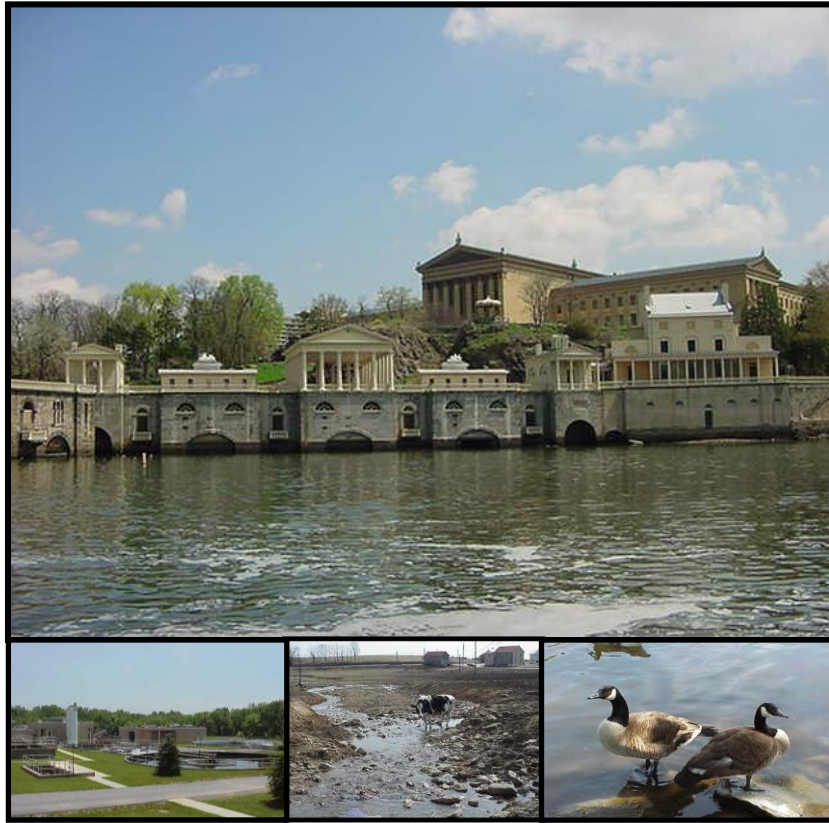


2016 Annual Status Report

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

January 2017

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

BCCD	Berks County Conservation District
BCWSA	Berks County Water and Sewer Association
BMP	Best Management Practice
CAC	Citizens Advisory Council
CDC	Community Design Collaborative
CSO	Combined Sewer Overflow
DRBC	Delaware River Basin Commission
EPA	United States Environmental Protection Agency
EWS	Early Warning System
FWWIC	Fairmount Water Works Interpretive Center
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 Dataset
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
PWD	Philadelphia Water Department
SAN	Schuylkill Action Network
SAS	Schuylkill Action Students
SRHA	Schuylkill River Heritage Area
SRRF	Schuylkill River Restoration Fund
SWA	Source Water Assessment
SWPP	Source Water Protection Plan
WCP	Watershed Control Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
USDA	United States Department of Agriculture

Section 1 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's Source Water Protection Program and through WCP actions aimed to specifically reduce levels of *Cryptosporidium* in the Schuylkill River watershed, Philadelphia's drinking water source. The following report documents PWD progress towards WCP initiatives during 2016, the fourth year of the 5-year plan.

Section 2 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 2-1.

Table 2-1: 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 <i>Cryptosporidium</i> 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
Bin classification and supporting data from 2nd round of monitoring due to State		October 2017
	2017 Annual Status Report due to State	January 2018

Section 3 2016 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/Compliance 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, and animal vectors, and education and outreach in the City and watershed wide. This section discusses the progress PWD has made towards each of the ongoing and proposed initiatives by category.

3.1 Wastewater Discharge/Compliance

Effluent from WWTPs upstream of the PWD Queen Lane intake is a source of *Cryptosporidium* in the watershed (PWD, 2002; PWD, 2011). Although approximately 2% of the Schuylkill River watershed is in Philadelphia, PWD plays a leadership and supporting role in multiple initiatives outside of the City of Philadelphia. 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 the City of Philadelphia and in the Schuylkill River watershed are detailed in Table 3-1 and Table 3-2, both reproduced from the WCP. Progress made in 2016 towards these initiatives is summarized in this section.

Table 3-1: Ongoing Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.1.1 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.</p>
	<p>3.1.2 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.</p>
	<p>3.1.3 Early Warning System Continue to maximize usage for the Early Warning System while maintaining the system's ongoing operations and maintenance needs.</p>
Schuylkill River Watershed	<p>3.1.4 Provide Project Support for the Lehigh University <i>Cryptosporidium</i> Study Continue to support Lehigh University's <i>Cryptosporidium</i> source tracking study by providing support in terms of sampling, elution, and project management and oversight.</p>
	<p>3.1.5 SAN Pathogens/Compliance Workgroup Continue to support efforts of the SAN Pathogens/Compliance Workgroup. The strategies for the 2016 SAN Pathogens/Compliance Work Plan are as follows: 1) Improve discharger/water supplier communication of events and use of the Delaware Valley Early Warning System and PAWARN, 2) identify priority wastewater discharges/issues in the watershed and formulate action plans to address them, 3) provide support (financial, information, expertise, collaborative problem-solving) for partners/communities to implement projects that reduce priority discharges, and 4) provide a forum for partner and agency communication and coordination around discharge issues and the formulation of creative new ideas and approaches for solving related problems.</p>
	<p>3.1.6 Abate Wildcat Sewers Continue to support SAN in its efforts to identify and abate wildcat sewers throughout the Schuylkill River watershed.</p>

Table 3-2: Proposed Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.1.7 PWD Schuylkill River Watershed 10-Year Review</p> <p>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.</p>
Schuylkill River Watershed	<p>3.1.8 Support <i>Cryptosporidium</i> Monitoring at Major WWTPs and Inclusion in NPDES Permits</p> <p>Support/help develop an effluent monitoring plan for <i>Cryptosporidium</i> at major WWTPs in the Schuylkill River watershed. In conjunction with this effort, should <i>Cryptosporidium</i> monitoring be considered for incorporation into NPDES permits, PWD will support such an effort. However, in regard to <i>Cryptosporidium</i> 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.</p>
	<p>3.1.9 Track Wastewater Related Changes in the Watershed</p> <p>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.</p> <ul style="list-style-type: none"> 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 sewerage of new areas) by reviewing Part II Permits. o Track projects funded under government loan programs, such as PennVest.
	<p>3.1.10 Wet Weather and High Flow Management Education for WWTP Operators</p> <p>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.</p>
	<p>3.1.11 Research on WWTP Effluent and <i>Cryptosporidium</i> in Surface Waters</p> <p>Support future research initiatives surrounding the impact of WWTP effluent on <i>Cryptosporidium</i> surface water concentrations by partnering with research organizations and/or academic institutions</p>

3.1.1 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. Philadelphia's Act 537 Plan was last updated in 2009.

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

Each year, PWD summarizes its activities and programs pertaining to the management of stormwater in combined and separate sewers in accordance with Philadelphia's CSO and MS4 NPDES permits. A major component of Philadelphia's CSO NPDES permit requirements is the implementation of the Long Term Control Plan Update (LTCPU), *Green City, Clean Waters*. *Green City, Clean Waters* is a 25-year plan with a green stormwater infrastructure-based approach to reduce pollutants discharged by the combined sewer system. The 2016 fiscal year report is available to the public on phillywatersheds.org.

3.1.3 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 flow water quality data and a central website where users can access event information, analysis tools and data.

In 2016, PWD continued to develop and enhance the Tidal Spill Trajectory Tool. The Tidal Spill Trajectory Tool 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. Additionally, in 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>.

3.1.4 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's source water and watersheds. 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 2016, PWD collected samples approximately twice per month in Philadelphia and at locations upstream in the Schuylkill River watershed. For more information, see Sections 3.1.11, 3.2.6, and 3.3.3.

3.1.5 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 2016 are included in Appendix B.

3.1.6 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 2016 updates is included in Appendix C.

3.1.7 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.

3.1.8 Support *Cryptosporidium* Monitoring at Major WWTPs and Inclusion in NPDES Permits

PWD regularly attends the quarterly SAN Pathogens and Point Source Workgroup meetings. Through this involvement, PWD supports the development of 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's monitoring and research efforts in the watershed.

3.1.9 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 included in Appendix D. 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).

3.1.10 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. However, the workgroup has met challenges while planning the content for the workshop, and the planning of the workshop is currently on hold. After the completion of the SAN 2016-2020

Strategic Plan, the workgroup is developing other ideas to provide education and outreach to WWTP operators.

3.1.11 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 watershed upstream of Philadelphia's drinking water intakes. 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 2016 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. PWD is partnering with two other water suppliers: Western Berks Water Authority and Reading Area Water Authority. Samples will be analyzed at Lehigh University to determine the species of any *Cryptosporidium* detected and assist in source tracking. The project will also document watershed conditions including rainfall, streamflow, and WWTP overflow events as available from PADEP to correlate with *Cryptosporidium* sample results.

3.2 Agricultural Land Use and Runoff

Animal manure-laden runoff from agricultural land is a source of *Cryptosporidium* and pathogens in the Schuylkill River watershed (PWD, 2002; PWD, 2011). Much of PWD efforts to address agricultural runoff occur upstream of the PWD intakes because the agricultural land within the City of Philadelphia 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 3-3 and Table 3-4 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 2016 towards each initiative listed.

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

Project Location	Project Overview
Phila- delphia	<i>BMPs have been implemented at all agricultural sites within the City.</i>
Schuylkill River Watershed	3.2.1 SAN Agriculture Workgroup
	Continue to be an active participant in the SAN Agriculture Workgroup and support future efforts. The strategies for the 2016 SAN Agriculture Workgroup plan are as follows: 1) support implementation of projects that demonstrate BMPs and/or creative solutions for agriculture in priority areas (with funding, information, expertise, collaborative problems, solving, etc.), 2) provide a forum for partner and agency communication and coordination around agricultural impacts and issues and the formulation of creative new ideas and approaches for solving related problems, 3) promote agricultural BMP successes and understanding of agricultural water quality issues and solutions to target audiences in the watershed through an educational/outreach program, and 4) monitor the impacts of agricultural BMP installations on stream water quality.

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

Project Location	Project Overview
Philadelphia	3.2.2 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.
	3.2.3 Natural Lands Trust and Erdenheim Farm
The National Lands Trust (NLT) is currently performing stream restoration on a tract of land on Erdenheim Farm, located in the Wissahickon 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 the NLT to install additional agricultural BMPs at the farm.	
3.2.4 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 2001 National Land Use Database will be used, along with more current information from the 2010 Census.	

Schuylkill River Watershed	<p>3.2.5 Visual Assessments for the Agriculture BMP Projects</p> <p>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.</p>
	<p>3.2.6 Agricultural BMP Monitoring for <i>Cryptosporidium</i></p> <p>PWD will explore the possibility of partnering with academic institutions on <i>Cryptosporidium</i>-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.</p>
	<p>3.2.7 Promotion of SAN Agriculture Projects</p> <p>Through involvement in the SAN Agriculture Workgroup, PWD will continue to work with partners and state and federal officials 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 <i>Cryptosporidium</i> contamination reduction, as a high-priority water quality improvement goal that requires adequate funding.</p>
	<p>3.2.8 CAFO Identification in the Watershed</p> <p>Through the SAN Agriculture Workgroup, PWD will work with partners to identify CAFOs located in the Schuylkill River watershed and assess the status of their NPDES permits.</p>
	<p>3.2.9 Schuylkill River Restoration Fund (SRRF) Grants for Agriculture BMP Projects</p> <p>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’s commitment through the SRRF will address priority stormwater and pathogen concerns while promoting the importance of watershed partnerships.</p>

3.2.1 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 2016 are included in Appendix B.

3.2.2 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 for the pre-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 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 solution options to address each issue. In 2016, Saul High School successfully created a 501(c)(3) as a mechanism to acquire project funding. PWD is coordinating internally to determine resources available to support projects to manage stormwater and protect drinking source water on Saul High School's campus.

3.2.3 Natural Lands Trust and Erdenheim Farm

Erdenheim Farm is located in Lafayette Hill on the Wissahickon Creek. 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 Wissahickon Creek. Additionally, a 96-acre parcel of Erdenheim Farm was purchased by Natural Lands Trust for preservation from development in 2009. In 2013, PWD reached out to Natural Lands Trust to express interest in collaboration on future projects at Erdenheim Farm. PWD is not aware of any new projects in the planning phase for Erdenheim Farm.

3.2.4 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 included in Appendix E.

3.2.5 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.

3.2.6 Agricultural BMP Monitoring for *Cryptosporidium*

Beginning in October 2015 and continuing through 2016, 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).

3.2.7 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 2015 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 <http://www.phillywatersheds.org/blog>.

3.2.8 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 2016, PWD received updated CAFO data from PADEP including number of animal equivalent units and primary animal for each operation. An updated map is included in Appendix F of this report.

3.2.9 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 2016, PWD supported the selection of two farms to receive SRRF grants for agricultural BMP projects: the Zettlemyer and Durkin farms. The SRRF projects are discussed in more detail in Section 4.2.1.

3.3 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 3-5 and Table 3-6 outline the SWPP ongoing and proposed initiatives that aim to reduce the impact of animal vectors near PWD's Queen Lane and Belmont intakes and expand implementation of animal vector control in the Schuylkill River watershed. This section explains the progress made in 2016 towards each initiative listed.

Table 3-5: Ongoing Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.3.1 Belmont Meadow Extension and Intake Project</p> <p>Maintain plantings at the site of the Belmont Meadow Extension/Intake project. Continue to monitor goose activity around the Belmont intake.</p>
	<p>3.3.2 Education and Outreach on Threat of Animal Vectors in the City</p> <p>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.</p>
Schuylkill River Watershed	<p>3.3.3 Lehigh University <i>Cryptosporidium</i> Source Tracking</p> <p>Continue to support Lehigh’s source tracking research to further identify and understand the animals that serve as mechanical vectors of <i>Cryptosporidium</i> in the watershed.</p>

Table 3-6: Proposed Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.3.4 Goose Measures at Fairmount Park Properties</p> <p>Identify and implement appropriate goose control measures at Fairmount Park properties, including Peter’s Island, and incorporate educational signage in these areas.</p>
	<p>3.3.5 Waterfowl Management at PWD Facilities</p> <p>Complete implementation of the USDA waterfowl management program at the Queen Lane WTP, Belmont WTP and Baxter WTP along with PWD’s three WWTPs.</p>
Schuylkill River Watershed	<p>3.3.6 Animal Vector Education and Outreach in the Watershed</p> <p>As part of the Source Water Protection Program’s education and outreach efforts, raise awareness of the threat animal vectors pose to our drinking water supplies. These efforts may focus on supporting Lehigh’s efforts to publish scientific journal articles.</p>

3.3.1 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, 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 2016, the Belmont meadow and intake plantings were maintained by Philadelphia Parks and Recreation to continue deterring geese from the area.

3.3.2 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 completion occurred in December 2015, and the next one is planned for 2017. 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, but no implementation timeline has been determined. PWD will continue to follow the plan status and look for opportunities to align source water goals with the plan, such as including education signage on geese as vectors of pathogens in Fairmount Park.

3.3.3 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. *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.

3.3.4 Goose Measures at Fairmount Park Properties

In 2016, 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 4.5 of this report.

3.3.5 Waterfowl Management at PWD Facilities

In 2016, under a PWD contract with the USDA, goose control measures were implemented at PWD's 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 4.5 of this report.

3.3.6 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.

3.4 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 3-7 and Table 3-8 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 2016 towards each initiative listed.

Table 3-7: Ongoing Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.4.1 Watershed Partnerships in the City Remain an active participant in the watershed partnerships and begin integrating drinking water issues into the scope of work for the Wissahickon Watershed Partnership.</p>
	<p>3.4.2 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 <i>Cryptosporidium</i> contamination.</p>
	<p>3.4.3 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.</p>
	<p>3.4.4 Improve Environmental Quality of Philadelphia Fairmount Park System Continue to work with Fairmount Park to improve the environmental quality of the City’s parks and streams through land management practices and BMP implementation.</p>
	<p>3.4.5 Maintain Fairmount Water Works Interpretive Center Continue to maintain the FWWIC and promote source water protection through the center’s various exhibits and learning programs.</p>
	<p>3.4.6 Philly RiverCast Continue to operate Philly RiverCast and promote the web-based recreational warning system.</p>
Schuylkill River Watershed	<p>3.4.7 Active Members of SAN Pathogens/Compliance and Agriculture Workgroups Continue to be an active member of the SAN Pathogens/Compliance and Agriculture workgroups and support initiatives outlined in the annual work plans.</p>
	<p>3.4.8 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.</p>
	<p>3.4.9 Schuylkill River Restoration Fund Continue to support the SRRF to achieve implementation of BMPs at high-priority sites in the watershed.</p>

Table 3-8: Proposed Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.4.10 Implement In-City Source Water Programs in East Falls, Roxborough and Manayunk</p> <p>Implement in-city source water programs in the East Falls, Roxborough, and Manayunk neighborhoods along the Schuylkill River. These programs will involve the implementation of stormwater management practices, storm drain labels and a dog waste control program. Through the programs, 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.</p>

3.4.1 Watershed Partnerships in the City

PWD supports a contract with the Pennsylvania Environmental Council (PEC) for regional watershed coordination 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 phillywatersheds.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 grant program, Soak It Up! Adoption. This program provides grants to civic organizations to help maintain green stormwater infrastructure. This infrastructure is designed under the *Green City, Clean Waters* initiative to reduce stormwater runoff captured in CSOs. Organizations receiving grants were asked to participate in an introductory training, monitor green stormwater infrastructure, collect trash and provide feedback on the site to PWD. One new organization was accepted into the program in fiscal year 2016, and one organization left the program keeping the total number of organizations at fourteen. There are 57 individuals acting as representatives for the program from these organizations, and 101 stormwater management practices have been adopted to date. Throughout the year, these organizations held guided tours, table sessions at local public events and presentations at civic association meetings. More information is available in Philadelphia's Wet Weather Management Programs Annual Report for fiscal year 2016 available on phillywatersheds.org.

3.4.2 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 2016 shares 2015 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 our source water and watershed protection efforts.

3.4.3 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).

3.4.4 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 planning process was completed in 2014 with no implementation timeline determined. PWD will continue to follow the plan status and look for opportunities to align source water goals with the plan.

3.4.5 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-and-research/. The project will include the development and construction of a production hatchery and a demonstration hatchery. Installation of the demonstration hatchery at the Fairmount Water Works was underway in 2016 and will continue in 2017.

3.4.6 Philly RiverCast

PWD continues to promote and maintain Philly RiverCast. The website has received over 900,000 visits since its launch in 2005. In 2016, PWD assisted individuals and recreational groups in interpreting RiverCast ratings. Organizers of the Philadelphia TriRock triathlon 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.

3.4.7 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 2016 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.

To support education and outreach in 2016, 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.

The SAN Pathogens and Point Source Workgroup hosted a water supplier forum in April 2016. The agenda included a discussion on emerging contaminants led by RAWA and a case study presentation of the June 2015 Miller Chemical Fire led by PADEP. Contamination to the Conewago Creek from the event killed more than 10,000 fish and the drinking water supply for New Oxford, Pennsylvania was offline for three months. Additionally, a number of SAN Pathogens and Point Source Workgroup members are a part of the Berks County Water and Sewer Association (BCWSA) which held its 4th annual conference in July 2016. The theme of the conference was "Partnership: The Health of Your System." The BCWSA also held an emergency response tabletop exercise for a compromised drinking water situation in Berks County in October 2016.

3.4.8 Collaboration with Partnership for the Delaware Estuary

PWD continued to contribute financial resources towards collaboration efforts with PDE on a number of 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 SAN. In 2016, PDE organized an annual *Green Cities, Clean Waters* art contest for Philadelphia students receiving over 1,300 entries. The winning artwork was used as advertisements in SEPTA buses and subways and as temporary street art stickers promoting clean water. PDE hosted the 2016 annual Coast Day at Penn's Landing and Fairmount Water Works in Philadelphia which received approximately 3,000 visitors. Additionally, PDE aided coordination of the annual Schuylkill Scrub cleanup effort partnering again with the Keep Pennsylvania Beautiful. The 2016 Schuylkill Scrub included nearly 800 cleanups and removed over 516,000 pounds of trash and 2,700 tires. The 2016 Schuylkill Scrub Report is included in Appendix G. The SAN also sponsored a Sojourn Steward, Bradley Maule, to participate in the Schuylkill River Sojourn. On the 112-mile kayak journey, Bradley photographed trash hot-spots. The photos and locations were used to create a trash map, which is available at arcg.is/28SUed1. In September 2016, PDE and PWD hosted a cleanup of Little Tinicum Island in the Delaware River with over 70 volunteers removing about 15,000 pounds of litter. PWD, PDE, the Academy of Natural Sciences, and the Fairmount Water Works are partnering to install a freshwater mussel hatchery demonstration project at the Fairmount Water Works (Section 3.4.5). The installation was underway in 2016.

3.4.9 Schuylkill River Restoration Fund

PWD continues to support the SRRF. In 2016, 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 4.2.1 of this report.

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

First steps to implement source water programs in East Falls, Roxborough and Manayunk neighborhoods are in progress. North Light Community Center 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 plants. The project will serve as a demonstration and outdoor learning space for students and the community. Amy Northwest middle school 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 3.2.2. 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.

3.5 Additional 2016 Highlights

3.5.1 Outreach to Watershed Community

PWD participated in the SAN annual meeting in November 2016. The meeting drew approximately 78 watershed partners to participate in a day of presentations and discussion. The theme was *A Vision for the Schuylkill* focusing on planning efforts in the basin. PWD gave a presentation on the Climate Change Adaptation Program.

3.5.2 Ecological Restoration Unit

The Ecological Restoration Unit 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, improve sediment transport, and 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 Wisers Mill Run and Saylor Grove.

Section 4 2016 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 4-1 below.

Table 4-1: 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

4.1 UV Installation at Wastewater Treatment Plants

4.1.1 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 publically 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 3.1.9 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.

4.1.2 *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 4-1 and Equation 4-2, 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 4-2.

Equation 4-1: Maximum Oocysts Loading from all Schuylkill River Watershed WWTPs:

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

Equation 4-2: Minimum Oocysts Loading from all Schuylkill River Watershed WWTPs:

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

Table 4-2: 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

4.1.3 *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 4-3 and compared to the WCP target loading reduction in Section 5.

Table 4-3: 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

4.2 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 five manure storage basins and five vegetated buffers on separate farms. 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.

4.2.1 Schuylkill River Restoration Fund Farms

In 2006, Exelon, SAN, and the Schuylkill River Heritage Area (SRHA) 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 yearly 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. SRHA, managed by the nonprofit Schuylkill River Greenway Association, 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 2016, two farms received funding from the SRRF. The PWD highest priority project was agricultural best management practice (BMP) installation at the Zettlemoyer farm. PWD also identified a second farm as high priority advocating for the SRRF to fund agricultural BMPs at the Durkin farm. (Additionally, PWD recognized a community center greening project 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 SRRF farm projects are described here in detail. Additionally, construction updates for one farm receiving an SRRF grant in 2015 are also described.

4.2.1.1 Zettlemyer Farms

The Zettlemyer farms were considered the highest priority project by PWD and are located on Manor Creek in the Maiden Creek watershed. The operation includes two farms owned and four farms rented by the Zettlemyers, a total of 450 acres farmed. The Zettlemyer 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.



Figure 4-1: Zettlemyer Farms

The Zettlemyer farms constitute a heifer operation with 60 heifers located on two of the farm properties. Construction has not yet begun on the one farm. Manure is stacked in the barn yard area, Figure 4-1 (a), where manure laden runoff leaks from the barnyard area, Figure 4-1 (b), down the driveway, across the street, and towards the creek, Figure 4-1 (c). The project will include a dry manure storage that captures manure from the barnyard area and stormwater controls to keep manure contaminated runoff from leaving the site. At the second farm, construction of a heifer barn with dry manure storage is underway, Figure 4-1(d). 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 season when there is water, Figure 4-1 (e).

4.2.1.2 Durkin Farms

The Durkin Farms were also considered a high priority project by PWD and 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, 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 five farm properties.



Figure 4-2: Durkin Farms

The Durkin farms constitute a dairy operation with approximately 95 milking cows and 30 dry cows and heifers. The farm property includes some steeper terrain. Figure 4-2 (a) shows a Google satellite image of the farm with 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, Figure 4-2 (b), 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 around 2003. However, even with the buffer in place, manure laden runoff was being directed towards the creek. As part of the project, a 6-month liquid manure storage was constructed, Figure 4-2 (c) (the circle shown in Figure 4-2 (a)). Manure from the dairy barn is pumped to the manure storage. A heavy use area, not yet constructed, will capture additional runoff that will also be pumped up to the liquid storage. Dry manure storage is currently under construction to hold manure from the heifer barn, Figure 4-2 (d).

This project also included the implementation of a riparian buffer funded by the Trust for Tomorrow and a PADEP Growing Greener grant at another Durkin farm downstream of the farm headquarters, Figure 4-2 (e). The Fish and Wildlife contributed to the project adding habitat features to 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 4-2 (f) to keep grazing cows out of the creek.

4.2.1.3 Donald Rice Farm

The Donald Rice farm was the PWD highest priority project in 2015. Construction had not yet begun at the end of 2015, and the project was completed in 2016. The farm is a heifer operation and is located in the Maiden Creek watershed. Donald Rice completed conservation and nutrient management planning in 2014, and received a 2015 SRRF grant for the first two years of a four-year BMP implementation project.



Figure 4-3: Donald Rice Farm

Figure 4-3 (a) shows a satellite image from Google Earth of the farm prior to BMP implementation. The manure was stored next to the road. Manure laden runoff flowed from the storage area down the driveway and into a pipe, Figure 4-3 (b). The pipe discharges on the other side of the road near another tributary to the Maiden Creek. The Donald Rice farm is located adjacent to the David Rice farm, recipient of a 2014 SRRF grant. The same unnamed tributary to the Maiden Creek flows through both Rice farm properties. A wetland buffer has been maintained for this unnamed tributary for approximately ten years, originally planted as part of a CREP project. Although there is a riparian buffer on this farm, the former manure storage system was continuing to contaminate nearby waterways demonstrating the importance of a whole farm approach taken by SAN partners. In 2016, a new barnyard was constructed, Figure 4-3 (c). The barn is located further from the road and includes a dry manure storage area, Figure 4-3 (d). The roof of the barn keeps clean rainwater from becoming contaminated with manure.

4.2.2 *Cryptosporidium* Loading from Agricultural Land

To estimate a range of *Cryptosporidium* loading from agricultural land runoff 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’s 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 4-3. 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 I. The animal population method is described by Equation 4-3. The results are summarized in Table 4-4.

Equation 4-3: Agricultural Runoff Method (Minimum Estimate):

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

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

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

Table 4-4: 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

4.2.3 *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 4-5.

Table 4-5: *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 2016, four manure storages were supported by the SRRF. PWD will count two storages towards WCP goals. The characteristics of the farms are:

Durkin Farm

- 450 acres farmed
- 119 cows (including milking cows and heifers) and 6 calves (ages 0-6 months)

Zettlemoyer Farm

- 450 acres farmed
- 45 cows (heifers) and 15 calves (0-6 months)

The *Cryptosporidium* loading reduction per year is estimated for the Durkin farm and the Zettlemoyer farm using the agricultural runoff and the animal population methods described in Equation 4-3 and Equation 4-4, 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 dairy cattle and calves at each farm because both the Durkin and Zettlemoyer farms are primarily dairy and heifer operations. Heifers are young female cows that have not born a calf. In the *Cryptosporidium* loading reduction calculations, heifers are assumed to be between six months and two years of age. The results of these calculations are presented in Table 4-6 and compared to the WCP target loading reduction in Section 5.

Table 4-6: Loading Reduction Estimates from Manure Storage Basins Implemented

Structural Control Measure	Estimated Min Reduction (oocysts/year)	Estimated Max Reduction (oocysts/year)
Durkin manure storage*	8.25+09	1.45 E+12
Zettlemoyer manure storage	8.25E+09	3.61 E+12

*The construction of manure storage was used in the loading reduction calculation; however, a riparian buffer was funded by other partners and also implemented on the farm.

4.2.4 SAN Ag BMPs

Outside the SRRF, many other SAN partners contributed to the implementation of agricultural BMPs in the watershed in 2016 including NRCS, Berks Nature, and BCCD. Table 4-7 estimates the number of agricultural BMPs implemented in 2016.

Table 4-7: Ag BMPs Implemented in 2016 through SAN partners

Ag BMPs Implemented in 2016 through SAN Partners*				
Comprehensive Nutrient Management	Manure Storages	Barnyard Repairs/ Heavy Use Areas	Stream Crossings	Riparian buffers
29	13	12	11	12.4 acres (4 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.

4.3 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, criteria 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 grants 2016. Additionally, NRCS implemented 29 CNMPs in 2016.

4.4 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. Additionally, through the SAN, other riparian buffers have been planted in the Schuylkill River watershed.

4.4.1 SRRF Riparian Buffer Plantings

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 publically owned land in Philadelphia along the Schuylkill River and Manayunk Canal. The Shawmont waterfront and Ottinger Tract are directly upstream of Philadelphia's 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 $\frac{3}{4}$ 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 4-4(a) shows a view of the Manayunk Canal looking downstream with part of the restored waterfront on the left bank. Figure 4-4(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 4-4: 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 damaging flows, 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.

4.4.2 SAN Riparian Buffer Plantings

Riparian buffers were planted in the Schuylkill River watershed by SAN partners. In 2016, 12.4 acres of stream buffer was planted through the Conservation Reserve Enhancement Program (CREP) with support from Stroud Water Research Center and BCCD, reported in Table 4-7. CREP is a partnership between federal and state governments and private groups and is administered by the USDA. It installs stream bank 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. Stroud Water Research Center’s Stroud Farm Stewardship Program offers “BMP vouchers” of \$4,000 for each acre of stream 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 other conservation BMPs on the farm 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.

4.5 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 April 2016 through June 2016 at Fairmount Park properties are shown in Figure 4-5. A total of 66 eggs were treated, 15 geese were removed, and 708 geese were harassed and dispersed from Fairmount Park properties. The numbers of geese dispersed and eggs treated from January 2016 through October 2016 at PWD facilities are shown in

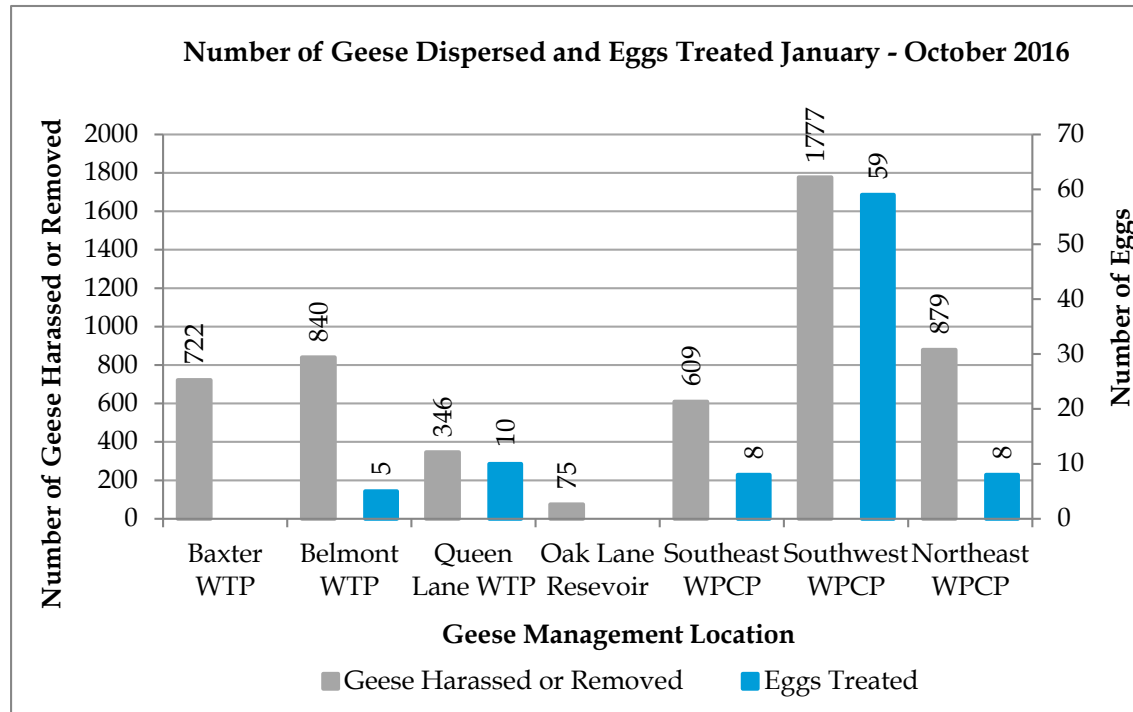


Figure 4-6. A total of 90 Canada goose eggs were treated, 29 geese were removed, and 5,219 were harassed and dispersed from PWD facilities.

The data collected between 2011 and 2016 is encouraging and suggests that the geese management strategies implemented by PWD through contracts with the USDA are impacting goose 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 prime 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, and 2016, 55, 58 and 66 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.

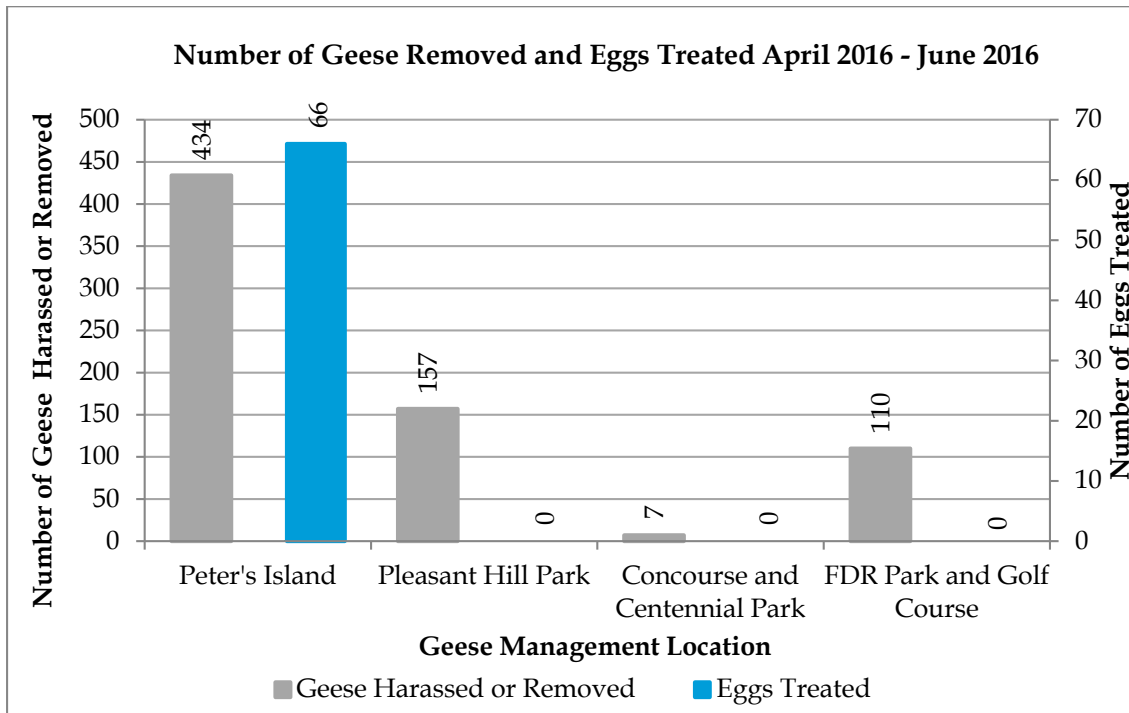


Figure 4-5: Geese Management at Fairmount Park Properties April 2016 through June 2016

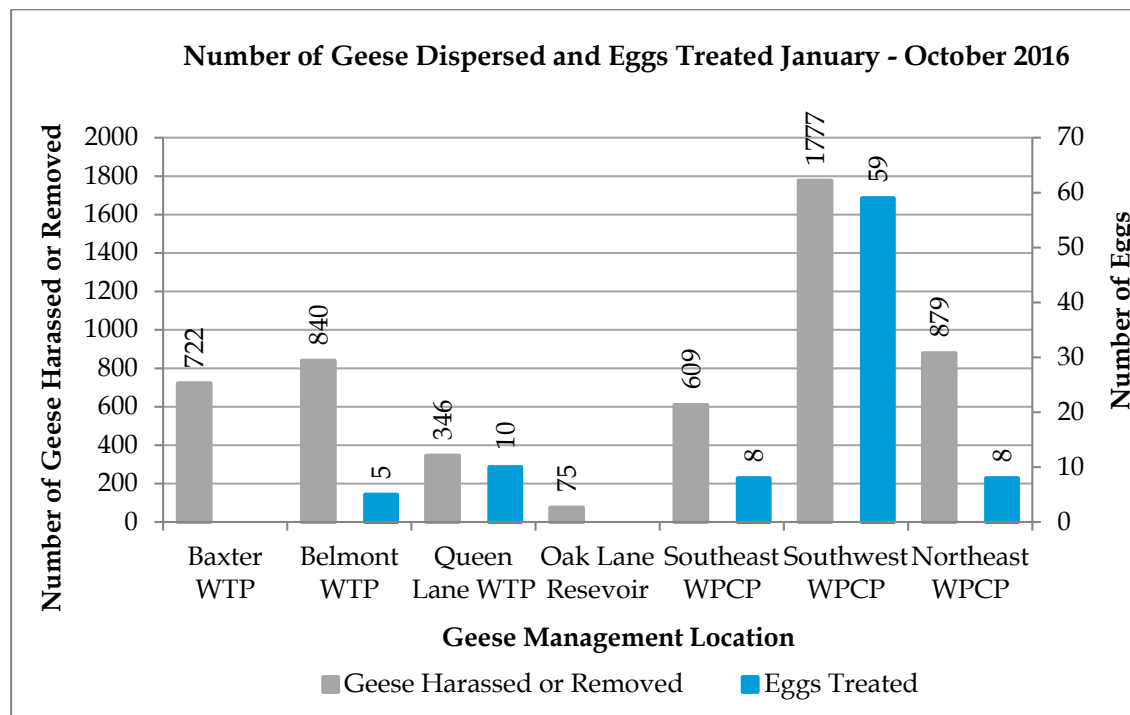


Figure 4-6: Geese Management at PWD Facilities January 2016 through October 2016

Section 5 2016 Watershed Control Plan Progress

5.1 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 thus far. The UV installation projects upstream of the Queen Lane intake at Upper Gwynedd WWTP and Fleetwood WWTP, which PWD has followed through publically available information, are both fully operational, as reported in the 2013, 2014 and 2015 Annual Status Reports. PWD contributed to the SRRF, which awarded grants to support the construction of two manure storage basins at two separate farms in the Schuylkill River watershed in 2016. The project at one of these farms also included planting a riparian buffer. PWD also reported supporting the implementation of the Shawmont waterfront riparian buffer along the Schuylkill River in Philadelphia in 2012 and 2013 through an SRRF grant. Twenty-nine new farms implemented a CNMP through NRCS in 2016. Geese were removed and nests and eggs treated at Fairmount Park properties and PWD facilities. The WCP progress in 2016 is summarized in Table 5-1.

Table 5-1: WCP Project Progress Summary

	WCP Project Type	Project Description	Project status
2013	WWTP Upgrade	UV installation at Upper Gwynedd WWTP	Fully Operational
	WWTP Upgrade	UV installation at Fleetwood WWTP	Fully Operational
	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	Under Construction
	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	Under Construction
	Farm BMP	Manure storage basin at Dalton Biehl Farm	Under Construction
	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 Zettlemyer Farm	Under Construction
	Farm BMP	Manure storage basin at Durkin Farm	Under Construction
	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		
	Farm BMP		
	Nutrient Management Plans		
	Riparian Buffer Planting		
	Waterfowl management		

WCP Completion Requirement Check	WWTP Upgrades	Track UV Installation at 2 plants	
	Farm BMPs	Manure storage basins -5	
		Vegetated buffers - 5	
	Nutrient Management Plans	Nutrient Management Plans -5	
	Riparian Buffer Planting	Sites - 1	
	Waterfowl management	Years - 5	

* There is an alteration to the original timeline described in Table 4-1. 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 J.

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 waste and stormwater management less important on the site. With earthen lagoons as manure storage basins, the storm water and groundwater are at risk for contamination. If groundwater on the site becomes contaminated, the karst and limestone geology in the Berks County area, which allows ground water to move quickly in the ground, will make nearby surface waters vulnerable to contamination as well. Additionally, PWD calculations presented in Section 4.2.3 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 fourth year of the WCP program, PWD has supported the implementation of eight manure storage basins. One of the farms receiving an SRRF grant in 2016 also implemented a riparian buffer on the property. The riparian buffer was funded by match contributions from the Trust for Tomorrow and a PADEP Growing Greener Grant.

5.2 *Cryptosporidium* Watershed Loading and Target Reduction

The WCP initiatives described in Section 4 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 (Sections 4.1 and 4.2). 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 4-1 and Equation 4-2 and the method summarized in Section 4.1.2. The maximum and minimum *Cryptosporidium* loading from agricultural land use runoff was estimated using Equation 4-3 and Equation 4-4 and the method described in Section 4.2.2.

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 used urban land acreage in Queen Lane’s 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 5-2.

Equation 5-1: Estimate of Oocyst Loading from Stormwater Runoff:

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

Table 5-2: 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 5-3.

Table 5-3: 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 <i>Cryptosporidium</i> 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 <i>Cryptosporidium</i> event mean concentrations for urban/developed land, similar to the 2002 SWA approach.	
TOTAL LOADING	Summation of minimum estimates of Schuylkill River watershed <i>Cryptosporidium</i> sources.	Summation of maximum estimates of Schuylkill River watershed <i>Cryptosporidium</i> 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 target reductions. The minimum target reduction is 2.11E+11 oocysts per year, and the maximum target reduction 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 2015 are estimated for UV installation at two WWTPs, and the construction of six manure storage basins at separate farms, Sections 4.1.3 and 4.2.3, respectively. The potential for reducing the total Schuylkill River watershed *Cryptosporidium* loading is then compared to the

range of target reductions established. Schuylkill River watershed loadings, target loading reduction and loading reductions from control measures are summarized in Table 5-4.

By summing the estimated impacts of UV installation at two WWTPs and BMP implementation at eight farms, total estimates of *Cryptosporidium* loading reduction in years one through four of the PWD WCP are calculated. The impact of control measures implemented both in 2016 and over the life of the WCP is estimated to potentially account for 7.8% to 13.1% and 13.6% to 167.5%, respectively, of the target reduction goal. 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 5-4: 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 Target Reduction	Maximum Reduction as % of Maximum Target Reduction
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	Farm BMP				
	Farm BMP				
5-Year Target Reduction	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	2.86E+10	4.31E+13	13.55%	112.00%
	TOTAL LOADING REDUCTION	1.23E+10	5.95E+13	13.63%	167.50%

Section 6 Expectations for 2017

In 2017, 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's source water and watersheds in collaboration with Lehigh University.
- Continued funding towards SAN administration and the SAN Coordinator position
- A \$100,000 contribution to SRRF for 2017 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

Section 7 References

- American Society of Agricultural Engineerings. 2003. *Manure Production and Characteristics*. ASAE D384.1, St. Joseph, MI.
- Carroll Engineering Corporation. 2013. *Municipal Wasteload Management North Wales Water Authority Wastewater Treatment Plant Annual Report Calendar Year 2012*. Print. Obtained through communication with PA DEP Southeast Regional Office.
- Cox, Peter; Griffith, Merran; Angles, Mark; Deere, Daniel; & Ferguson, Christobel. (2005) *Concentrations of Pathogens and Indicators in Animal Feces in the Sydney Watershed*. Applied Environmental Microbiology. 71 (10):5929.
- Crockett, C.S. 2007. "The Role of Wastewater Treatment in Protecting Water Supplies Against Emerging Pathogens." *Water Environment Research* 79.3: 221-32. Print.
- Duzinski, Phil. 2008. *Schuylkill Action Network Pathogens Workgroup Study of Cryptosporidium Occurrence in Wastewater Treatment Plants*. Rep. Print.
- Environmental Engineering & Management Associates, Inc. 2013. *Upper Gwynedd Township, Chapter 94 Municipal Wasteload Management, Annual Report 2012*. Print. Obtained through communication with PA DEP Southeast Regional Office.
- Fayer, Ronald; Santin, Mónica; Trout, James M.; Greiner, Ellis. 2006. Prevalence of species and genotypes of *Cryptosporidium* found in 1–2-year-old dairy cattle in the eastern United States. *Veterinary Parasitology*, 135(2):105-112.
- Jellison, Kristen L., Amy E. Lynch, and Joseph M. Ziemann. 2009. "Source Tracking Identifies Deer and Geese as Vectors of Human-Infectious *Cryptosporidium* Genotypes in an Urban/Suburban Watershed." *Environmental Science and Technology* 43.12: 4267-272. Print.
- Jellison, Kristen. 2010a. *Detection and Genotyping of Cryptosporidium Spp. Oocysts in Water and Geese Faces in the Wissahickon Watershed: September 2008-May 2010*. Rep. Lehigh University, Department of Civil and Environmental Engineering, Bethlehem, PA. Print.
- Johnson, E.; Atwill, E.R.; Filkins, M.E.; & Kalush, J. 1997. *The prevalence of shedding of Cryptosporidium and Giardia spp. Based on a Single Fecal Sample Collection from each of 91 Horses used for Backcountry Recreation*. *Journal of Veterinary Diagnostic Investigation*. 9.1:56-60. Print.

Fleetwood Borough. 2013. Fleetwood Borough Council Meeting Minutes. Web.
www.fleetwoodboro.com/page3.html.

R.H. McCuen. 2004. *Hydrologic Analysis and Design*. Prentice Hall, Upper Saddle River, New Jersey, 07458, 3rd edition.

Philadelphia Water Department (PWD). 2002. *Belmont & Queen Lane Treatment Plant Source Water Assessment Report (PWSID #1510001)*. Publication.

Philadelphia Water Department (PWD). 2006. *The Schuylkill River Watershed Source Water Protection Plan, Belmont & Queen Lane Surface Water Intakes (PWSID#1510001)*. Publication.

Philadelphia Water Department (PWD). 2011. *Long Term 2 Enhanced Surface Water Treatment Rule Watershed Control Program Plan*. Publication.

Philadelphia Water Department (PWD). 2014. *2013 Watershed Control Plan Annual Status Report*. Publication.
www.phillywatersheds.org/what_were_doing/documents_and_data/watershed_plans_reports

Philadelphia Water Department (PWD). 2015a. *2014 Watershed Control Plan Annual Status Report*. Publication.
www.phillywatersheds.org/what_were_doing/documents_and_data/watershed_plans_reports

Philadelphia Water Department (PWD). 2015b. *Watershed Sanitary Survey*. Publication.

Philadelphia Water Department (PWD). 2015c. *Philadelphia's Wet Weather Management Programs Combined Sewer Management Program Annual Report and Stormwater Management Program Annual Report*. Publication. phillywatersheds.org/doc/FY15CSO_MS4AnnualReport.pdf

Pennsylvania Department of Environmental Protection (PA DEP). 2016. *2016 Draft Pennsylvania Integrated Water Quality Monitoring and Assessment Report: Clean Water Act Section 305(b) Report and 303(d) List*. <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-13014>

United States Environmental Protection Agency (US EPA). 2006. *Federal Register: 40 CFR Parts 9, 141, and 142 National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule; Final Rule*. 3rd ed. Vol. 71. Print.

United States Department of Agriculture (USDA). 1993. *Cryptosporidium* is Common in Dairy Calves: National Dairy Heifer Evaluation Project. Web.

http://www.aphis.usda.gov/animal_health/nahms/dairy/ U.S. Department of Agriculture (USDA). 2002. *2002 Census of Agriculture*. Publication.

World Climate. "Hamburg, Berks County, Pennsylvania USA Average Rainfall." Web.

<http://www.worldclimate.com/cgi-bin/data.pl?ref=N40W075+2300+363632C>

Appendix A: 2016-2020 SAN Strategic Plan



Schuylkill Action Network
Strategic Plan
2016-2020

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SAN Drinking Water Protection History

Following the passage of the Clean Water Act and the Safe Drinking Water Act in the early 1970s¹, 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
<p>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.</p> <p>Work collaboratively to ensure the availability of resources, expertise, and commitments to support the work.</p>	Executive Steering Committee
<p>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.</p> <p>Create and maintain an effective network that maximizes the resources of its membership to protect and restore the Schuylkill watershed.</p>	Planning Committee
<p>Maximize reduction and/or treatment of abandoned mine drainage discharges.</p>	Abandoned Mine Drainage (AMD) Workgroup
<p>Maximize reduction and/or prevention of agricultural impacts to water quality.</p>	Agricultural Workgroup
<p>Improve public support for watershed protection actions.</p>	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 Monitoring²

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 its 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 its 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.

Schuylkill Action Network Fact Sheet – May 2004

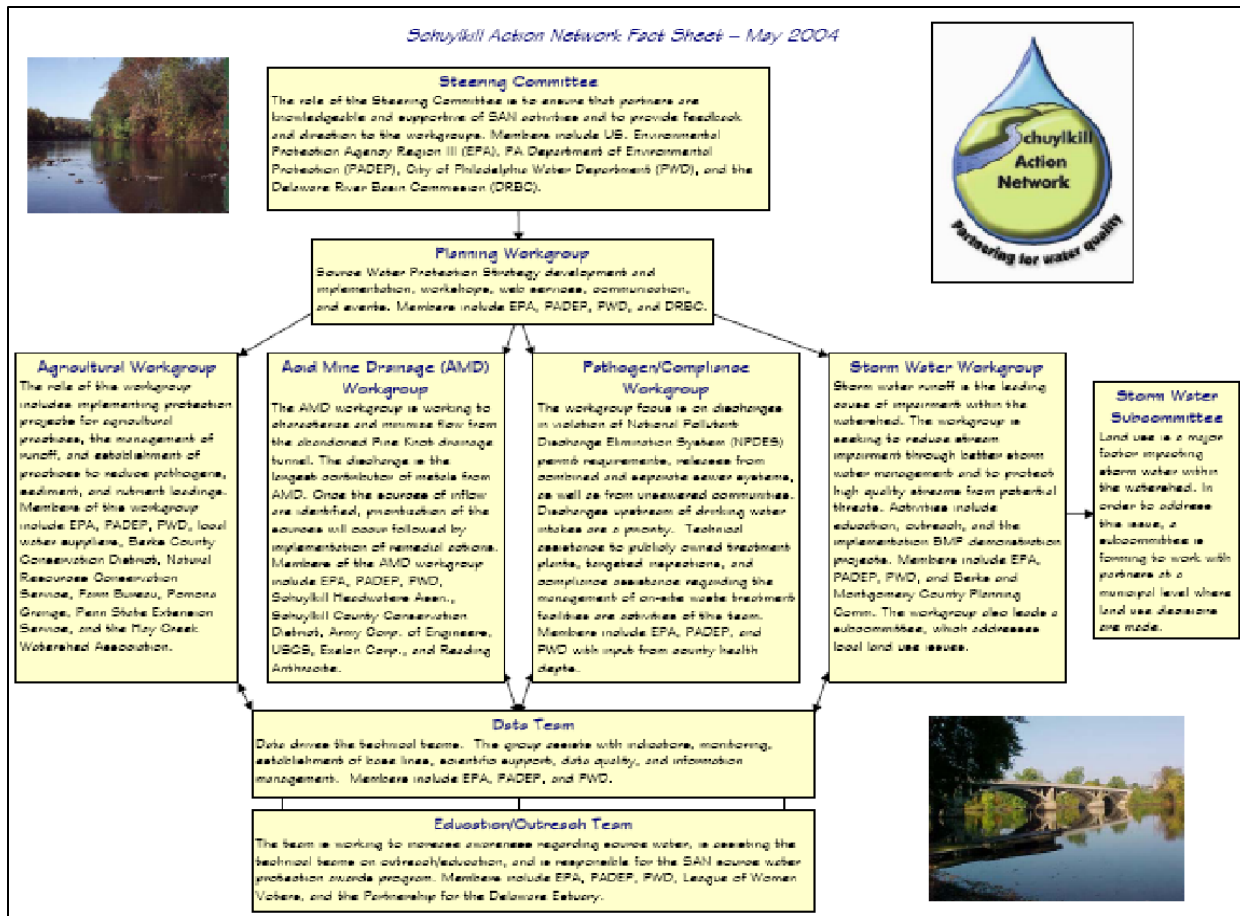


Figure 1: SAN Organizational Chart 2004

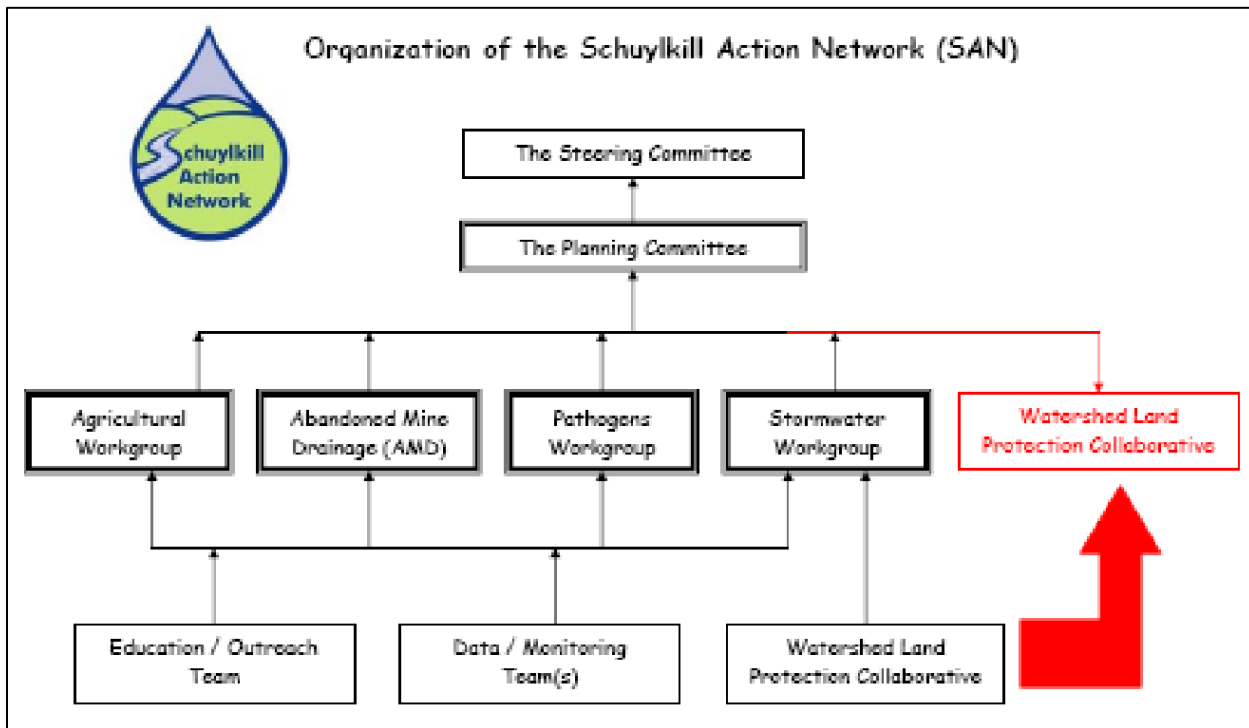


Figure 2: SAN Organizational Chart 2007



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 Source and SAN Agriculture Workgroups 2016 Meeting Minutes

SAN PATHOGENS/COMPLIANCE WORKGROUP FIRST QUARTER MEETING

Schuylkill Action Network Pathogen/Compliance Meeting Minutes March 16, 2016

Attendees:

Joe Hebelka, PA DEP
Craig Ebersole, PA DEP
Tom Davidock, PDE
Steve Flannery, PA DEP
Erick Ammon, PA DEP
Kevin Buss, PA DEP
Virginia Vassalotti, PDE
Beth Garcia, EPA
Kelly Anderson, PWD
Beth Ventura, PWD
Jason Coyle, NLCA
Jared Sabitsky, PA DEP (via phone)

Minutes from 12/9/2015 Workgroup Meeting – Beth G. had one edit to be made – change Kyle Schmeck to Walter Higgens in EPA section.

SAN 5-Year Strategic Plan Update –

- Kelly stated how the Pathogens/Compliance workgroup goals and strategies have changed since the creation of the SAN. The workgroup was originally very focused on compliance with EPA and DEP leading the workgroup. Since then, there has been a shift to bring more water suppliers and wastewater utilities to the table.
- Beth G. announced that Jon Capacasa suggested a name change for the group, since he believed “pathogens” was too narrow of a focus. Beth V. suggested renaming it to the “point source workgroup”. Beth G. will ask Jon how he feels about the name suggestion and/or bring it up during the ESC conference call.

2016 Work Plan Update – Under each strategy in each 2016 workplan, there is a section that lists what strategies it aligns with in the 5-year strategic plan. The group discussed what are some common issues (items coming through a WWTP) that are detrimental to source water (and the WWTP treatment process). Tom suggested developing a one page fact sheet that WWTP could use to distribute at events and through municipal newsletters, etc. By the next meeting, the group will develop a list of what they want to be included in the fact sheet.

http://www.schuylkillwaters.org/doc_files/SAN%20Pathogens%20Workplan%202016%20Final.pdf

PWD Schuylkill Watershed Control Plan/Sanitary Survey – Beth V. submitted PWD’s sanitary survey to DEP and it was approved. The full report can be found here:

http://phillywatersheds.org/doc/Sourcewater/Watershed%20Sanitary%20Survey%202015_FINAL.pdf

PWD Chapter 94 Data – Beth V. explained that this data is related to crypto sampling with Lehigh University. PWD is sampling for crypto at 5 different locations and Lehigh will be conducting genotyping to determine the source. They are also looking at other data (air temp, water temp, flow, etc.) and compare with crypto results. Beth V. wants to get data from upstream utilities if there were any treatment overflows/issues.

Algae Info –

- In Feb, USGS scientists detected algal toxins in 39% southern states. This is the first of several regional assessments. <http://thewatchers.adorraeli.com/2016/02/19/algal-toxins-found-in-39-of-assessed-streams-in-southeastern-us/>
- June 21 – PennState Extension webinar on HABs in ponds and lakes. <http://extension.psu.edu/natural-resources/water/events/harmful-algae-blooms-in-pennsylvania-ponds-and-lakes-2013-results-from-a-penn-state-extension-project>
- April 29 - PA AWWA HABs workshop in Pittsburgh. <http://www.paawwa.org/event/harmful-algae-blooms-habs-overview-case-studies-and-table-top-exercise-workshop-pittsburgh/>

Emerging Contaminants –

- April 14 – SAN water supplier forum at Albright. Register here: <http://schuylkillwatersupplierforum.eventbrite.com>
- April 21 – Our Rivers on Drugs at Stroud. http://www.wcupa.edu/ACADEMICS/sch_sba.geo/documents/RiversOnDrugs.pdf
- April 30 – national drug take back day
- Walgreens is installing take back drop boxes in PA and other states.

Quarry – no significant updates.

Delaware Valley EWS – In Jan, 4,200 gallons heating oil was spilled below PWD intake. Kevin would like to be signed up for EWS.

BCWSA Activities –

- May 6 – Aqua Polluzza event for 3rd and 4th graders in Berks County
- BCWSA meets the 3rd Tuesday of every month at Albright
- April – revised total coliform workshop.
- July 27 – annual conference

PENNVEST – Septic replacement program will provide loans up to \$25,000 to homeowners for on-lot septic failures/issues.

EPA –

- Drinking water online mapping tool to protect source waters: <https://www.epa.gov/sourcewaterprotection/dwmaps> Beth is trying to coordinate a webinar to teach people how to use the tool.
- EPA received 35 comments/200+ pages of comments about the updated Unregulated Contaminant Monitoring Rule (UCMR 4). <https://www.epa.gov/dwucmr/fourth-unregulated-contaminant-monitoring-rule>
- New training on understanding climate change impacts on water resources – part of the watershed academy. <https://www.epa.gov/watershedacademy/understanding-climate-change-impacts-water-resources>
- Clean watersheds needs survey for PA - \$6.9 billion

Watershed News –

WWTP Dockets for DRBC February and March meeting: renewal of WWTP discharge at Abington, Washington, and Alsace Townships WWTPs.

<http://www.nj.gov/drbc/meetings/archive/>

News Articles –

- CFA accepting apps for water-related recreation grants starting March 1. <http://www.paenvironmentdigest.com/newsletter/default.asp?NewsletterArticleID=34758&SubjectID=>
- Valley Forge sewer repairs costs split between Easttown, East Whiteland, Willistown Townships and Malvern Borough
- Microbead ban by Obama. <http://www.cnn.com/2015/12/30/health/obama-bans-microbeads/>
- Maxatawny supervisors OK agreement for sewer pumping system.

Next Meeting Date – Wednesday, June 8

SAN PATHOGENS/COMPLIANCE WORKGROUP SECOND QUARTER MEETING

**Schuylkill Action Network Pathogen/Compliance Meeting Minutes
June 8, 2016**

Attendees:

Joe Hebelka, PADEP
Tom Davidock, PDE
Ron MacGillivray, DRBC
Steven Flannery, PADEP
Erick Ammon, PADEP

Jason Coyle, NLCA
Jesse Goldberg, Miller Environmental & RAWA
Virginia Vassalotti, PDE
Beth Garcia, EPA
Beth Ventura, PWD
Kelly Anderson, PWD
Scott, PADEP (on phone)

1. Minutes from 3-16-16 Workgroup Meeting – no edits.

2. RAWA – Reading’s City Council dissolves RAWA.

3. PWD Schuylkill Watershed Control Plan/Sanitary Survey – no update.

4. PWD Chapter 94 Data – no update. PWD is also looking at upstream data of the crypto sampling locations. PADEP (Steve) can sample PCR data.

5. Algae Info

- May 31 EPA webinar slides: Responding to Harmful Algal Blooms, Optimization Guidelines, and Sampling for Utilities
- June 21 PennState Extension webinar: HABs in PA ponds and lakes
- Article: HABs and Public Health: Progress and Current Challenges by Lesley V. D’Anglada

6. Emerging Contaminants

- House Bill 1737 passed to allow the public to take back drugs to local hospitals and pharmacies.
- **Emerging Contaminants Monitoring Discussion** – Jesse led a mini follow up to the water suppliers meeting discussion on emerging contaminants. He would like to determine if water suppliers in the Schuylkill are interested in developing a monitoring plan for emerging contaminants.
 - Alison Aminto, PWD, previously expressed her opinion that if water suppliers were to start a monitoring program there must first be an objective.
 - PWD would support identifying locations in Berks County, but are currently committed to many other sampling programs.
 - DEP is offering 5 pesticide (triazines) sampling locations in the Schuylkill, as emerging contaminants are sometimes found near farms. Ron will send Jesse a website that shows where pesticides are heavily used, which will help us decide where to take these samples.
 - Kelly suggested pairing sampling with WPF monitoring. Tom recommended incorporating sampling into the WPF Middle Schuylkill cluster phase 2 planning.
 - PWD is working on an internal report that summarizes all of the emerging contaminant sampling that has been done in the watershed.
 - EPA Webinar June 29th 2-3pm: Contaminants of Emerging Concern (CECs) in Source and Treated Drinking Water

7. Quarry – Eastern Industries is expanding their quarry near Kutztown.

8. Delaware Valley EWS – There is no stakeholder meeting scheduled for 2016. Joe heard that the Brandywine-Christina may be interested in using the EWS in their watershed.

9. WWPTs Flyer/Brochure – Virginia and Joe shared tips from other WWTP brochures. They mostly focused on what not to put down the drain. Jason announced that NLCA is creating a similar brochure that will go out to all of their customers. The Pathogens workgroup will continue brainstorming for the brochure and looking for funding to create and print a brochure.

10. BCWSA Activities

- Aqua Polluzza was cancelled and will probably be rescheduled for a date in October.
- Summer conference is July 27.

11. PENNVEST – no new grants/loans in the Schuylkill watershed.

- Temple previously received a loan for \$6 million for stormwater improvements. PDE is talking with Pennvest about developing mussel hatcheries in the Susquehanna and Schuylkill watersheds. The hatcheries will be used for reseeding and for sale to make profit in the future, which would be used to support future mussel restoration efforts.

12. EPA

- EPA Region 3 state source water meeting is the end of next week.
- EPA issued a health advisory for PFOA & PFOS. This is the first time that EPA has looked at a combined concentration limit of the two chemicals together.
- EPA proposes several regulatory revisions and updates to NPDES regulations. These include clarifying definitions, applications, and fact sheets, as well as allowing permitting authorities to complete certain permit actions online and in a timelier manner.
- EPA blog by Joel Beauvais: Moving Forward for America's Drinking Water.

13. Watershed News

- DRBC dockets
 - Exide Technologies, industrial wastewater and stormwater treatment plants
 - NGR REMA, LLC – Titus Generating Station, facility operations
 - Exeter Township, wastewater treatment plant
 - Richland Borough, groundwater withdrawal

14. News Articles

- New Weisenberg sewage treatment plant needs \$530,000 fix (Lehigh County Authority)
- Yuengling's old ice cream factory is now a gift shop and a waste treatment facility for the brewery.
- EPA released its Safe and Sustainable Water Resources Strategic Research Action Plan 2016-2019 which uses an integrated systems approach to develop scientific and technological solutions to protect human health, and to protect and restore watersheds and aquatic ecosystems.
- Greater Berks Development Fund proposes to build warehouses in Longswamp Township on former farms.

- Maxatawny supervisors amended the on-lot sewage ordinance to require pumping evidence within 14 days or face civil penalties.
- The Borough of Bally will spend \$2.1 million to correct sewer problems, such as replacing more than 50% of the borough's sewer lines.
- Jefferson Township supervisors have approved a site plan for the Tulpehocken School District's improved wastewater treatment plant.
- EPA reaches settlement with Brenntag Northeast, Inc. for alleged environmental violations in Reading facility. Brenntag Northeast will pay a \$55,000 penalty and donate \$30,000 of emergency response equipment to a local fire department to settle alleged oil and hazardous waste storage violations.
- Senate Bill 1022 helps to improve sewer lines in South Heidelberg Township by conveying a permanent sanitary sewer easement and a temporary construction easement.
- RAWA plant completes third phase of Partnership for Safe Water Program, a voluntary effort to provide safe drinking water.

15. Other Items

- There is a new acting secretary for PADEP: Patrick McDonnell
- Chris Crockett is leaving PWD and moving on to Aqua PA.

16. Plant Tour – Jesse will look into private tour of Yuengling

17. Next Meeting Date – Wednesday, Sept 14th 10am-12pm

**SAN PATHOGENS/COMPLIANCE WORKGROUP
THIRD QUARTER MEETING**

**Schuylkill Action Network Pathogen/Compliance Meeting Minutes
September 21, 2016**

Attendees:

Kevin Buss, PADEP
Kate Hutelmyer, PDE
Beth Ventura, PWD
Tess Schlupp, PENNVEST
Bob Kahley, Aqua PA
Joe Hebelka, PADEP
Jesse Goldberg, Miller Enviro/RAWA
Jason Coyle, NLCA
Beth Garcia, EPA (on phone)

1. Welcome Kate / Introductions – Kate Hutelmyer will be taking over a slightly modified version of Tom Davidock's role at PDE. Her title is Senior Watersheds Coordinator, and she can be reached at khutelmyer@delawareestuary.org or at 302.655.4990 x109.

2. Minutes from 6-9-16 Workgroup Meeting – no outstanding items or edits

3. SAN Annual Meeting – Pathogens Update Presentation

- The Annual Meeting will take place on Nov. 4th from 10am-4pm at RACC. The SAN ESC will meet prior to that from 9am-9:50am.
- Short work group updates in the morning session: Tess to present on Reading Sewer Plant improvements made possible by PENNVEST funding. At the group's suggestion, she will also include (or tag-team with someone else) a brief discussion of emerging contaminants and how they tie into the group's work.

4. PWD Schuylkill Watershed Control Plan/Sanitary Survey – no update

5. PWD Chapter 94 Data – no update

6. Algae Info

- There is a bloom on Lake Ontelaunee, where the lack of rain and consistent heat has been a serious problem.
- EPA is developing a management guidance document for cyanotoxins, which have been added to the UCMR4 candidate list.
- CDC's new Technical Assistance in State and Local Response to Harmful Algal Blooms was released on June 21, 2016.
- American Water Works Association recently released "Managing Cyanotoxins in Drinking Water: A Technical Guidance Manual for Drinking Water Professionals."
- PA Extension recently hosted a webinar on harmful algal blooms in ponds and lakes.
- PWD is looking for new places to sample for harmful algal blooms, and they are also monitoring for nuisance blooms. If you have suggestions for sites, please let Beth Ventura know.

7. Emerging Contaminants

- USGS study: "Bacterial Pathogen Genes in Streams related to Animal Type and Hydrologic Conditions."
- New article in *Environmental Science & Technology*: "Occurrence and Potential Biological Effects of Amphetamine on Stream Communities."
- "Our Rivers on Drugs" presentation on April 21st by Dr. Emma Rosi-Marshall of the Cary Institute (hosted by Stroud)
- Amy Williams of PADEP facilitated pesticide sampling of 5 sites in the watershed on Sept. 23rd. It would be great to continue this collaborative effort and sample for pesticides with greater frequency.
- According to Beth Garcia, the Susquehanna River Basin Collaborative is in the process of forming an emerging contaminants work group, following in the footsteps of this work group.

8. Quarry – There is currently a proposal on the table to expand discharges from the quarry into the Saucony Creek from 5,000 gallons per minute to 8,000 gallons per minute. At a public hearing on Aug. 10th, source water and drinking water concerns were raised.

9. Delaware Valley EWS

- EPA released new Online Source Water Quality Monitoring for Surveillance and Response Systems (SRS) guidance document. This document provides guidance for designing a real-time source water quality monitoring system to achieve a variety of design goals, including: treatment process optimization, detection of source water contamination incidents, and monitoring threats to long-term source water quality. Other SRS guidance materials and tools can be found here.
- A water main break on Sept. 10-11th in Pottstown may have caused a fish kill, but was not entered into the system. There was some discussion among the group about whether or not main breaks (or their impacts, like fish kills) should be entered.
- “Feds propose new safety rules for oil trains”

10. WWPTs Flyer/Brochure – Something to consider for 2017 work plan. Aqua had developed one for small pressure systems, and Joe noted that Virginia should have a copy of that.

11. BCWSA Activities

- Smart Growth Starts Today: Open House on Oct. 18th at Albright College. Jane Lipton of the Manayunk Development Corporation will be the guest speaker. More information available here. Click here to register for the event.
- BCWSA Annual Conference was held on July 27th, and was well attended.
- Table top training for water/wastewater operators on Oct. 21st (postponed from original date) from 9am-12pm at Albright College. \$50 registration fee.
- Joe mentioned that PADEP is working with stakeholders to develop a county-wide source water plan.

12. PENNVEST

- “Geigertown Joint Sewer Authority rejects state funding for sewer project.” However, Tess noted that they will likely un-reject the funding and come back in now that they’ve received an enforcement letter. PENNVEST would be supplying \$6 million in funds, \$3 million of which would be grant monies.
- \$121.8 million in loans to Reading Waste Water. Bids for plant upgrades there came in higher than expected, but should only increase rates by \$5 per year.
- Tess is currently looking for applicants from the Schuylkill Watershed, so if you know of anyone who might be interested, send them her way.

13. EPA

- There will be a National Source Water Collaborative webinar on Sept. 27th from 1-2pm, to be followed by a webinar on PFOAs and PFOS.
- SAN is currently being highlighted on the Source Water Collaborative website through their Learning Exchange page.
- Yuengling press release: <https://www.epa.gov/newsreleases/yuengling-upgrade-environmental-measures-settle-clean-water-act-violations-two>
- SepticSmart week Sept. 19-23. EPA’s SepticSmart program educates homeowners about proper septic system care and maintenance all year long, which we all know is important to protecting our drinking water resources. For information on SepticSmart Week or tips on how to properly maintain your septic system, visit <http://www.epa.gov/septicmart>.

- Climate Ready Water Utilities Initiatives: <https://www.epa.gov/crwu>.

14. Watershed News

- Georgio Foods looking to upgrade their treatment facilities. Tess will reach out to see about opportunities to fund those upgrades through PENNVEST.
- RAWA has studied this issue for some time now. The macro community is depressed in Willow Creek, and the stream has been downgraded from a Class A Brook Trout Stream.
- Wildcat sewers are still an ongoing problem in West Penn Township. There are multiple options to deal with this issue and lots of public opinions on the topic.

15. News Articles

- National Infrastructure Advisory Council report from June 2016: Water Sector Resilience Final Report and Recommendations
- "Watershed Degradation Costs Global Cities \$5.4 Billion in Water Treatment Annually"
- "Berks County judge's decision delays action in dispute over sewage system"
- "Muhlenberg commissioners amend on-lot sewer fees"
- "Longswamp Township sewers fix closer to resolution"

16. Other Items

- Future agendas should include a numbered placeholder for PADEP updates.
- The Environmental Quality Board meeting has been cancelled. The meeting's agenda included creating an aquatic life standard for chlorides (there is currently only a standard for water intakes).
- Kate Keppen is leaving the Berks County Conservation District on Oct. 14th to be the Director of Sustainability at Ursinus College.

17. Plant Tour – Oct. 26th in the morning. More details to come. Thanks to Jesse for organizing!

18. Next Meeting Date – Wednesday, Dec. 7th from 10am-12pm.

SAN PATHOGENS/COMPLIANCE WORKGROUP FOURTH QUARTER MEETING

**Schuylkill Action Network Pathogen/Compliance Meeting Minutes
December 7, 2016 (Rescheduled for January 12, 2017)**

Meeting Minutes will be included in the 2017 Annual Status Report.

SAN AGRICULTURE WORKGROUP FIRST QUARTER MEETING

Schuylkill Action Network Agriculture Meeting Minutes February 17, 2016

Attendees:

Tom Davidock, PDE
Virginia Vassalotti, PDE
Jessica Moldofsky, MCCD
Larry Lloyd, Berks Nature
Kim Fies, Berks County Agricultural Land Preservation Office
Jesse Goldberg, Miller Environmental/RAWA
Beth Ventura, PWD
Kate Keppen, BCCD
Joe Hebelka, PADEP
Jineen Boyle, PADEP
Lamonte Garber, Stroud
Ross Stowell, USDA
Cheryl Auchenbach, BCPC
Dean Druckenmiller, BCCD
Nick Ramsey, USDA

Review of November 2015 Meeting Notes

Update on grant requests/funding efforts

1. Berks Watershed Restoration Fund (Berks Nature)

- Larry reported that RAWA will provide support in areas that drain to Lake Ontelaunee; Kutztown Water has donated money; still waiting on Saucony Creek Brewery.
- Tom mentioned installing an educational display at the brewery about the connection between clean water and beer. He suggested working with Steel City Displays (SRHA worked with them in their visitor's center).

2. National Fish & Wildlife Fund (Berks Nature/Stroud)

- Grant proposals are due in March.
- There is a new category - *Cornerstone Grants* - which is not strictly for implementation. Larry is meeting with an interested farmer in two weeks to submit for a potential project. Stroud is applying for a cornerstone grant in the Brandywine.
- Tom will update the implementation map with new projects.

3. USDA programs (NRCS)

- Through the Farm Bill there are 3 funding programs with close to \$2 million available in funding for Berks County.
 - EQIP - \$900,000
 - RCPP - \$750,000
 - Stroud RCPP - \$300,000

- Nick reported that they have ranked projects and are in the process of developing contracts.

4. Regional Conservation Partnership Program (NRCS/Stroud/LCCD)

- Conservation Steward Program funding is now available.

5. Schuylkill River Restoration Fund Recipients (Berks Nature)

- The SRRF funds stormwater, agriculture, and abandoned mine drainage projects and ranges from \$250,000-\$400,000 available in funding.
- Letters of intent (LOI) were due today (February 17).
- BN submitted a couple LOIs for projects.
- The BCCD submitted a LOI for a horse operation in the Perkiomen Creek watershed (around \$10,000).
- The MCCD had a swine farm project ready, but the farmer pulled out at the last minute.

6. Growing Greener Grant Program Updates (DEP)

- Applications were due in July 2015.
- Announcements haven't been made yet.
- The BCCD applied for a grant on mushroom composting outreach.
- Stroud applied for a grant to match with RCPP funding.
- The PDE applied for a Schuylkill Action Students project at Blue Mountain Middle School in Schuylkill County.

7. Land Assistance Program (Berks Nature)

- BN received funding to assist with land transactions on two easements (one in Mulhead Creek and one in Oysterhead Creek).

8. PACD Mini-Grants (BCCD)

- The BCCD is holding a manure management workshop on March 19 at Hoss' Steak & Sea House.
- The BCCD is holding a workshop for horse operators on April 6 and April 9 at the Ag Center.
- The MCCD held a workshop for horse operators on Feb 8.
- The MCCD is applying for a nonpoint source mini-grant to conduct outreach to golf courses.

9. Conservation Initiative Grant (Stroud)

- Stroud is working in the White Clay watershed with mixed cover crops and innovative water quality testing.

10. Five Star/Urban Waters (EPA)

- The grant has a land protection and stormwater focus.
- No one from the Ag workgroup applied for a five star/urban waters grant.

11. OTHER

- There is a potential \$75,000 for source water protection projects from EPA 319 program and applications are due March 15.

- Jessica reported that the MCCD is working with Extension and NRCS to develop a no-till advisory group and initiative where they will rent out equipment to farmers.

Projects in Progress

1. William Penn Foundation/NFWF (PDE/Berks Nature/Stroud)

- BN is wrapping up its two NFWF projects for 2015 (Rice and Zentlemore).
- Stroud got additional funding from the DRRF for vouchers for buffers and is trying to link it with the RCPP.
- Tom announced that the WPF will continue the DRWI for a 4th year (through the end of 2017) and will be initiating a planning phase during that time for a second phase of the DRWI.

2. William Penn watershed monitoring program (PDE/Berks Nature/Miller/Stroud)

- Monitoring work through the WPF is continuing as planned.

3. Growing Greener Projects (Stroud/LCCD/BCCD)

- Stroud provides vouchers and technical assistance through a GG grant. This grant is more flexible with area (than the WPF Middle Schuylkill cluster) and can include the Irish Creek.
- The BCCD has 3 projects from the 2014 GG round: 2 dairy farms in the Tulpehocken and a horse operation in Mill Creek that recently got rid of their horses. Kate will work to find another site in the Perkiomen watershed.

4. Fish & Boat (Cacoosing, Willow Creek, Bushong dams) (Berks Nature)

- Larry reported that he has a meeting on March 21 with USACE about preserving the cultural integrity of Cacoosing dam.
- Larry is waiting to hear from DEP regarding Bushong dam.

5. WBWA Buffer/Sign project (WBWA/Berks Nature)

- The buffer at WBWA treatment plant is installed and the signage will be installed in the spring.

6. Wyomissing Creek Watershed Coalition (BCCD)

- The BCCD applied for a cold water heritage grant for stream signage and a stream cleanup for the Schuylkill Scrub. Partners in the grant are the Fish and Boat Commission, Trout Unlimited, and DCNR.

7. Topton/Toad Creek project (BCCD)

- Kate has a meeting on Friday regarding this project.

8. Lower Maiden Watershed Implementation Plan (PDE)

- Tom reported that the WIP should be completed very soon. Stroud is wrapping up modeling with Mapsheds. Then PDE needs to write some narrative on prioritized projects and predicted results. The plan allows this area to be eligible for 319 funding.

9. SAN/Kutztown project data collection (PDE)

- The grant was approved by the WPF to 1) correlate implementation work with Kutztown well water data (reduction in nutrients); 2) collect more accurate and complete data of completed projects in the Middle Schuylkill cluster area and develop a process for continuing to collect data in the future; and 3) convene meetings throughout the entire DRWI area to discuss with other organizations how to track projects with USDA's privacy policies.

10. Moselem Creek buffer (RAWA)

- This project is in the Lower Maiden WIP area. Jesse is working with Larry Kail to install a riparian buffer on his property.

11. Crypto monitoring (PWD/Lehigh)

- Beth V. reported that monitoring started in the fall. There are positive hits for crypto in some locations, but Lehigh is working on genotyping.

12. Unassessed Waters (RAWA)

- Jesse reported that a 6 mile area of the Maiden Creek is now eligible for reclassification. Out of 20 streams, TU identified 5 stream segments that have been reclassified.

13. Reading HS Stormwater (BCCD)

- Kate has a meeting this afternoon and will know more after that.

14. OTHER

- Kate reported that she is in her 2nd year of 319 monitoring with 10 sites (5 stationary and 5 rotating to reflect project implementation). She submitted a grant to continue monitoring for 3 years.
- On March 3, BN is holding an outreach event on land preservation.

Education/Outreach

1. SAN website update

- The PDE is starting the website redesign process this spring by hiring a consultant. In 2017, the actual redesign will begin.

2. Farm Achieving Resource Management – FARM Program (BCCD)

- Kate reported that this program is critical for keeping farmers updated about funding opportunities, workshops, and more.
- Stroud is hosting a workshop on March 10 at Shady Maple.
- Stroud is working with Conrad Weiser Middle School to install a buffer this spring. The PDE and BN are also working with this school to install a rain garden. Tom mentioned getting signage for both of the projects.
- Stroud also received a mini-grant for a billboard advertising CREP.

Planning

1. SAN 5-year Strategic Plan

- **Listening Sessions (PDE)**

- **Need to determine metrics for next strategic plan:**
 - **Look at 2015 numbers to shape goals**
 - **Emerging issues like chicken industry and horse farms**
 - **New partnership opportunities – PA Sustainable Ag**
 - **Implementation of Lower Maiden WIP**
 - **Ag issues in Upper Perk watershed**
 - **Stormwater in agriculture**
- The strategic plan is in its final stage of review. It will be sent out to the Ag workgroup by the end of February for their feedback.

2. Ag 2016 Workplan

- Under strategy 1, the projects need to be updated.
- A new bullet about the RCPP was added under strategy 1.
- Under strategy 2, a bullet was added about the coordination of the WPF Middle Schuylkill cluster initiative.
- Another action item was added under strategy 2 about expanding efforts to focus in Lehigh, Montgomery, and Chester counties.
- Joe suggested adding DEP's Improving Waters Program.
- The group discussed wording for the objectives section on how the ag workgroup will measure success.

3. Surface Supplier Meeting

- Tom will send out a doodle poll about rescheduling this meeting/workshop.

Other Workgroup Updates

1. Stormwater/Schuylkill Action Students (PDE)

- The PDE is working with a number of schools through the SAS program – 1) the Montessori School in Dresher; 2) Conrad Weiser Middle School; 3) Phoenixville Area Middle School; and 4) West Vincent Elementary School.

2. Education/Outreach (PDE)

- The Schuylkill Scrub (www.SchuylkillScrub.org) is starting on March 1 and runs through May 31. The PDE is working with the Schuylkill Navy to develop a trash sampling protocol and will pilot it with 5 different cleanups to quantify what types of trash are being found throughout the watershed.
- The PDE is hosting a Schuylkill Street Art Contest for students 6-12 grade in Berks, Chester, Montgomery, and Schuylkill Counties. There will be one winner per county, who will get their artwork transformed into street art. The contest ends on February 29.
- The Schuylkill Watershed Congress is on March 12. Virginia will be presenting about the Schuylkill Scrub and Jessica will be presenting about different site analysis tools.
- The PDE is partnering with Green Valleys Watershed Association and PEC to hold a Green Saves Green workshop (www.green-saves-green-workshop.eventbrite.com) on March 30 in Phoenixville.

3. Pathogens (DEP)

- The next meeting is on March 16.

Other Notable Items

- Aquapalooza event is on Friday, May 6 at Angelica Center for 4-5 grade students.
- BN is launching its Ambassadors program, a volunteer monitoring program.
- National Ag Day is March 15. Kim suggested highlighting SAN activities at the event.

Next Meeting: May 11, 10am-12pm

SAN AGRICULTURE WORKGROUP SECOND QUARTER MEETING

Schuylkill Action Network Agriculture Meeting Minutes May 11, 2016

INTRODUCTIONS/NEW MEMBERS

Review of Feb 2016 Meeting Notes

Shannon Rossman, BCPC Executive Director – Special Request for PA Planning Association tour experts for Ag practices – October 2016

I. Update on grant requests/funding efforts

- Berks Watershed Restoration Fund (Berks Nature) – RAWA, WBWA, and Kutztown have donated to fund – cost-share of practices and conservation planning.
- National Fish & Wildlife Fund (Berks Nature/Stroud) – Applications submitted in March; to be announced in July. Program lined up with RCPP; focus areas include Maiden Creek, Maxatawney, Tulpehocken
- USDA programs (NRCS) – working on 35 contracts for \$900,000, mostly in Schuylkill County. CREP is still open.
- Regional Conservation Partnership Program (NRCS/Stroud/LCCD) – National: Delaware for \$1.1M; \$500,000 for 2017. Stroud will finish up 1 yr early at \$450,000. \$1.0M was turned back in 3rd round, so people need to apply for funds to keep program funding. Eric Rosenbaum for capacity grants for technical assistance. PSU Ag has seniors certified to develop plans. There needs to be a separate initiative that funders can commit for technical assistance without expecting implementation immediately.
- Schuylkill River Restoration Fund Recipients (Berks Nature)- Presentations next week for Durkin and Zettlemyer projects.
- Growing Greener Grant Program Updates (DEP) – no announcement on applications from July 2015 yet. Some notification letters had been received by applicants, like Berks CD's mushroom initiative. No information on 2016 round yet.
- Land Assistance Program (Berks Nature) – may have 1 application; SRRF
- PACD Mini-Grants (BCCD/MCCD/LCCD) – Lehigh – rain barrels and pasture source water protection; Berks – adult education; Montco – golf course education.
- Conservation Initiative Grant (Stroud) – no report
- EPA 319 SWP Projects – applications in review; no decisions to date

- MCCD/Extension/NRCS No-Till Advisory Group - no report
- DCED Watershed Restoration program (BN) - Sunnyside Dairy, Magnolia Land Partners - mitigation credit program; some interest from Maiden Creek

II. Projects in Progress

- William Penn Foundation/NFWF (PDE/Berks Nature/Stroud) - last 2 farms from 2015 completed in summer. PDE- starting Phase II process this summer with a 6-year proposal.
- William Penn watershed monitoring program (PDE/Berks Nature/Miller/Stroud) - Academy of Natural Sciences is doing basin-wide program. Miller Environmental is doing local monitoring.
- Growing Greener Projects (Stroud/LCCD/BCCD) - BCCD is nearing final designs for Tulpehocken projects; Lehigh is waiting for notification on Benicoff farm.
- Fish & Boat (Cacoosing, Willow Creek, Bushong dams (Berks Nature) - Cacoosing - gas line company partner; Bushong- Growing Greener; Willow Creek - city
- WBWA Buffer/Sign project (WBWA/Berks Nature) - Larry will take pictures of signs. Project completed.
- Wyomissing Creek Watershed Coalition (BCCD) - no report
- Topton/Toad Creek project (BCCD)- no report
- Lower Maiden Watershed Implementation Plan (PDE) - Received comments from DEP and EPA, more needs to be done on plan this summer.
- SAN/Kutztown project data collection (PDE) - BMP data collection will start this summer or fall; need discussion with NRCS for data sharing.
- Moselem Creek buffer (RAWA) - 135 trees in Kehl farm in Richmond Twp.
- Crypto monitoring (PWD/Lehigh) - 5 sites in watershed. Waiting for genotyping for any hits.
- Reading HS Stormwater (BCCD) - no report
- Adding Ag Workgroup partners - think about how to add to our group.
- MS4 (BCPC) - 2018 renewals; new municipalities will be added. Munis with TMDLs must have pollution reduction plan and map inlets and outfalls.

III. Education/Outreach

- SAN website update - PDE sent a Request for Proposal for technical assistance for updating website.
- Farm Achieving Resource Management - FARM Program (BCCD/Stroud) - CREP/Buffer maintenance workshop scheduled for June 18.

IV. Planning

- Surface Supplier Meeting - held April 14; topics were emerging contaminants and the Miller Chemical plant event update.

V. Other Workgroup Updates

- Stormwater/Schuylkill Action Students (PDE) - Montco and Chester projects; need to wrap up Weiser
- Education/Outreach (PDE) - Schuylkill Scrub successful; stormdrain art contest is progress; the Sojourn Stewards were mapping trouble spots.

- Pathogens (DEP) - June 8 meeting scheduled.

VI. Other Notable Items

- The Lehigh PBS station will have history of Wyomissing on May 17
- Carl Rohr informed the group that there will be significant staff reductions; Ofc of Water Resource Planning is headed by Kelly Heffner, will include NPS/319 and Water Support Technical Assistance (Doug Goodlander).

SAN AGRICULTURE WORKGROUP THIRD QUARTER MEETING

Schuylkill Action Network Agriculture Meeting Minutes August 10, 2016

INTRODUCTIONS/NEW MEMBERS

Review of May 2016 Meeting Notes

I. Update on grant requests/funding efforts

- Berks Watershed Restoration Fund (Berks Nature) - Conservation planning needed. WBWA golf event coming up for donation, waiting for Saucony Creek Brewing.
- National Fish & Wildlife Fund (Berks Nature/Stroud) - Received \$250,000 for Delaware River Watershed Initiative projects; looking at 5 projects in Maiden Creek.
- USDA programs (NRCS) - application deadline is 10/21/16 for 2017 funds; expect more funding to be diverted to Chesapeake Bay.
- Regional Conservation Partnership Program (NRCS/Stroud/LCCD) - Stroud is well on way for contracted farms - spending money in Berks County- in the Tulpehocken and Maiden Creek and some subwatersheds.
- Schuylkill River Restoration Fund Recipients (Berks Nature)- 2 farms and 1 easement; PDE is conducting a bus tour, and will have a press event for announcements on Wed. September 7. BCCD also working on a horse operation.
- Growing Greener Grant Program Updates (DEP) - no report for next round yet. BCCD receive grant for mushroom industry from 20165 round. Most work in Maiden Creek. Charles Durkin farm starting in fall with stream BMPs. Berks Nature and Ag Land Pres also on project.
- PACD Mini-Grants (BCCD/MCCD/LCCD) - no report, though PACD announced program for outreach.
- MCCD/Extension/NRCS No-Till Advisory Group - no report.
- DCED Watershed Restoration program (BN) - Application was submitted for Kunkel in Albany Twp.
- Fish & Boat - program reinstated for habitats and restoration.

- PA American Water – grant for water testing in Wilson West (Lower Cacoosing) and invasives/planting.

II. **Projects in Progress**

- Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – extend Phase I through 2017, and starting Phase II – 3 years of planning.
- Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) – currently wrapping up older grants: BCCD 2014 grant for 2 farms in Tully and 2 in Perkiomen. Stroud working on voucher program.
- Fish & Boat dam removals (Berks Nature) - Cacoosing- gas line issue; Willow Creek-no report; Bushong -ready to hire design contractor.
- Wyomissing Creek Watershed Coalition (BCCD) – 8 municipalities trying to address MS4 BMPs; watershed modeling through Center for Watershed Protection.
- Topton/Toad Creek project (BCCD) – design needs to be revised.
- Lower Maiden Watershed Implementation Plan (PDE) – ongoing – models didn't show that BMPs would restore watershed. Working with Stroud & Berks Nature for better data to reduce pathogens.
- SAN/Kutztown project data collection (PDE) – DRWI funding to better track BMPs and Kutztown well water data.
- Crypto monitoring (PWD/Lehigh) – 5 sites; genotyping through March 20; genotypes show cattle in Berks.
- Reading HS Stormwater (BCCD) – EPA did presentation to senior high school classes; on agenda for signature.
- Berks County SWP Plan – project to begin in fall to use all current approved systems and encourage new systems to join for a county-wide collaborative.

III. **Education/Outreach**

- SAN website update (PDE) – RFP too expensive; looking at other updates.
- Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – dialogues with farmers to foster more information; planning distribution of a newsletter twice a year.
- Stroud – going to run workshop on hydro modeling, stream biology at a very introductory level; 2 yr grant to help science participation in watershed.
- Source Water Collaborative (EPA) – 10-year anniversary – hosting Learning Exchange webinars on Creative Partnerships and grant funding.

IV. **Planning**

- Annual Conference – Friday November 4 at RACC
- Executive Steering Committee – Jon Capacasa of EPA is retiring; new ESC chair to be selected at conference.

V. Other Workgroup Updates

- Stormwater/Schuylkill Action Students (PDE) – projects in Chester and Montgomery counties.
- Education/Outreach (PDE) – stormdrain art contest; teacher outreach; Sojourn Steward.
- Pathogens (DEP) – workgroup meeting in September; DEP is sampling pesticides as contaminant of Emerging Concern (CEC).

VI. Other Notable Items

- Eastern Industries petitioned DEP for discharge increase. (Miller Env)
- Mark Beard new president of Trout Unlimited Tulpehocken Chapter.
- Saucony Creek Brewing gives spent grain to local farm

NEXT MEETING: Wednesday November 30, 10:00 AM – Berks Ag Center

SAN AGRICULTURE WORKGROUP FOURTH QUARTER MEETING

**Schuylkill Action Network Agriculture Meeting Minutes
November 30, 2016**

INTRODUCTIONS/NEW MEMBERS

Review of August 2016 Meeting Notes

I. Update on grant requests/funding efforts

- Berks Watershed Restoration Fund (Berks Nature) – Funding is being used for nutrient management planning and cost-share of BMPs.
- National Fish & Wildlife Fund (Berks Nature/Stroud) – Complete 2015 grant, and halfway through 2016 round. NFWF is the funding arm for Delaware River Basin Initiative.
- USDA programs (NRCS) – Gearing up for 2017 round; focus on Ches Bay projects. EQIP will have around \$1M for Berks/Schuylkill counties; revamping CSP in springtime. New initiative for permanent grass in CRP. CREP funding still available.
- Regional Conservation Partnership Program (NRCS/Stroud/LCCD) – Started ranking farms. Funding amount still unknown, but \$500K-\$1M possible.
- Schuylkill River Restoration Fund Recipients (Berks Nature) – Special focus on Perkiomen watershed. 2015 projects finished, and 2016 projects in motion. Land transaction program protected 245 forest acres in St.Lawrence. Information will be out soon on new round.
- Growing Greener Grant Program Updates (DEP) – Applications due 1/17/17. Ches Bay has priority.

- PACD Mini-Grants (BCCD/MCCD/LCCD) – MCCD planning workshop for farms and will develop a brochure to educated golf course. MCCD will share brochure when complete. MCCD also hosting a key farming conference on February 10. Working on NACD grant for Urban gardens in Norristown/Pottstown area.
- 5-Star Urban Grant (EPA) – applications accepted through 1/31/17. Prioritizing urban areas, possibly Maiden Creek would qualify.

II. Projects in Progress

- Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – extend Phase I through 2017, and starting Phase II – 3 years of planning from 2018-2021.
- Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) – Working on applications for 2016 round.
- Fish & Boat dam removals (Berks Nature) - Cacoosing- eliminated the cultural resource problem, but still working on gas line issue; Bushong – will not move ahead until ready to hire design contractor.
- Wyomissing Creek Watershed Coalition (BCCD) – Entered agreement with Center for Watershed Protection for assessment of stormwater BMPs in watershed.
- Topton/Toad Creek project (BCCD) – Final design to be approved. Contract signed with Reading HS, needs assessment completed as next step.
- Lower Maiden Watershed Implementation Plan (PDE) – Working on a nutrient reduction target rate.
- SAN/Kutztown project data collection (PDE) – Completed by end of January 2017. PDE will present findings at next meeting.
- Crypto monitoring (PWD/Lehigh) – No report.
- Berks County SWP Plan – Working on county-wide management strategies. Considering need for paid position to sustain committee and activities.
- Maiden Creek Project Maintenance - Invasives removal and planting assistance from RAWA staff.

III. Education/Outreach

- SAN website update (PDE) – Complete overhaul more than budgeted for; working on fixes.
- Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – No report.
- Stroud Workshops – Workshop scheduled for 12/18/16.
- Source Water Collaborative (EPA) – National Souce Water Collaborative is hosting webinars. Will hold a Leadership Forum on December 14.

IV. Planning

- Annual Conference – Conference was held November 4. Jon Capacasa of EPA is retiring, and Rick Rodgers will be new lead for ESC. PDE requests feedback on presentations and meeting.

- Executive Steering Committee - Jon Capacasa of EPA is retiring; new ESC chair to be selected at conference.

V. **Other Workgroup Updates**

- Stormwater/Schuylkill Action Students (PDE) - Project at Montessori school in Philly cluster, and two in Chester County.
- Education/Outreach (PDE) - Discussed purchased of markers for different watersheds; stormdrain art was painted at the Berks County Planning Commission. Schuylkill Scrub events can be planned and registered.
- Pathogens (DEP) - Meeting was postponed until January; members had a tour of the Yuengling plant.

VI. **Other Notable Items**

- New Watershed Specialist for BCCD started December 12.
- EPA working on non-point program report.
- USDA working on adaptation resources for Ag
- PDE's Science & Environment Summit is scheduled for January 2017.
- BARN is hosting a Reading Royals hockey night on Saturday January 7.

NEXT MEETING: Wednesday February 22, 2017 - 10:00 AM - Berks Ag Center

Appendix C: Wildcat Sewer Update

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 of 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 pursued 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

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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 untreated wastewater to the West Branch Schuylkill River.	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
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 received 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 plant 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-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	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

				Environmental Excellence from PADEP in 2015 for completion of the project.	
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. <i>Chapter 94 Municipal Wasteload Management Report.</i>
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

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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., <i>Facebook</i> . 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. <i>Annual Report for 2012 DEP Rules and Regulations, Chapter 94</i> .

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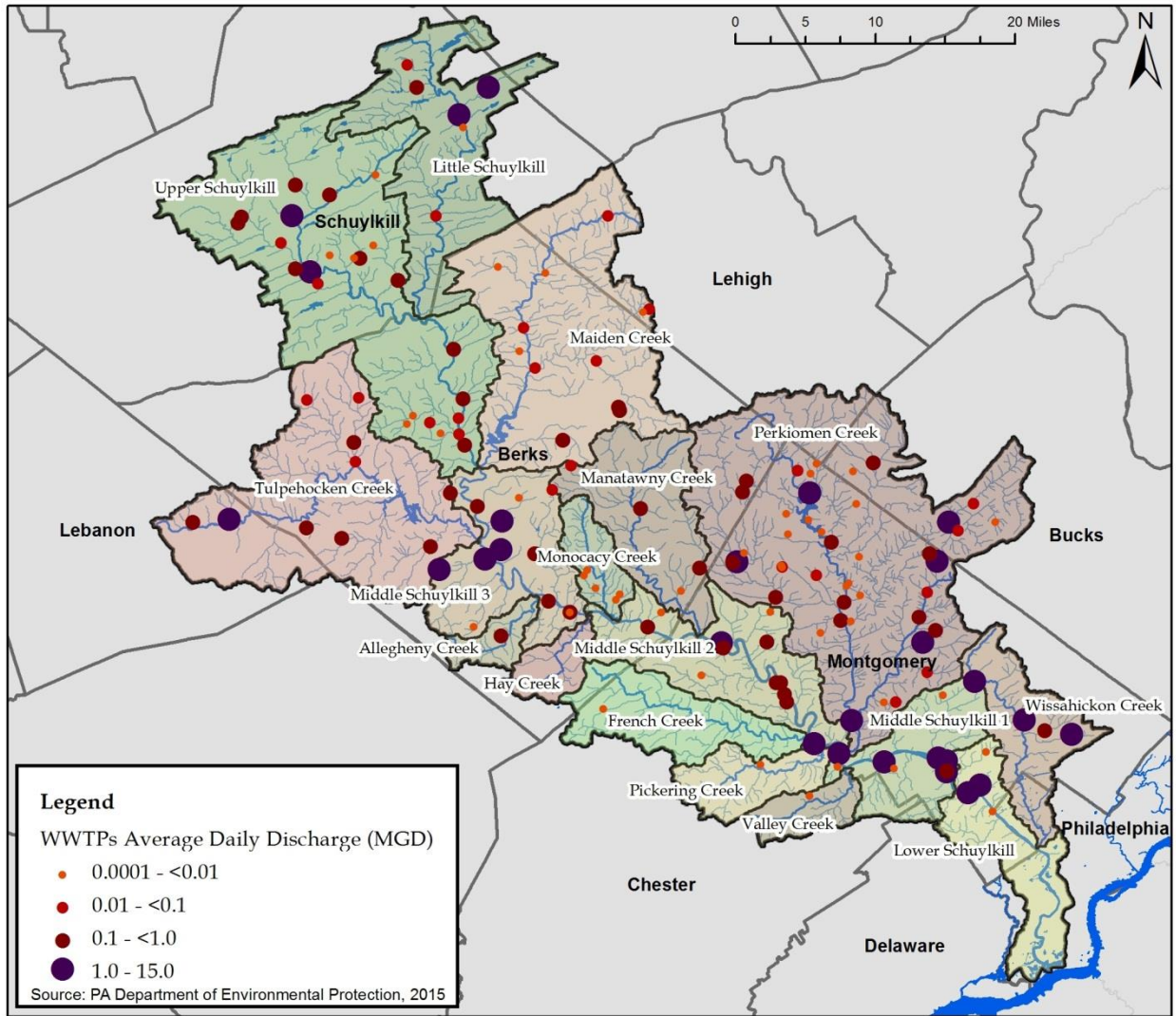
Lenhartsville	Lenhartsville Borough	Berks	Furnace Creek, Maiden Creek	Lenhartsville Borough received over \$1.3 million in 2002 and over \$1.6 million in 2004 in loans and grants from PENNVEST to construct a new sewage treatment plant and collection system to eliminate the use of on-lot septic systems 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. <i>Title 25 Chapter 94 Municipal Wasteload Management Annual Report.</i>
Sassmansville	Douglass Township	Montgomery	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 community of Sassmansville which is located in Douglass and New Hanover Townships.	"Douglass (Mont.) Oks Sassmansville Sewer Project." The Mercury News; Berks-Montgomery Municipal Authority Sewer Revenue Bonds. Apr 20, 2015. McElwee & Quinn Financial Printing. www.mcelweequinn.com.
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	(Rob Jones, Tamaqua Public Works, personal communication, May 22, 2015)

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Philadelphia Water Department

				system.	
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.	"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
Albany	Albany Township	Berks	Maiden Creek	Unknown	
Port Indian	West Norriton	Mont- gomery	Schuylkill River, main stem	Unknown	

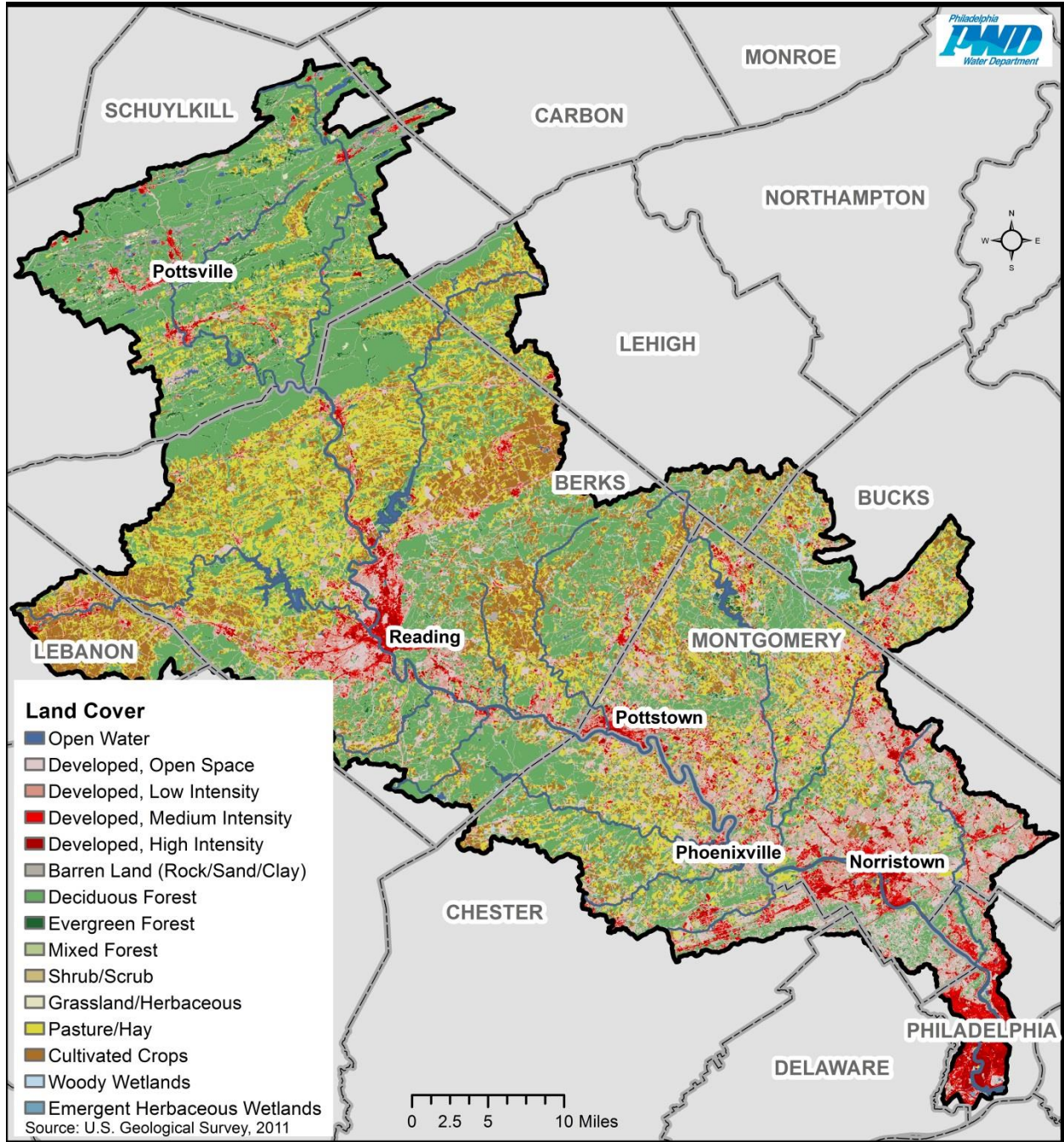
*Updated from news sources in 2016

Appendix D: WWTPs in the Schuylkill River Watershed Map

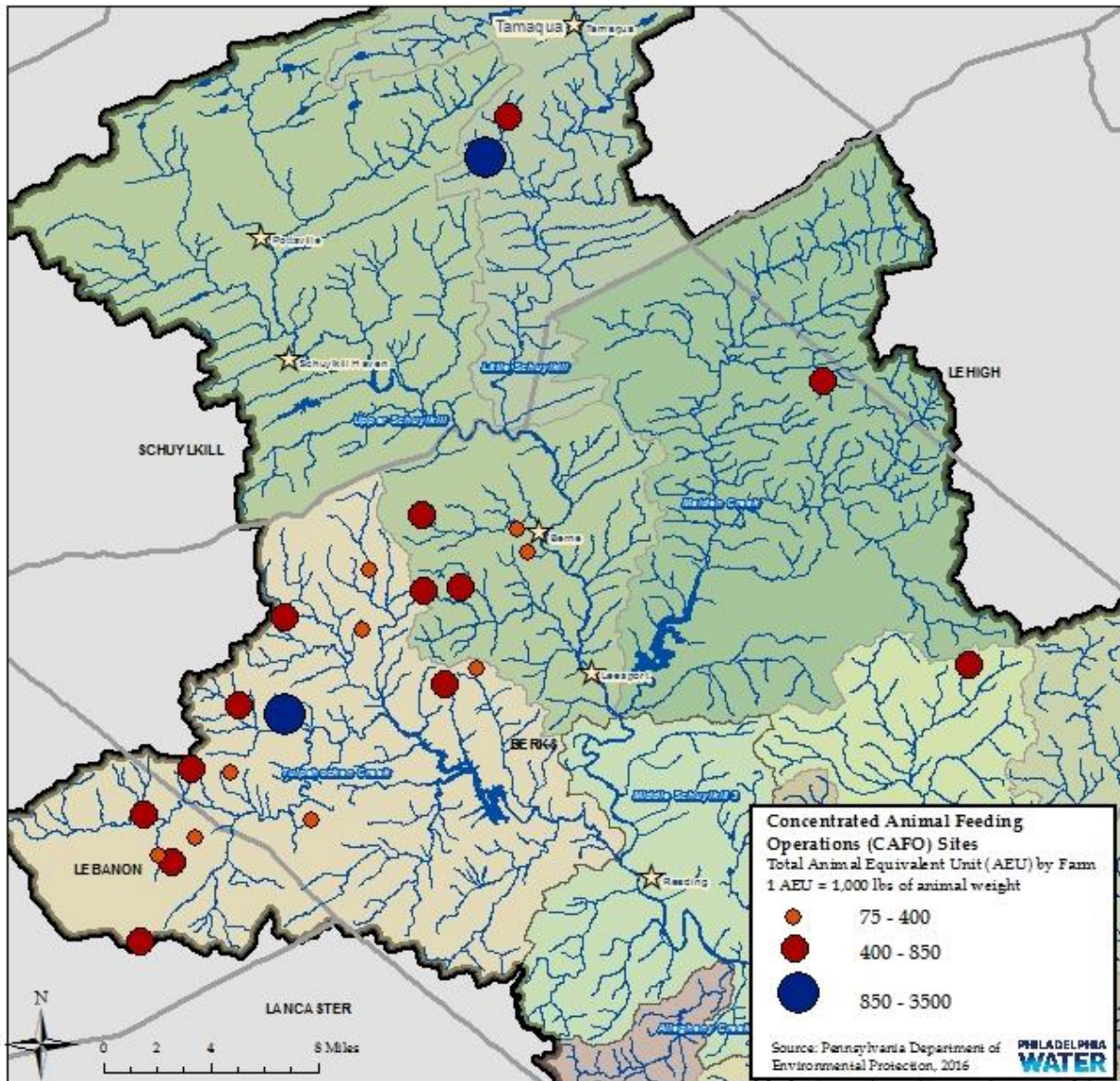


Sources: Developed using EPA Permit Compliance System and Integrated Compliance Information System (PCS-ICIS) and Chapter 94 Reports submitted by WWTPs to PADEP (PWD, 2015b)

Appendix E: Schuylkill River Watershed Land Cover Map



Appendix F: CAFOs in the Schuylkill River Watershed Map



Appendix G: Schuylkill Scrub 2016 Report

WHAT IS THE SCHUYLKILL SCRUB?

The Schuylkill Scrub is a cleanup initiative that takes place across the 2,000 square miles that drain to the Schuylkill River (aka the Schuylkill River Watershed). The Schuylkill Scrub occurs every year from March 1 through May 31. The Schuylkill Action Network coordinates this initiative, but gives credit to the many partners who clean up the Schuylkill watershed.



Photo by Kathie Johnson



Cleaning up the Schuylkill River and the land that drains to it



Volunteer at a cleanup or coordinate your own! Visit www.schuylkillscrub.org for more information.

Special Thanks to our Sponsors:





Photo by Jill Kemp

115 tires collected at
Angelica Creek cleanup
on April 30, 2016

Bradley Maule
collecting trash
along the
Schuylkill River

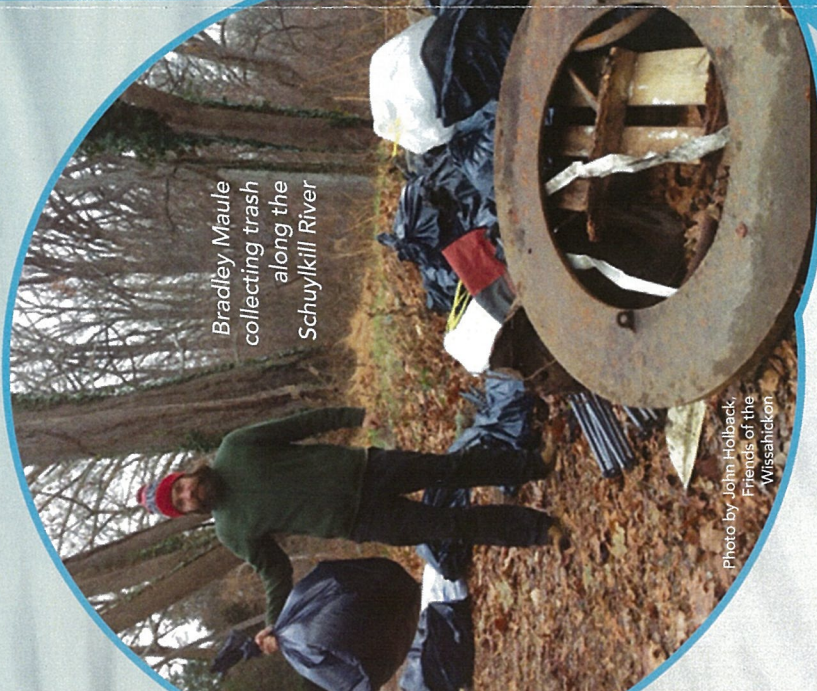


Photo by John Holback,
Friends of the
Wissahickon

SOJOURN STEWARD:

This year the Schuylkill Action Network sponsored Bradley Maule to participate in the Schuylkill River Sojourn, a 112 mile kayaking expedition from Schuylkill Haven to Philadelphia. In return, Bradley photographed trash hot-spots using a GPS camera. Bradley was pleased to learn from previous sojourners that the river is much cleaner than it's been in the past, but we still have a lot of work to do. Check out the trash map by visiting <http://arcg.is/28SUed1>. You can read his blog posts at www.phillyskyline.com.

WATER REFILL STATIONS:

This spring, Philadelphia Water installed 4 water refill stations in Fairmount Park. From just April to September, nearly 205,000 water bottles worth of water was used. That's 205,000 plastic water bottles that would have filled up our landfills or ended up in the street or waterways! Not to mention that's nearly a quarter million dollars saved from not buying single use water bottles.



Water refill station
locations in
Fairmount Park

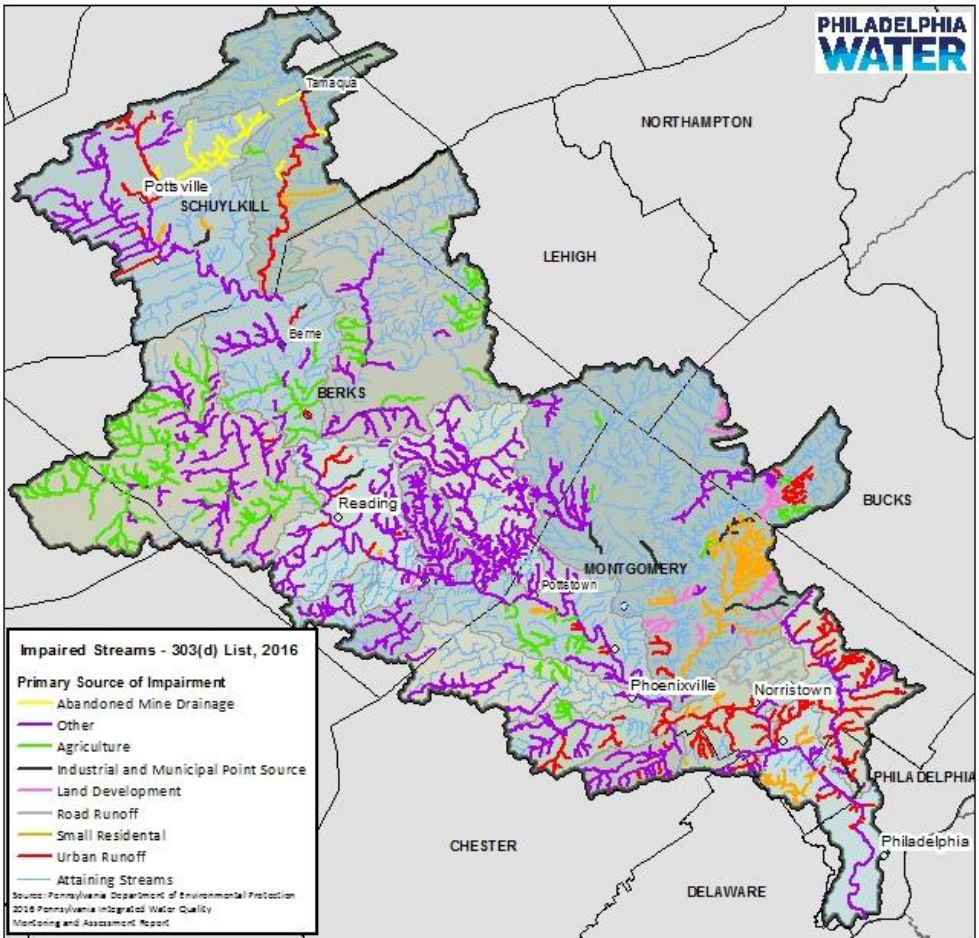


An estimated 1,300 water bottles were removed from the Schuylkill River on April 16, 2016 at the Schuylkill Navy River Stewards Committee cleanup

2016 SCHUYLKILL SCRUB STATS

797 Cleanups
29,377 Volunteers
793 Miles of streams cleaned up
516,365 Pounds of trash removed
2,771 Tires collected

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



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 I: 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)
<i>Cryptosporidium</i> oocysts per day per animal	(Atwill et al., 2003)	--
<i>Cryptosporidium</i> oocysts per weight feces	--	(Cox et al., 2005)
Weight manure per day per animal	--	(ASAE, 2003)

Appendix J: WCP Program Change Approval - March 2016



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:

- 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
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Elizabeth Ventura