

Separate and Combined Sewer Systems

In many of Philadelphia's homes, sanitary sewage and stormwater travel together through a combined sanitary/storm sewer system for treatment at one of the City's three sewage treatment plants, where it is cleaned before it is discharged to the Delaware River.

In some areas of Philadelphia, such as the Wissahickon Creek Watershed, stormwater from downspouts, yards and streets is piped to separate storm sewers and released into local streams. This stormwater runoff is not treated before it is released.

Homes that are serviced by separate storm sewers also have a separate drainage system for their sanitary sewage, which is collected in the sanitary sewer and sent to a treatment plant.

In some homes, the pipes (called laterals) leading to these two systems may be leaking or improperly connected. In this situation, sanitary sewage may enter stormwater sewers and may be released untreated into local waterways.

Laterals that are improperly connected (also known as crossed laterals or cross connections) and laterals that are leaking due to deterioration are known as defective laterals.

PWD (Philadelphia Water Department) funds the correction of the crossed laterals in its effort to improve stream water quality with minimal public impact.

Introduction

Welcome to PWD's Second Quarterly Water Quality Update for the Monoshone Creek. Following our May 2009 issue, we received a number of inquiries concerning the periodic high levels of fecal coliform that were measured at Outfall Five. Part of the problem of placing these high levels in some context — to determine if such high levels are a chronic problem and representative of the typical quality of the flow from Outfall 5 into the Monoshone — was the lack of a large sampling pool. As we shared in our last update, PWD is required to perform four quarterly samples at its priority stormwater outfalls and test all 404 of its stormwater outfalls within a five year period.

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Challenges

Separate storm sewers can be beneficial to our rivers and streams as they often contain underground streams, providing essential base flow to our waterways.

But urban environments also present some challenges, as the quality of stormwater runoff can be tainted by litter, gasoline, oils, fertilizers, animal wastes and other pollutants that are washed from our lawns and streets into storm drains.

In addition, high volumes of stormwater runoff are delivered to streams during intense rain storms, which impacts stream habitats. The programs that PWD has instituted in the Monoshone Creek Watershed are programs focused on the inherent problems of separate sewer systems in urban areas.

Monoshone Watershed



Aerial View of the Monoshone Watershed:

The above aerial photograph shows the Monoshone Creek and the locations of the Water Department's stormwater outfalls along the creek. Outfall Number 5, which receives the largest volume of stormwater runoff due to the size of the drainage area, is the location where PWD takes its quarterly fecal coliform sample.

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Summary of Fecal Coliform Results

Stormwater Outfall Monitoring Program

Data from project initiation (May '09) to present.

MONOSHONE CREEK Outfall #5 (ST068050)	
Sample Date	Fecal Coliform (# per 100 milligrams)
5/12/09	720
5/19/09	4,000
5/26/09	1,700
5/26/09	4,900
6/02/09	3,000
6/22/09	3,000
6/24/09	4,800
7/06/09	11,000
7/15/09	1,100
7/27/09	78000
8/17/09	26000
8/26/09	560000*
9/02/09	9400

*As the sampling above illustrates, fecal coliform numbers are often in the low thousands, which means we all still have work to do. But, at the same time, we have witnessed a marked improvement from sampling results taken a decade ago. Often, a high result – such as the one obtained on 8/26/09 – is an indicator that there is a problem within the City’s sewer or a property lateral(s), resulting in sewage entering the creek. PWD inspects the sewers in this area to track down and repair potential problems. We did not find a problem in our system and therefore believe it is related to a private property problem.

MONOSHONE CREEK -- Downstream Site (MON0250)	
Sample Date	Fecal Coliform (# per 100 milligrams)
5/12/09	400
5/19/09	300
5/26/09	1,000
6/02/09	180
7/06/09	900
7/15/09	200
8/17/09	700
8/26/09	540
9/02/09	500

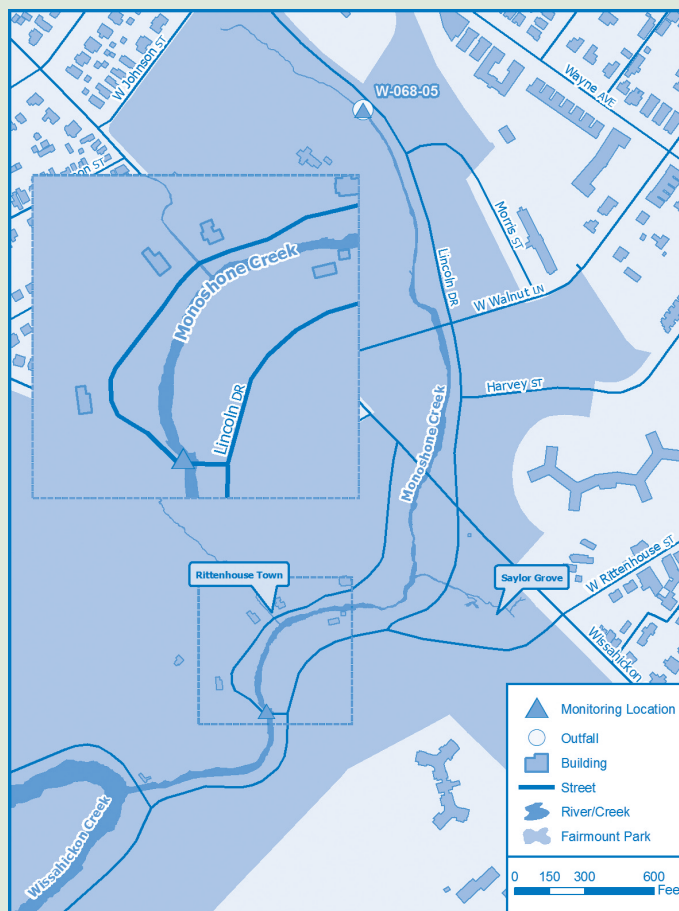
Pilot Monitoring Program

We felt that additional samples were needed at Outfall 5 to give us a better picture of typical water quality at this outfall. We also wanted to determine if PWD crews could make a more timely response if sampling showed that a pollution-causing event was happening somewhere in the Outfall 5 drainage area.

To address these issues, this past May we initiated a pilot sampling program, geared to collect samples at both Outfall 5 and a location downstream of RittenhouseTown, above the confluence of the Monoshone and Wissahickon creeks. Originally, we were going to collect samples on a weekly basis, three times a month, during dry weather (no rainfall within a 72 hour period), as the sampling goal was to determine the quality of the stream flow within Outfall 5 untainted by polluted stormwater runoff. Because this summer was a fairly wet one, we did not collect as many samples as we had hoped. However, we did accumulate a fair number of samples at both locations and plan to continue this sampling program into the future.

Pilot Monitoring Program Results

The good news: fecal coliform results, beginning in May 2009, illustrate a consistently fair water quality for an urban stream like the Monoshone, and sampling results are even better in the creek itself by the time the stream travels past RittenhouseTown. These results are comparable to fecal counts found in all of the streams in the urban Southeast PA Region.



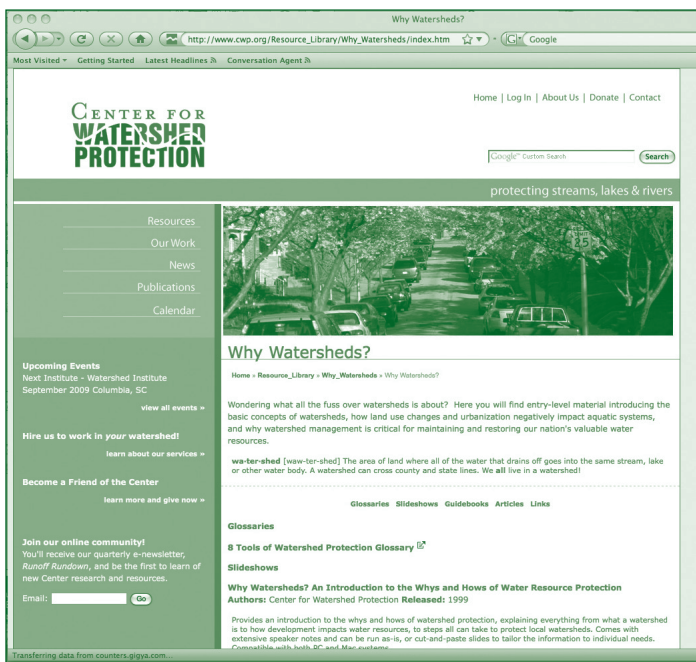
Overview of the Monoshone Watershed:

This map shows the Monoshone Creek and the locations of the Water Department’s stormwater outfalls along the creek. Outfall Number 5, which receives the largest volume of stormwater runoff due to the size of the drainage area, is the location where PWD takes its quarterly fecal coliform sample. At the same time, a sample is taken just south of Historic RittenhouseTown.

FACT:

The Monoshone Watershed drains approximately 1,100 acres, of which 40 percent is impervious.

Information from the Center for Watershed Protection on Impervious Surfaces and their Impact on Stream Water Quality



Research has revealed that imperviousness is a powerful and important indicator of future stream quality and that significant degradation occurs at relatively low levels of development. The strong relationship between imperviousness and stream quality presents a serious challenge for urban watershed managers. It underscores the difficulty in maintaining urban stream quality in the face of development. At the same time, imperviousness represents a common currency that can be measured and managed by planners, engineers and landscape architects alike. It links activities of the individual development site with its cumulative impact at the watershed scale. With further research, impervious cover can serve as an important foundation for more effective land use planning decisions.

For the entire article, go to the Center for Watershed Protection’s Website at: http://www.cwp.org/Resource_Library/Why_Watersheds/index.htm.



Long Term Plan

PWD will continue to invest in its long term plans to address water quality problems in its streams and rivers through its integrated watershed management approach, seeking opportunities to slowly redevelop the City so that it manages stormwater in an environmentally beneficial way. Additional information about the Department's strategy can be found in its recent report titled, *Green City, Clean Watershed*, submitted to the PA DEP and EPA on September 1. The entire report, and a public summary, are currently on line at www.phillywatersheds.org/lcpcu.

Aeration

How it works

As a stream flows over rocks and riffles, oxygen gets introduced into the water, which improves the ability of beneficial microbes in the stream to break down and remove bacteria and excess nutrients.

In some urban streams, this process does not occur due to a lack of riffles or excessive amounts of sediment deposition, which decreases the flow of oxygen through the streambed.

This in turn decreases the amount of oxygen available to stream insects and the fish that use them as a food source. It also promotes the presence of anaerobic bacteria. These microbes break down nutrients and the waste products of other organisms (more slowly), but the by-product of this anaerobic process (similar to fermentation of beer or lactic acid production in a runner's legs) is the creation of methane gas, nitrates, hydrogen sulfide (swamp gas) and other chemicals that are harmful or toxic to stream organisms.

That is why aerators are used in man-made ponds and detention basins. Adding oxygen, artificially or naturally, improves water's ability to self-cleanse.

We are also continuing to investigate pollution sources to the Monoshone that include: defective laterals, spills, improper disposal of wastes, and other sources that can impact the Monoshone Creek.

Investigations

When we received the high fecal count at Outfall Five on August 26, we dispatched a Sewer Maintenance crew to check the outfall and sewers in the immediate area for the source of pollution.

However, although only a day had passed since the sample was taken and tested, and the crew notified, when the crew reached the site, the outfall no longer showed apparent contamination. This is a constant challenge in a separate sewer system - contamination can happen anywhere in the system, at any time. It is not necessarily a constant.

Moving forward, PWD will be assessing health facilities, businesses and other non-residential properties to ensure that proper use of storm and area drains are taking place. We will also be identifying sections of the watershed that have septic systems and private sewers.

Next Issue:

Update on Pilot Sampling Program

For More Information:

PWD's Annual Stormwater and Combined Sewer Overflow (CSO) Annual Report and other watershed management and comprehensive characterization reports can be found at: www.phillyriverinfo.org.

For up to date information on the recreational water quality of the Schuylkill River, go to <http://www.phillyrivercast.org/>.

Here's What You Can Do:

Join a watershed partnership. For information, go to: www.phillyriverinfo.org.

Visit the Fairmount Water Works Interpretive Center, both online at www.fairmountwaterworks.org, or in person at 640 Water Works Drive in Philadelphia.

What is a WATERSHED?

A watershed is the land surrounding a system of rivers (or streams or creeks), or a particular river, that, when it rains, sheds the runoff into that waterway. Everything you do impacts your watershed. Runoff from garden fertilizers, hazardous substances like used motor oil, and trash dumped into one area of a river bank can pollute water many miles downstream. Protecting and preserving our watersheds helps protect our water resources.