Susquehanna River Basin Commission

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Middle Susquehanna Subbasin Year-2 Survey

Introduction

The Susquehanna River Basin Commission (SRBC) performed a water quality survey in the Lackawanna River Watershed from April 2009–April 2010 for the Year-2 small watershed study in the Middle Susquehanna Subbasin (Figure 1). Year-1 and Year-2 surveys are part of SRBC's Subbasin Survey Program, which is funded by the United States Environmental Protection Agency (USEPA). This program consists of two-year assessments in each of the six major subbasins in the Susquehanna River Basin on a rotating basis. The Year-1 studies are broad-brush, one-time sampling efforts of about 100 stream sites to assess water quality, macroinvertebrate communities, and physical habitat. The Year-2 studies focus on a particular region or small watershed within the major subbasin, and typically seek to address one specific issue. SRBC conducted the Middle Susquehanna Year-1 study from June-August 2008 (Buda, 2009). The Year-2 sampling plan is tailored for the individual needs or concerns of a chosen watershed, and sampled accordingly, so a more detailed evaluation can be made. More information on SRBC's Subbasin Survey Program is available at http://www.srbc.net/programs/subbasinsurveys.htm, and technical reports are available in hard copy or online at www.srbc.net/pubinfo/techdocs/Publications/techreports.htm.

The Lackawanna River Watershed was chosen for a small watershed study in the Middle Susquehanna Subbasin because of local support from the Lackawanna River Corridor Association (LRCA), as well as interest by local and state government agencies. In 2001, LRCA developed a Rivers Conservation Plan (RCP) for the Lackawanna River Watershed. This plan examines the conditions of the watershed related to ecological health of land and water resources, as well as issues related to open space, recreation, aesthetics, and public infrastructure. To date, abandoned mine drainage (AMD) is the issue that has received the most attention and funding, but the RCP also pointed out that stormwater and combined sewer overflows (CSOs) are important concerns throughout the watershed that should be considered and addressed. SRBC agreed and chose to focus this Year-2 project on the impacts of stormwater runoff and CSOs on the water quality in the Lackawanna River Watershed and its tributaries.

An additional motivation in pursuing this project on stormwater was SRBC's involvement in and experiences from a large-scale stormwater retrofitting and management project in the Harrisburg, Pa., area. As part of that three-year stormwater initiative, SRBC built in the idea of transferability to other areas of the state. The baseline data collection work in the Lackawanna River Watershed will be important as local municipalities continue to deal with the many issues associated with controlling stormwater in urban areas.

The Lackawanna River Watershed

The Lackawanna River Watershed encompasses about 350 square miles in the northeastern portion of the Susquehanna River Basin (Figure 1). The Lackawanna River flows nearly 60 miles in four counties of northeastern Pennsylvania to its confluence with the Susquehanna River. It originates in a series of glacial ponds and a wetland bog complex along the border of Susquehanna and Wayne counties (LRCA, 2001). The east and west branches of the Lackawanna River flow into the reservoir at Stillwater Dam, the outflow of which begins the mainstem Lackawanna. The river then flows 40 miles in a northeast to southwest direction through Forest City, Carbondale, Scranton, and down to its mouth at Pittston, Pa. The lower 20 miles of river and 200 square miles of drainage area are located in the greater Scranton region and are highly urbanized (Figure 2). There are more than 60 tributaries to the Lackawanna that rise from the surrounding mountains and flow through gaps to join the mainstem (LRCA, 2001).

Small Watershed Study: Lackawanna River

An Assessment of Water Quality in Base Flow and Stormflow Conditions

April 2009 - April 2010

Report by Luanne Steffy, Aquatic Biologist

This report and all data are available on the Internet at www.srbc.net/pubinfo/techdocs/publication_269/techreport269.htm.

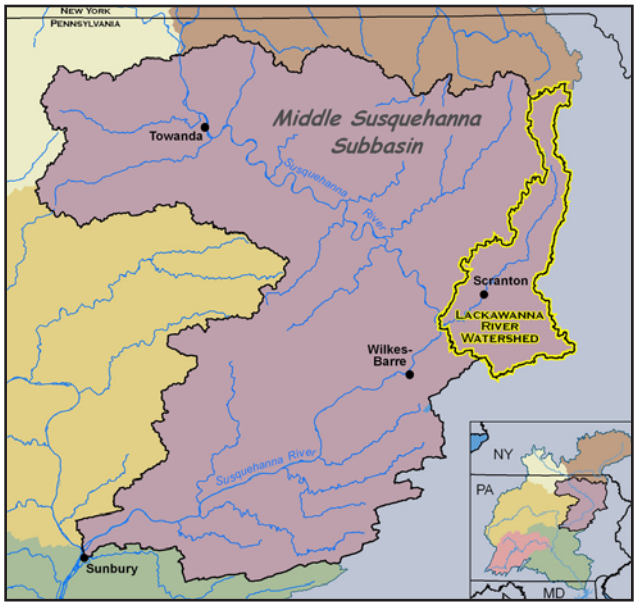

Figure 1. Location of Lackawanna River Watershed within the Middle Susquehanna Subbasin

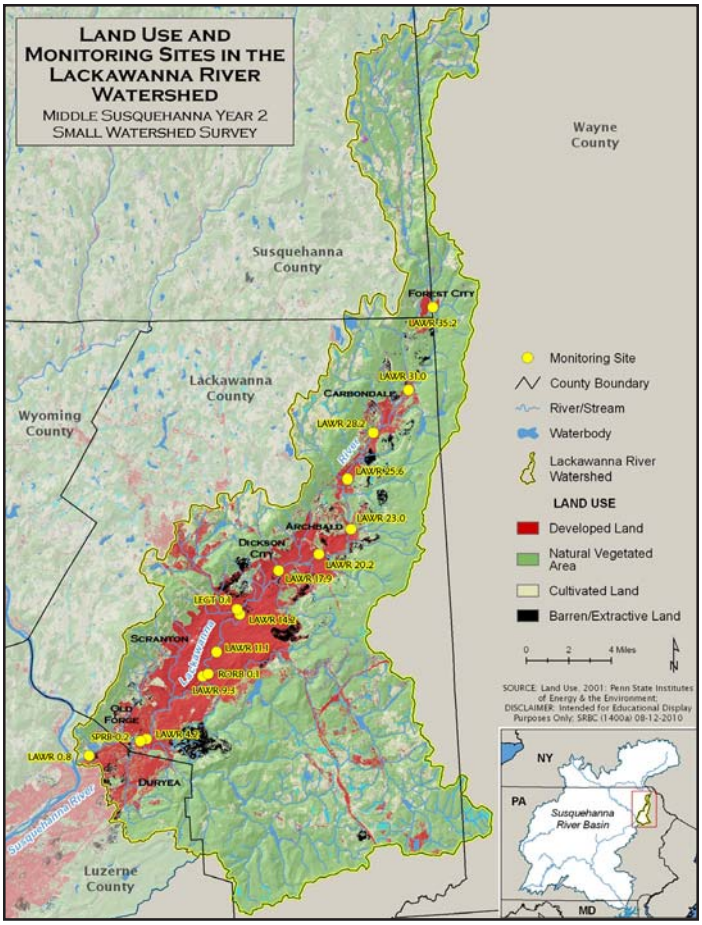

Figure 2. Sampling Site Locations and Land Use for the Lackawanna River Watershed

Overall, the land use of the Lackawanna River Watershed is 17 percent urbanized, with almost all of that urban development surrounding the river corridor through the greater Scranton area (Figure 2). Forested land makes up about 63 percent of the watershed, while agriculture constitutes the only other large land use category, with 14 percent. The remaining area is a mixture of wetlands, quarries, and industrial land uses. The Lackawanna River Watershed has numerous water quality issues, including AMD, urban stormwater runoff, and CSOs.

Table 1. Sampling Site Descriptions

Station ID	County	Latitude	Longitude	Site Description
LAWR 0.8	Luzerne	41.346149	-75.780512	Mouth of Lackawanna River at Coxton Rd. bridge near Duryea
LAWR 4.2	Lackawanna	41.356988	-75.728306	Lackawanna River at 3rd St. bridge in Old Forge
LAWR 9.3	Lackawanna	41.399321	-75.676498	Lackawanna River downstream of Roaring Brook at Elm St. bridge
LAWR 11.1	Lackawanna	41.415838	-75.663501	Lackawanna River above downtown Scranton at Olive St.
LAWR 14.2	Lackawanna	41.441191	-75.642104	Lackawanna River at Parker St. bridge
LAWR 17.9	Lackawanna	41.470717	-75.606289	Lackawanna River at West Lackawanna St. bridge in Olyphant
LAWR 20.2	Lackawanna	41.481461	-75.569132	Lackawanna River at Bridge St. near Jessup
LAWR 23.0	Lackawanna	41.498378	-75.539884	Lackawanna River in Archbald at Gilmartin St. bridge
LAWR 25.6	Lackawanna	41.532299	-75.542018	Lackawanna River near Mayfield at Poplar St.
LAWR 28.2	Lackawanna	41.563387	-75.517977	Lackawanna River downstream of Carbondale at Pike St.
LAWR 31.0	Lackawanna	41.592147	-75.485436	Lackawanna River upstream of Carbondale at Morse St. bridge
LAWR 35.2	Wayne	41.648456	-75.461715	Lackawanna River upstream SR247 bridge near Forest City
RORB 0.1	Lackawanna	41.400881	-75.671582	Mouth of Roaring Brook at South Washington St. bridge
LEGT 0.1	Lackawanna	41.444809	-75.644511	Mouth of Leggetts Creek at Wells St.
SPRB 0.2	Lackawanna	41.355670	-75.734171	Mouth of Spring Brook at Main St. in Moosic

In addition to twelve mainstem Lackawanna River sites, three tributaries (Leggetts Creek, Roaring Brook, and Spring Brook) were sampled as part of this project. (The number after the river abbreviation denotes the river mile from the mouth where the station was located — i.e., LAWR 23.0 is 23 miles upstream from the mouth of the Lackawanna River.)

The sampling sites listed in Table 1 were selected so SRBC staff could collect water quality samples during two storms and one baseline period throughout the urbanized portion of the Lackawanna River Watershed. The data from this assessment will provide valuable water quality information to SRBC and other interested parties, including LRCA, Lackawanna Heritage Valley Authority (LHVA), Pennsylvania Department of Environmental Protection (PADEP), and Lackawanna County Conservation District (LCCD).

Combined Sewer Overflows

Combined sewer systems were designed to collect rainwater runoff, domestic sewage, and industrial waste in the same pipe. During periods of rainfall, the wastewater volume in a combined system can exceed the capacity of the system or the treatment plant. When this capacity is exceeded, the excess wastewater flows directly into nearby streams and rivers. This typically occurs during heavy or extended rain events but can happen as a result of very little rain. These overflows can contain not only stormwater but also untreated human sewage, industrial waste, toxic materials, and other debris. This small watershed study focuses on stormwater and the impacts of CSOs on water quality during high flow events.

As of June 2010, more than 130 CSOs are still active and can discharge into the Lackawanna River and its tributaries between Carbondale and Old Forge, Pa., during rain events. In addition, surface stormwater flows over land, across un-vegetated mine spoil piles and contributes to excessive particulate sedimentation and further degraded water quality (LRCA, 2001).

Combined sewer overflow systems have been a priority of federal and state water quality regulators for the past 20 years. In 1994, USEPA published a national framework for the control of CSOs, which, in 2000, was incorporated into the Wet Weather Water Quality Act. In 2008, PADEP Bureau of Water Standards and Facility Regulation published the Pennsylvania Combined Sewer Overflow Policy.

CSOs continue to be a concern in many older cities, including the greater Scranton area, because of the considerable resources and time needed to completely rework an area's wastewater infrastructure. However, a substantial amount of money has been invested already in the Lackawanna River Watershed to fix the problems related to CSOs. For example, over the past ten years, the Lackawanna River Basin Sewer Authority (LRBSA) has completed numerous projects at the Throop wastewater treatment plant in Dickson City. These improvements include automatic mechanical screening to remove solids and debris, additional chlorine disinfection to reduce fecal coliform, eliminating one CSO discharge by rerouting the flow back to the treatment plant, and installing a remote monitoring system to alert facilities of possible overflows. Other improvements within the LRBSA include standby emergency generators to maintain operation in the event of power loss, a wet weather treatment system, updated interceptors, and manhole improvements. Additionally, for local citizens concerned about stormwater, LRCA has information about rain gardens, downspout disconnection, and rain barrels on its web site (www.lrca.org).

Methods

Between July 2009 and March 2010, SRBC staff collected base flow and stormflow water quality samples at 15 locations within the Lackawanna River Watershed. Macroinvertebrate samples also were collected at four locations in July 2009. Table 1 contains a list of station names, sampling location descriptions, drainage areas, and latitude and longitude coordinates for each of these sites. Given the number of CSOs in the watershed (more than 130), it is not feasible to sample at all of them during

Table 2. Water Quality Standards and Levels of Concern and References

Parameter	Limit	Reference
Temperature	> 25 degrees	a,e
Dissolved Oxygen	< 4 mg/l	a,f
Conductivity	> 800 µmhos/cm	c
pH	< 5	b,e
Total Suspended Solids	> 15 mg/l	g
Total Dissolved Solids	>500 mg/l	a,h,i
Total Organic Carbon	> 10 mg/l	j
Total Nitrogen	> 1.0 mg/l	h
Total Phosphorus	> 0.1 mg/l	d, k
Total Copper	> 200 ug/l	i
Total Iron	>1.5 mg/l	a
Total Lead	>65 ug/l	n
Total Zinc	>120 ug/l	n
Total Aluminum	0.75 mg/l	a.
Total Cadmium	>5 ug/l	i
Total Chromium	>100 ug/l	n

Reference Code & References

a. http://www.pacode.com/secure/data/025/chapter93/s93.7.html
b. Gagen and Sharpe (1987) and Baker and Schofield (1982)
c. http://www.uky.edu/WaterResources/Watershed/KRB_AR/wq_standards.htm
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e. http://www.hach.com/h2ou/h2wtrqual.htm
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