwater run-off, agricultural pollution and abandoned mine drainage. View More	Schuylkill River Heritage Area	Abandoned Mine Drainage, Agriculture, Stormwater, Watershed Land Protection	Schuylkill River Watershed	government agencies, non-profit organizations	Up to $100,000	
Riparian Forest Buffer Program The DCNR Riparian Forest Buffer Program provides reimbursable grants to organizations to establish riparian forest buffers. View More	Pennsylvania Department of Conservation and Natural Resources	Abandoned Mine Drainage, Agriculture, Education and Outreach, Stormwater, Watershed Land Protection	Pennsylvania	local government, educational organization, non-profit organizations, for-profit businesses	Up to $1,000,000	
Partnership Grants Partnership Grants are reserved for agricultural service providers--extension staff, nonprofits, consultants, state departments of agriculture, and others working in the agricultural community--who want to conduct on-farm demonstrations, research, marketing, and other projects with farmers as active cooperators. View More	Northeast Sustainable Agriculture Research & Education	Agriculture	Northeast states, including Pennsylvania	academia, non-profit organizations, for-profit businesses, government agencies	Up to $15,000	

Also New…

- **Login to access documents**
  - Admin
  - Chairs
  - Workgroup Member
- **Email System – MailChimp**
  - No longer lost in spam from "schuylkillwaters@gmail.com"

We Need Your Help!

Populating the website:

- Events
- News
- Volunteer Opportunities
- Completed Projects

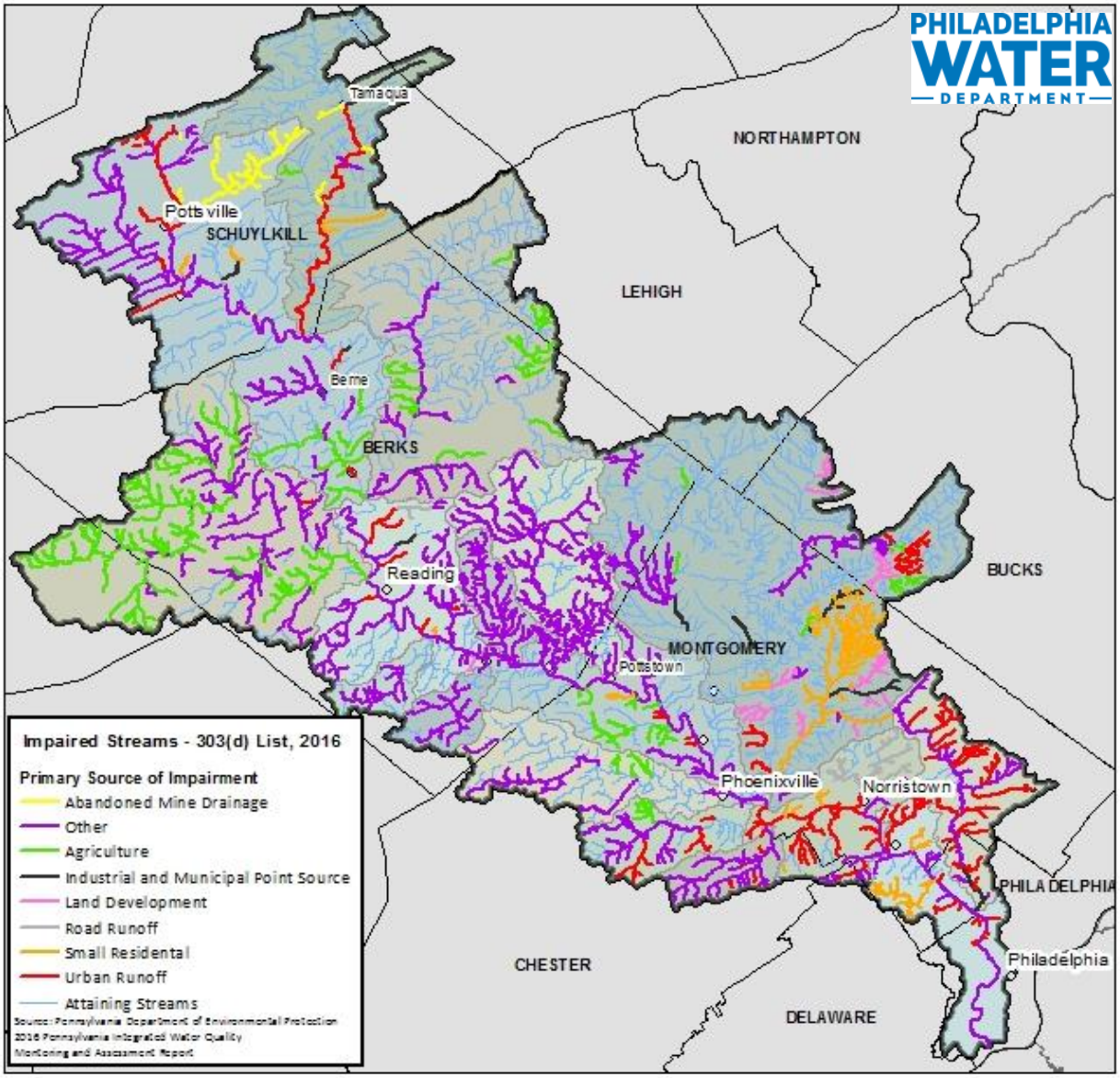
Questions/Suggestions?

Virginia Vassalotti
Schuylkill Action Network Coordinator
(302) 655-4990, x121
VVassalotti@DelawareEstuary.org

Partnership for the DELAWARE ESTUARY

Connecting people, science, and nature for a healthy Delaware River and Bay

Appendix E: 303(d) List Map of Impaired Streams



303(d) Listed Streams for Impairment in the Schuylkill River Watershed by Primary Source of Impairment (PADEP 2016)

This map shows the primary source of impairment for streams on the 2016 303(d) list. Portions of the Perkiomen Creek (5.6 miles) and unnamed tributaries to the Perkiomen Creek (1.5 miles), originally listed in 2016, were delisted for impairments from pathogens in 2016 (PADEP, 2016).

Appendix F: Additional Literature Sources for *Cryptosporidium* Loading Estimates

	beef cattle, dairy cattle, calves	swine, sheep, horse
Estimated Prevalence of Infection in Animals	(Cox et al., 2005); (Fayer et al., 2006); (USDA, 1993)	(Cox et al., 2005); (Johnson et al., 1997)
Cryptosporidium oocysts per day per animal	(Atwill et al., 2003)	--
Cryptosporidium oocysts per weight feces	--	(Cox et al., 2005)
Weight manure per day per animal	--	(ASAE, 2003)

Appendix G: WCP Program Change Approval – March 2016

PHILADELPHIA WATER
EST. 1801

Debra McCarty, Water Commissioner

Ms. Zahra Nucci
Safe Drinking Water Program Manager
Southeast Regional Office
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, PA 19401

February 29, 2016

Dear Ms. Nucci,

In compliance with the Environmental Protection Agency National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), Philadelphia Water (PWD) submitted a Watershed Control Plan (WCP). The WCP was approved in December 2012, and the third of five implementation years was completed in 2015. In accordance with 40 CFR §141.716 which states, "If a system determines during implementation that making a significant change to its approved watershed control program is necessary, the system must notify the State prior to making any such changes," Philadelphia Water is requesting to make a change to the approved WCP.

In the WCP, control measures to reduce *Cryptosporidium* in Philadelphia's source watershed are identified for implementation during the five-year timeline. The table below lists the control measures.

WCP Control Measure	**Project Description**
Wastewater Treatment Plant (WWTPs) Upgrades	Track ultraviolet disinfection installation at two WWTPs
Farm Best Management Practices (BMPs)	Manure storage basins at five farms
	Riparian buffers at five farms
Comprehensive Nutrient Management Plans	Comprehensive Nutrient Management Plans for five farms
Riparian Buffer Planting	Riparian buffer planting at one site
Waterfowl Management	Waterfowl management at priority sites in Philadelphia for five years

Philadelphia Water requests a minor wording change to the farm BMP control measure obligation, which presently includes **"supporting the installation of manure storage units on at least five separate farms; [and] supporting the installation of vegetated buffers on at least five separate farms"** (WCP, Appendix A, page 9). PWD is requesting a change to the farm BMP control measure obligation to include **"supporting the installation of manure storage basin(s) AND/OR riparian buffer(s) at ten separate farms."** This change will maintain the same level of source water protection achieved through the WCP by implementing BMP control measures at ten farms. To date, PWD has supported implementation of six manure storage basins in the source watershed. With this change, PWD is requesting the flexibility to implement more manure storage basins if projects become available. PWD believes this change should be made for the following reasons:

1. **Experts in stormwater and nutrient management on farms recommend a holistic approach to BMP implementation.**

PWD implements agricultural BMPs by leveraging funding through the Schuylkill River Restoration Fund and expertise from Schuylkill Action Network (SAN) partners including the Natural Resource Conservation Service, Berks Nature and Berks County Conservation District. These experts, on whom PWD relies to select projects with the greatest positive

impact on the watershed, take a holistic approach when implementing BMPs on a farm. A holistic approach controls animal waste and stormwater on a farm by choosing a combination of BMPs that address all nutrient and stormwater management issues.

2. **Manure storage basins protect groundwater from contamination in addition to surface waters.**

Many farms entering into agreements for the implementation of BMP projects on their property are identified by the SAN as priority farms but do not have streams and riparian corridors directly on the property. This does not make animal waste and stormwater management on the site any less important. With manure stored in open piles or earthen lagoons, both surface water and groundwater are at risk for contamination. The karst and limestone geology in the Berks County region allows groundwater to move quickly beneath the ground surface. Groundwater contaminated by improperly stored manure on a farm may be contributing flow to nearby creeks making surface waters not on the property vulnerable to contamination as well. It is critical that contaminants to ground and surface waters are controlled at the source: the location the manure is produced and stored.

3. **When compared, manure storage basins and riparian buffers provide equivalent removal of *Cryptosporidium* from stormwater.**

As part of the WCP, PWD provided a quantitative assessment of the relative impact of contamination sources and source water protection initiatives on water quality at the Queen Lane intake (WCP, Appendix A, page 17). The assessment estimates that manure storage basins detain 100% of Cryptosporidium on site, and riparian buffers filter 99% of Cryptosporidium from stormwater before it enters the stream. For this reason, PWD considers both manure storage basins and riparian buffers on farms in Berks County to provide an equivalent removal of Cryptosporidium from stormwater.

In line with these three justifications, PWD has supported the implementation of manure storage basins on farms for the first three years of WCP implementation, and wishes to continue to support the BMPs recommended by the expertise of SAN partners. A change in the requirements to allow implementation of manure storage basin(s) AND/OR riparian buffer(s) at ten separate farms will best reflect the holistic approach taken by experts and provide flexibility for best addressing nutrient and stormwater management issues at selected priority farms.

If you have questions, please do not hesitate to contact us. We look forward to your review of the requested change to the PWD WCP.

Sincerely,

Kelly Anderson
Source Water Protection Program
Office of Watersheds
1101 Market Street, 4th Floor
Philadelphia, PA 19107
(215) 685-6245

CC:
Chris Crockett
Marc Cammarata
Kevin Smith
Elizabeth Ventura

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

March 9, 2016

Ms. Debra McCarty, Water Commissioner
Philadelphia Water Department
1101 Market Street
Philadelphia, PA

Re: Philadelphia Water Department – Queen Lane Intake
Watershed Control Program Plan 2016 program change letter
PWSID 1510001

Dear Ms. McCarty:

Thank you for submitting to the Pennsylvania Department of Environmental Protection a copy of your letter indicating a program change, dated February 29, 2016, regarding the Watershed Control Program Plan for the Queen Lane Intake. Please be advised that your submission satisfies Philadelphia Water Department's obligation related to Chapter 109, Safe Drinking Water regulations, Section 109.1204(b)(4)(i), and this information has been made part of the file.

If you have any questions regarding this matter, please contact Mr. Kevin Smith of our office at 484.250.5131.

Sincerely,

David J. Bolig, P.E., P.L.S.
Environmental Engineer Manager
Safe Drinking Water

Cc:
Ms. Kelly Anderson - PWD
Mr. Smith-SDW
Mr. Bolig - SDW
File (kr16sdw) 067-2

Appendix H: Presentations from 2017 Open Space Showcase

Watersheds of the Greater Philadelphia Area

Image source: Philadelphia Water Department www.phillywatersheds.org

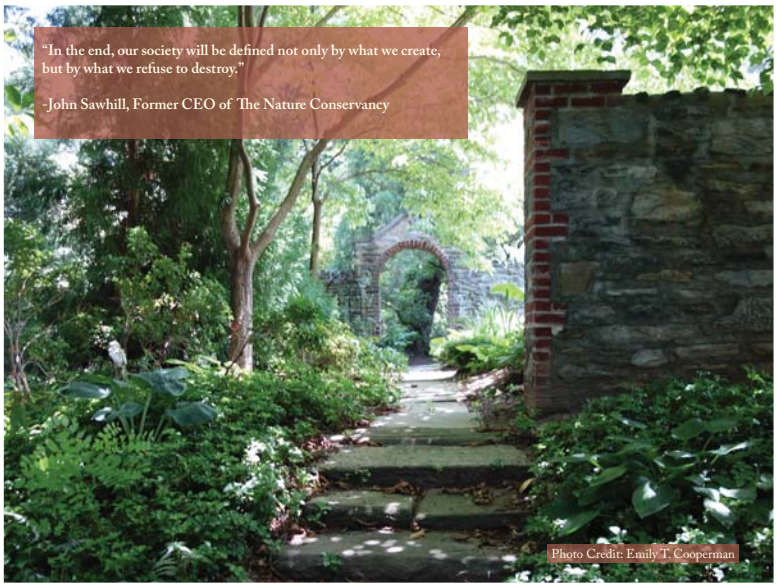
Chestnut Hill Conservancy & Friends of the Wissahickon

Peg Shaw
FOW Project Manager

Angelina R. Jones
CH Conservancy Conservation and Easements Manager

Chestnut Hill Conservancy and Friends of the Wissahickon Conservation & Easements Program

Photo Credit: Charles Uniatowski



"In the end, our society will be defined not only by what we create, but by what we refuse to destroy."

-John Sawhill, Former CEO of The Nature Conservancy

Photo Credit: Emily T. Cooperman

The Purpose of Our Program

- Preserves the network of **contiguous public and private open space** that is necessary for the ecological health of the Wissahickon Valley
- Limits development on key open tracts of land in the lower Wissahickon watershed in order to **reduce the destructive effects of stormwater runoff**
- Protects **historically and architecturally significant buildings** throughout Chestnut Hill, Mount Airy, and adjoining neighborhoods

Photo Credit: Wendy Concannon

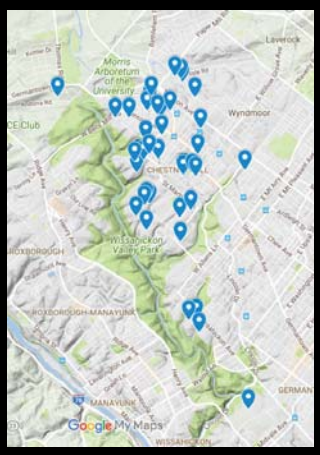
CH Conservancy/FOW Partnership

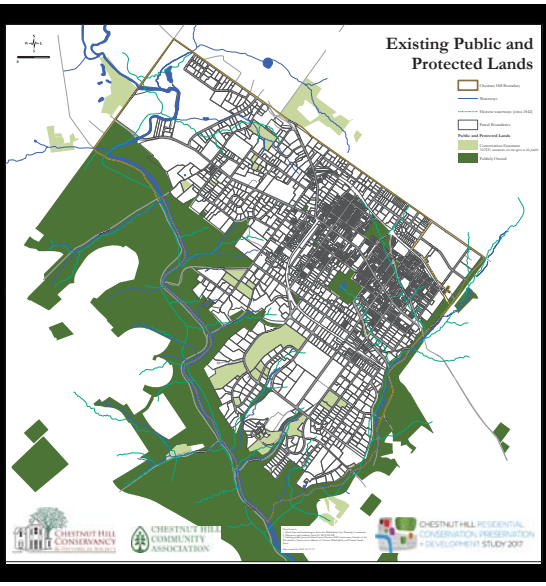
Stormwater Damage, Erosion, and Flooding

CH Conservancy/FOW Partnership

Community Education

Our Easements





Wissahickon Valley Park

Photo Credit: FOW

Photo Credit: Sarah Marley

Photo Credit: Bill Cannon

Easements

Photo Credit: Emily T. Cooperman

Photo Credit: Wendy Concannon

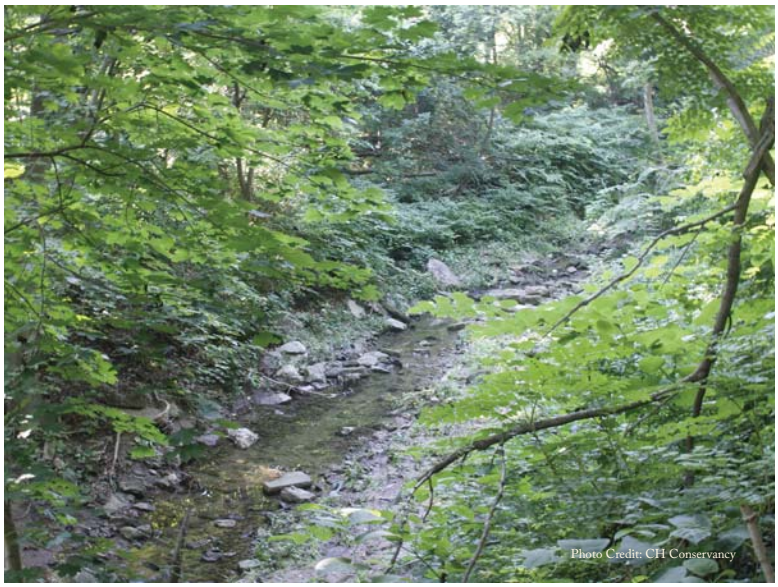
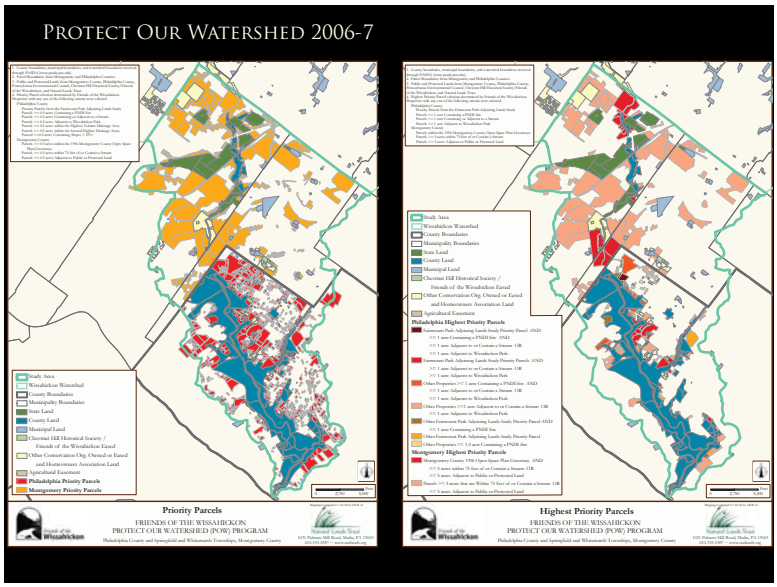
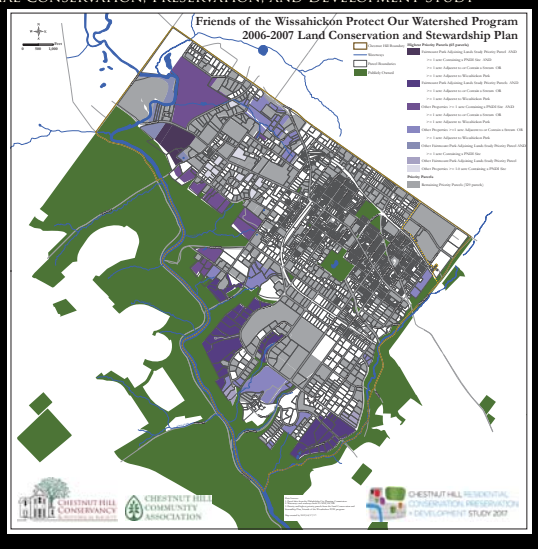


Photo Credit: CH Conservancy

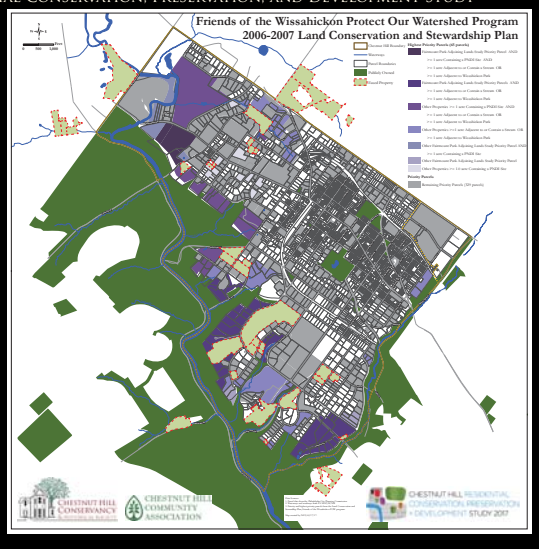
Protect Our Watershed 2006-7



Residential Conservation, Preservation, and Development Study



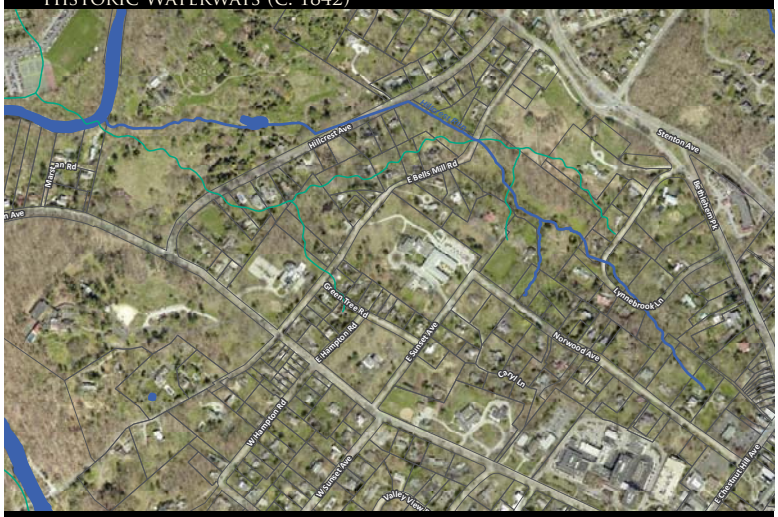
Residential Conservation, Preservation, and Development Study



Hillcrest Run/East Brook

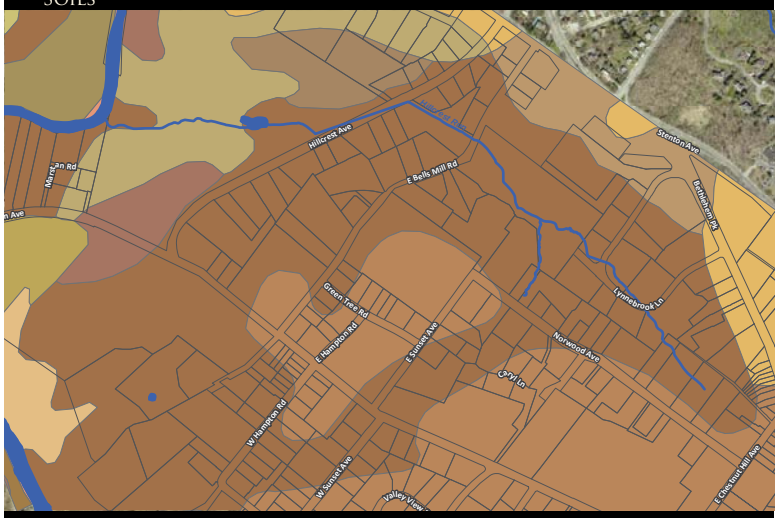
Conservation and Preservation Easements

Historic Waterways (c. 1842)

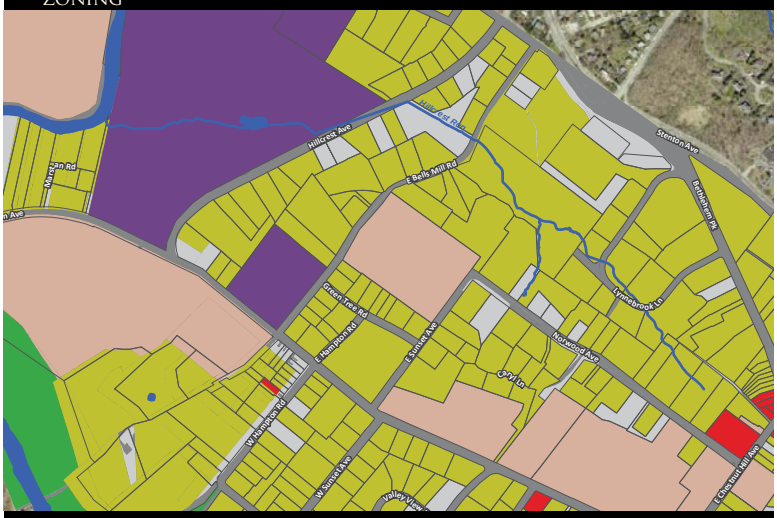


Slopes

Soils



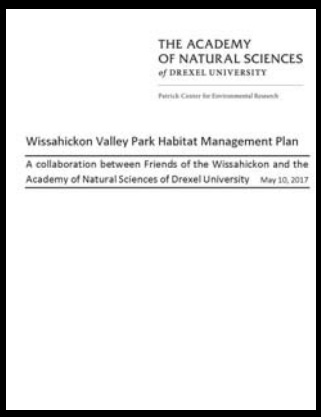
Zoning



Impervious Cover

Residential Conservation, Preservation, and Development Study

Wissahickon Valley Park Habitat Management Plan



THE ACADEMY OF NATURAL SCIENCES of DREXEL UNIVERSITY

Patrick Center for Environmental Research

Wissahickon Valley Park Habitat Management Plan

A collaboration between Friends of the Wissahickon and the Academy of Natural Sciences of Drexel University May 10, 2017

Photo Credit: Allen Aisenstein

Erdenheim Farm

Peter Ernst

Executive Director Erdenheim Farm Foundation

ERDENHEIM FARM

CHESTNUT HILL CONSERVANCY & HISTORICAL SOCIETY

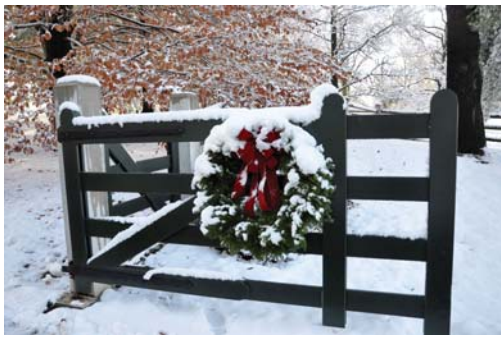
Open Space Showcase on **October 26th** from **6-8 PM** at Springside Chestnut Hill Academy

Green Space Conservation & Preservation

Sustainable Agriculture

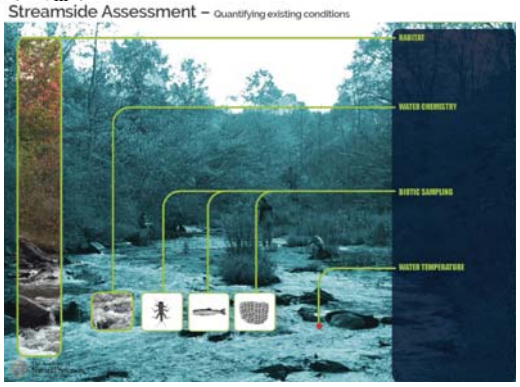
Architecture Preservation & Restoration

Holiday Cheer



The Six Tracts of Land

Partnership with Academy of Natural Sciences



Partnership with PHILADELPHIA OUTWARD BOUND SCHOOL

Outward Bound Urban Expedition Wissahickon Creek service project removed >40 tires from creek

Partnership with Philadelphia Zoo

Project to protect Arapawa goats

Project Description

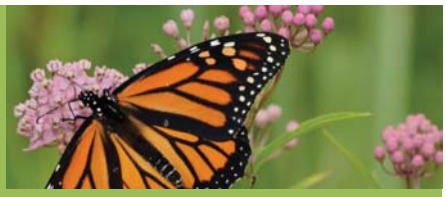
- Erdenheim Farm Foundation and the Philadelphia Zoo share a common mission – to be catalysts for conservation and preservation.
- EFF and PZ have joined forces to preserve a critically endangered breed of goat – the Arapawa
- Arapawas are popular with small farmers because they are "easy keepers" that can be raised for dairy or meat.

sign up for newsletter
at
erdenheimfarm.com

Natural Lands

Peter R. Williamson
Vice President of Conservation Services

save open space.



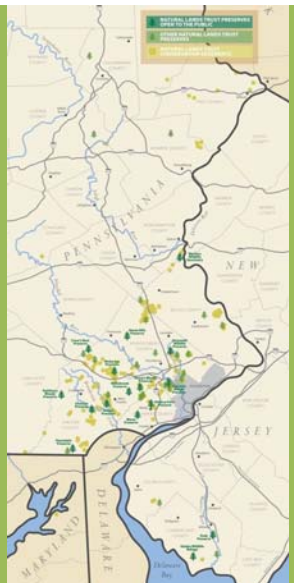
care for nature.

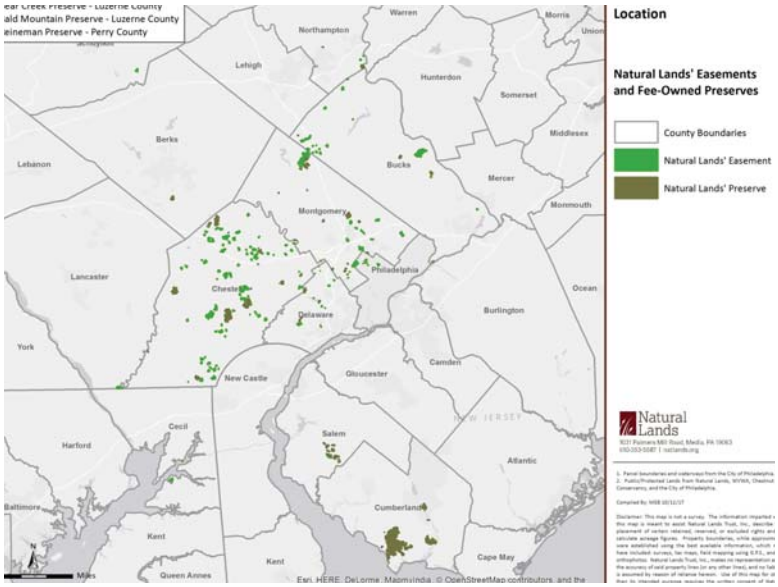
connect people with the outdoors.

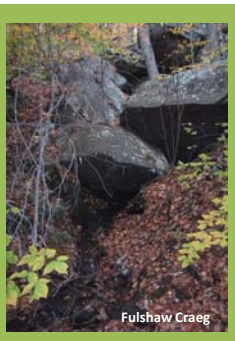
Own and steward 21,936 acres on 43 preserves

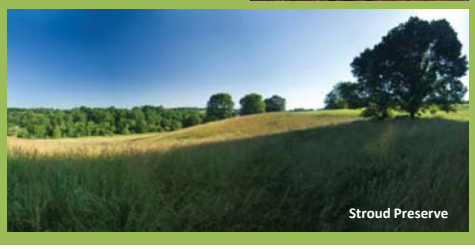
Protect 25,319 acres through conservation easement (370 easements)

Provide consulting services to private and public landowners



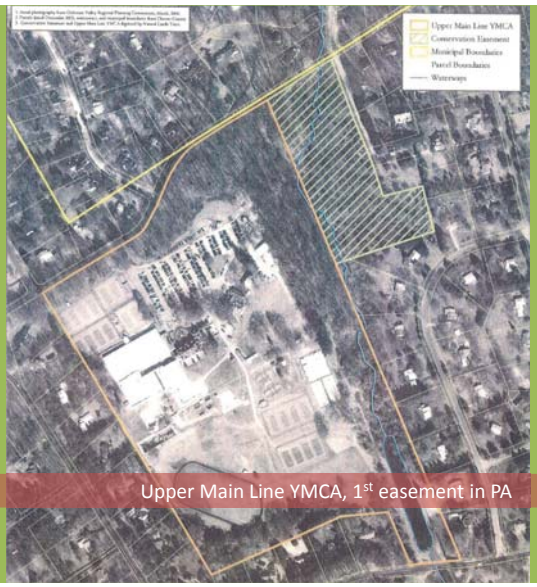




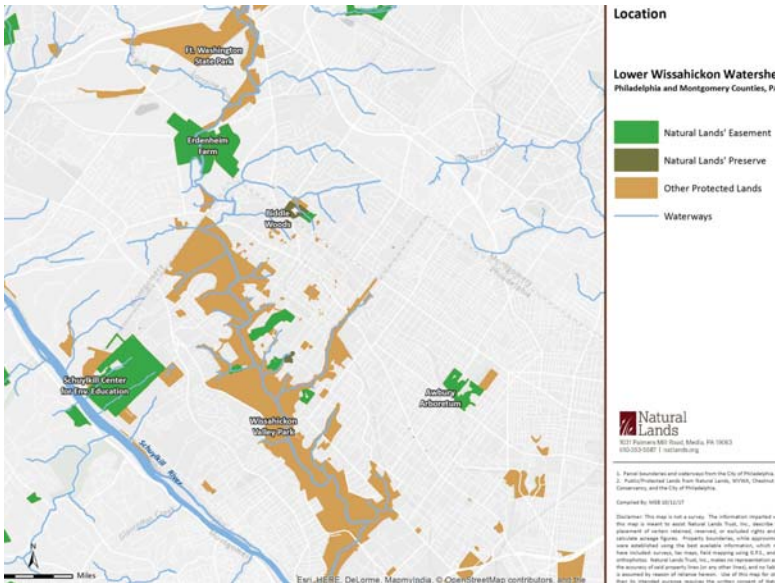


Allston Jenkins

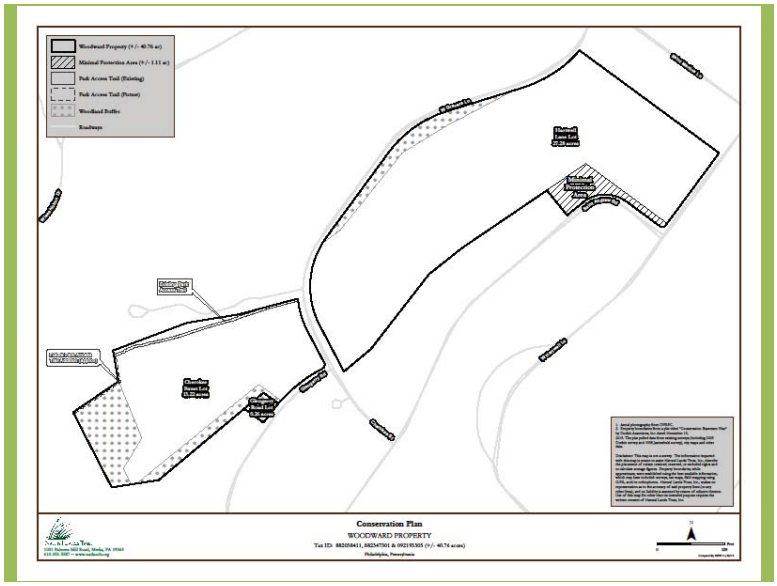
First Preserve,
Willisbrook Preserve, October 1963



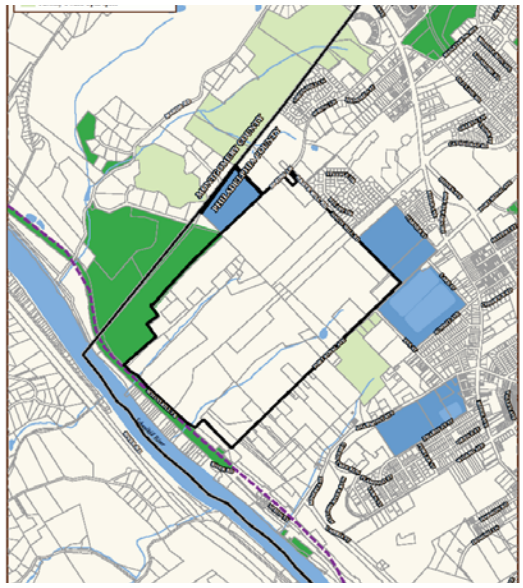
Upper Main Line YMCA, 1st easement in PA


Location
Lower Wissahickon Watershe
Philadelphia and Montgomery Counties, P
Natural Lands' Easement
Natural Lands' Preserve
Other Protected Lands
Waterways
Natural Lands
Ft. Washington State Park
Erdenheim Farm
Schuylkill Center for Env. Education
Wissahickon Valley Park
Arnsbury Arboretum
Schuylkill River
Miles

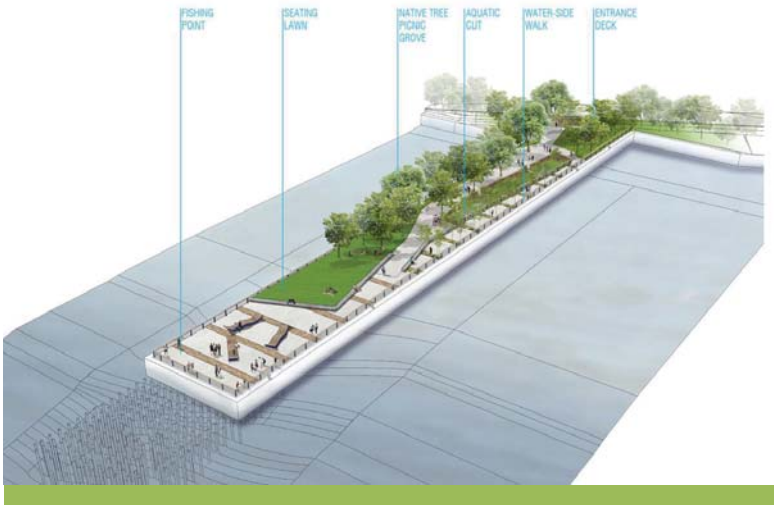

Woodward Property
Parcel Boundaries
Wissahickon Valley Park
2010 Aerial Photography
WOODWARD PROPERTY

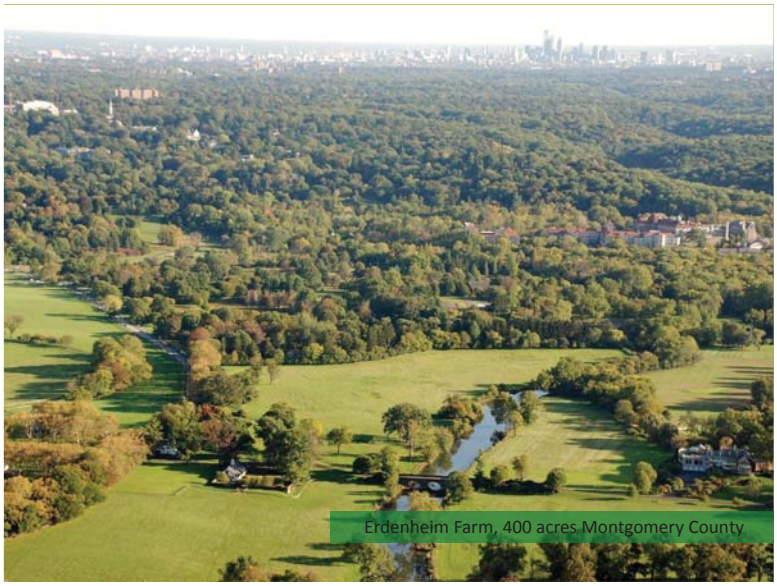

Woodward Property (+/- 40.76 ac)
Minimal Protection Area (+/- 1.11 ac)
Path Access Trail (Existing)
Path Access Trail (Future)
Woodland Buffer
Roadways
Conservation Plan
WOODWARD PROPERTY

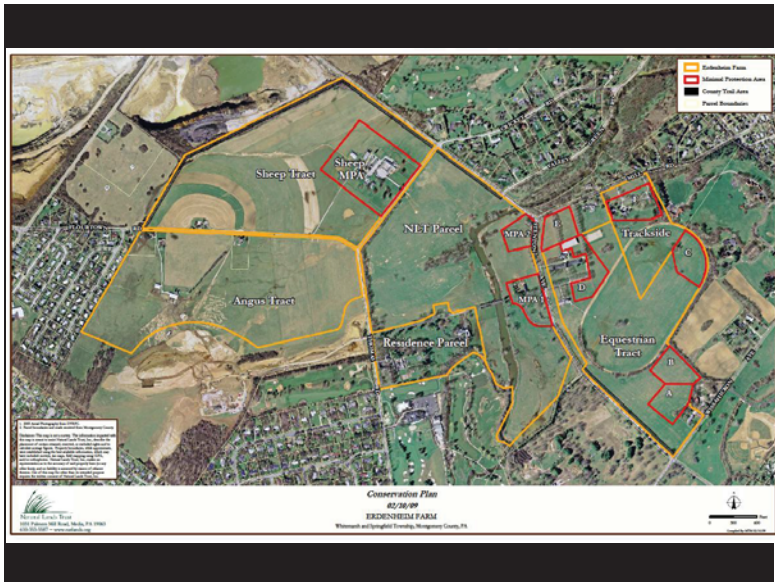

Schuylkill Center for Environmental Education


DESIGNATED GREENWAY
PHILADELPHIA PARK & TRAIL


Pier 67




Erdenheim Farm, 400 acres Montgomery County



Peter Williamson

Vice-president of Conservation Services

610-353-5587 ext. 215

pwilliamson@natlands.org

Facebook.com/NatLands

Preservation Alliance for Greater Philadelphia

Amy E. Ricci

Program Director

PRESERVATION ALLIANCE

for greater philadelphia

Philadelphia Historic Preservation Corporation 1979

Preservation Coalition of Greater Philadelphia 1982

→ The Preservation Alliance for Greater Philadelphia 1996

The mission of the Preservation Alliance for Greater Philadelphia is to actively promote the appreciation, protection, appropriate use, and development of the Philadelphia region's historic buildings, communities, and landscapes. We are a membership-based, not-for-profit advocacy organization that shines a spotlight on the historic places that make the Philadelphia region special. The Alliance gives a voice and a toolbox to those who care deeply about protecting them for the future.

PRESERVATION ALLIANCE

for greater philadelphia

Monitor and Assist the Philadelphia Historical Commission

Recent Nominations to the Phila. Register of Historic Places

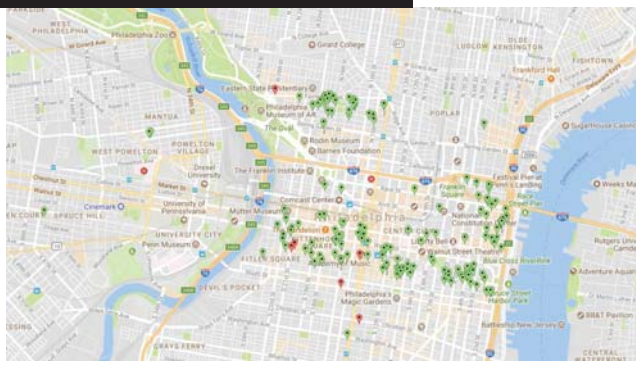
Architecture Walking Tours

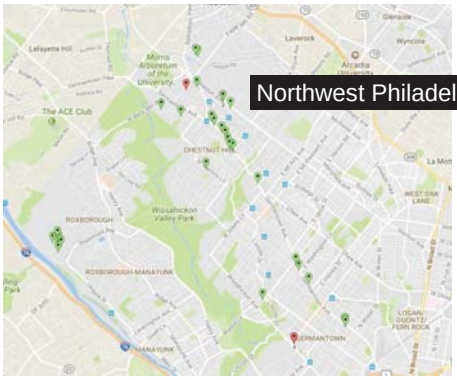
Extant Magazine

Neighborhood Outreach

Preservation Achievement Awards

240 Total Easements





Northwest Philadelphia Easements

Easements on the Avenue

7402 Germantown Ave., 1997

7932-34 Germantown Ave., 1995

8232-34-36 Germantown Ave., 2002

8430 Germantown Ave., 1996

7924-26 Germantown Ave., 1996

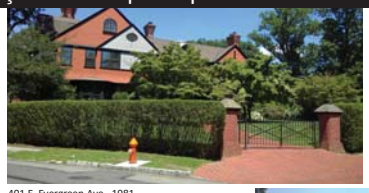
7928-30 Germantown Ave., 1995

8138 Germantown Ave., 1995

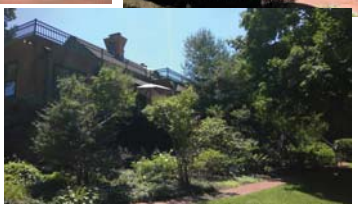
8042-44 Germantown Ave., 2002

8513-15 Germantown Ave., 1996

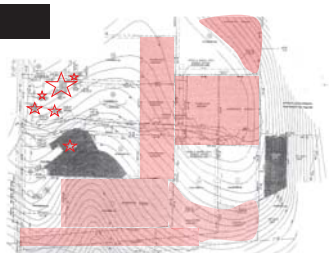
Façade and Open Space Easements



401 E. Evergreen Ave., 1981



Façade and Open Space Easements



Port Royal Ave., 2001

Façade and Open Space Easements

Natural Lands

Lower Merion Conservancy

PRESERVATION ALLIANCE for greater philadelphia

330 Spring Mill Rd., 2016

Whitemarsh Foundation

Kimberly Sheppard
President

WHITEMARSH FOUNDATION

Preserving a Piece of America's Early History

Chestnut Hill Conservancy October 26, 2017

How We Began

- 2001 Dixon Family sells 50 acre parcel to be developed as The Hill at Whitemarsh
- Local organizations unite for preservation of open space & Whitemarsh Foundation is incorporated
- $26mm raised to purchase Angus and Sheep tracts of Erdenheim Farm

Land Ownership & Farm History

- Earliest Settlement (1600s)
- Widener (1912-1971)
- Dixon (1971-2009)
- Whitemarsh Foundation (2008 -)
- McCausland (2009 -)
- 2009- Entire 450 acres preserved in perpetuity

Figure 7: General farmhouse location in 1893 (Detail, Baist, 1893).

Dixon Meadow Preserve

14 –acres within the Angus Tract

Dixon Meadow Preserve

- Robust birding community
- Year-round meadow flora and fauna
- 2/3 mile boardwalk

Dixon Meadow Preserve

Dixon Meadow Preserve

Signage

Educational & Way-finding

What to do???

Farmhouse Restoration

- Restoration & Modernization
- New roof
- Exterior painting
- Gutters and downspouts
- Shutters and window re-glazing
- New heating air conditioning systems
- New plumbing and electrical systems
- Interior painting
- An ADA compliant entrance and bathroom
- New kitchen and patio restoration

WHITEMARSH FOUNDATION

Renovation

Exterior Stucco and Trim

Interior Woodwork

WHITEMARSH FOUNDATION

Renovation

Exterior Window Repair

Interior Woodwork

WHITEMARSH FOUNDATION

Dixon Meadow House and Preserve Educational Programming

- Science & Meadow Preservation
- Birding
- Visual arts
- Childrens Early Science
- Technology

WHITEMARSH FOUNDATION

Falconry demonstration

Thank you for your support of preservation

WHITEMARSH FOUNDATION

WISSAHICKON VALLEY WATERSHED ASSOCIATION

SCOTT BERMAN
CONSERVATION RESOURCES INTERN

Open Space in the Wissahickon Watershed

By Scott Berman

Open Space Policy Intern

WISSAHICKON WATERSHED valley ASSOCIATION

PROTECTING LAND, WATER AND LIFE IN THE WATERSHED SINCE 1957

WVWA

- The Wissahickon Valley Watershed Association (WVWA) is a non-profit land trust founded in 1957 to protect the quality and beauty of the Wissahickon Creek.
- We believe people benefit when nature thrives

Land Worth Preserving

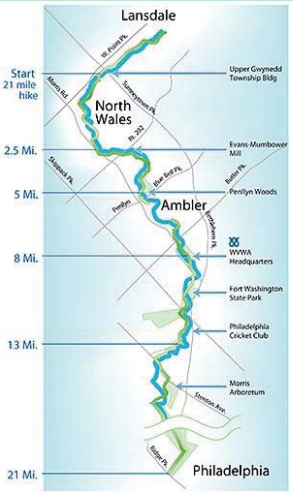
- WVWA has permanently preserved 1,300 acres of open space:

WVWA Owned
72 Parcels; 650+ acres

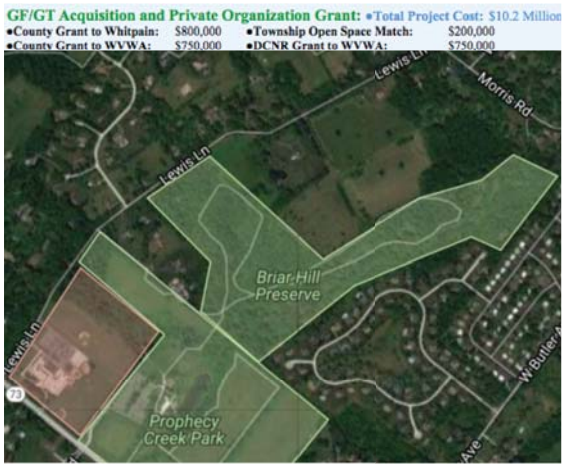
Conservation Easements
29 Easements 600+ acres

Conveyed
7 Parcels

Trail Easements
26 Parcels



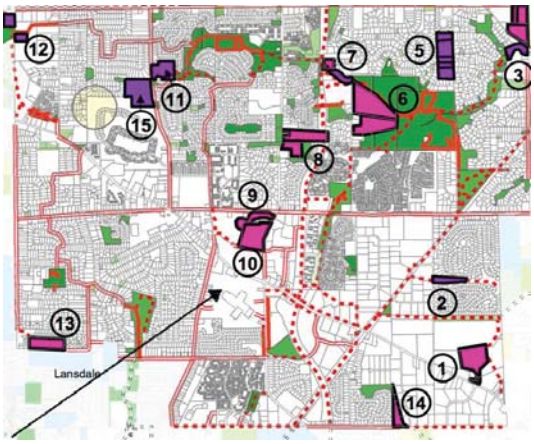
Briar Hill Preserve



Crossways Preserve

Crossways Trail

Municipal Open Space Plans



Open Space in 2017

4,420 acres of unprotected open space in the Upper portion of the Wissahickon Watershed

- 14 Montgomery County municipalities
  - 340 acres of farmland
  - 1,040 acres of woodlands-forests
  - 702 acres of undeveloped riparian buffer corridors
  - 1733 acres of institutional open space - golf courses, schools, day camps, large commercial campuses, etc.

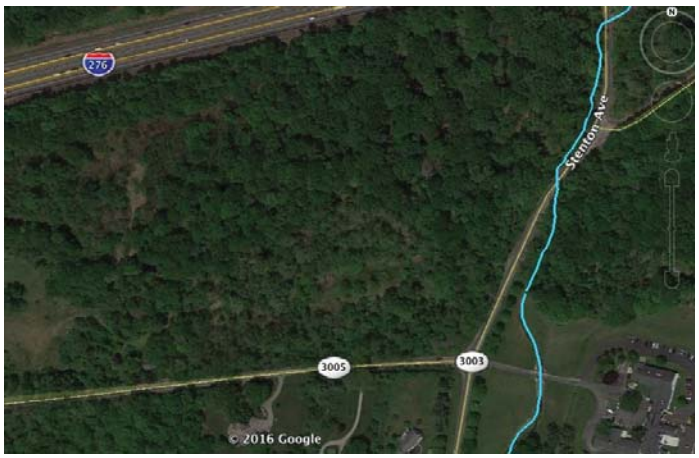
Conservation Criteria

Resource Values: Important species, habitat-ecosystem, riparian waterways, parcel size

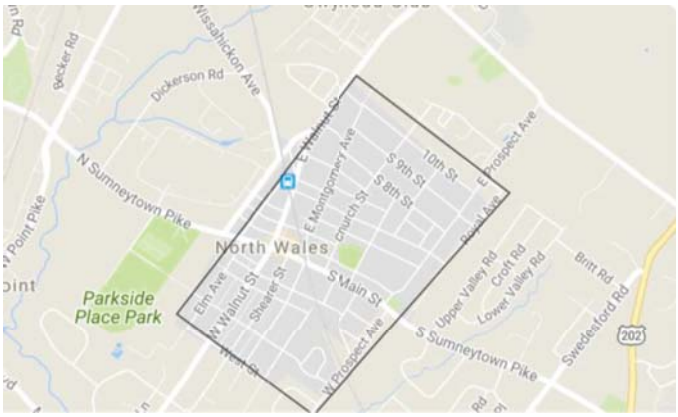
Strategic Values: Likely to be developed without WVWA participation, in an open space plan, land that is important to controlling stormwaters

Public Values: Opportunity for recreation or education, facilitate connections to existing trails, scenic open space

Woodlands-Forest



North Wales



Open Space-Stormwater Management

Conclusion

- Open space is still abundant in the Wissahickon Valley
- Opportunity for all of us to work together to continue protecting open space and improving life in the Wissahickon
- Questions?

Contact Info:

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