NWQEP NOTES

The NCSU Water Quality Group Newsletter

Number 112 February 2004 ISSN 1062-9149

NC STATE UNIVERSITY

IN THIS ISSUE

NWQEP NOTES is issued quarterly. Subscriptions are free. *NWQEP NOTES* is also available on the World Wide Web at http://www5.bae.ncsu.edu/programs/extension/wqg/issues/Default.htm. To request that your name be added to the mailing list, use the enclosed publication order form or send an email message to wq_puborder@ncsu.edu.

PROJECT SPOTLIGHT

New Thinking in an Old City: Philadelphia's Movement Towards Low-Impact Development

Glen J. Abrams, AICP
Philadelphia Water Department

Introduction

The Philadelphia Water Department (PWD), the oldest municipal water department in the United States, is an integrated drinking water, wastewater, and stormwater utility that serves the nation's fifth largest city, with a population of over 1.4 million. Its massive sewer system network includes 1,600 miles of combined sewers, 1,200 miles of separate sanitary and storm sewer lines, 150 miles of intercepting sewers, 169 combined sewer regulating chambers, 85,600 manholes, and 75,000 stormwater inlets.

In 1844, Philadelphia embarked on an ambitious land preservation program to protect drinking water supply by prioritizing acquisition of riparian corridors. Roughly ten percent of the City's land area was dedicated to stream and river valley parks and prevented from development. Nevertheless, industrialization and other development upstream fouled the water that flowed into the City. While water quality in the City's rivers and streams has vastly improved over the past thirty years due to Clean Water Act regulations on "point sources" of pollution, Philadelphia's waterways still do not meet designated use standards. Today, the most significant remaining impacts to the health of the City's rivers and streams result from stormwater runoff, or "nonpoint source pollution," and combined sewer overflows.

To address these remaining challenges, PWD has embraced a comprehensive watershed management program that fosters regional cooperation and looks beyond traditional infrastructure projects as a solution to stormwater management and combined sewer overflow mitigation. The program strives to minimize water pollution from all sources in a manner that is based on good science and achieves a sensible balance between ratepayer costs and environmental benefit. To that end, PWD has integrated the department's "wet weather" programs – combined sewer overflow and stormwater management – with a new drinking water source protection program under the umbrella of the Office of Watersheds (OOW).

EDITOR'S NOTE

It is well documented that land clearing and traditional development adversely impact water quality by altering the hydrologic cycle. Plant uptake, evapotranspiration and infiltration are all decreased, leading to increased site runoff. Conventional stormwater management is designed to collect this runoff and convey it off site as quickly as possible, further disrupting the local watershed hydrology. While this approach may prevent local flooding, it often leads to increased streambank erosion, sediment deposition, downstream flooding and wildlife habitat degradation.

Low impact development (LID) is gaining recognition as an environmentally friendly approach to land development and stormwater management. Its objective is to maintain the natural, pre-developed site hydrology through the creation of a hydrologically functional landscape that provides for stormwater source control and treatment. Specifically, LID practices are intended to reduce runoff volume, velocity and pollutant loads by promoting on-site stormwater capture, detention and infiltration. LID can help communities meet Phase II requirements for post construction runoff control.

This issue of *NWQEP NOTES* highlights the innovative programs and projects of the Philadelphia Water Department's Office of Watersheds. Driven by the need to reduce combined sewer overflows, the City uses LID in concert with neighborhood transformation programs to bring about improvements in both water quality and quality of life for its communities. It is inspiring to learn how this city is successfully turning great challenges into even greater opportunities.

As always, please feel free to contact me regarding your ideas, suggestions, and possible contributions to this newsletter.

Laura Lombardo

Laura Lombardo
Editor, *NWQEP NOTES*
Water Quality Extension Associate
NCSU Water Quality Group
Campus Box 7637, NCSU
Raleigh, NC 27695-7637
Tel: 919-515-3723, Fax: 919-515-7448
Email: notes_editor@ncsu.edu

The Office of Watersheds

PWD established the Office of Watersheds in 1999 by combining staff from the department's planning and research, collector systems, laboratory services, and other key function groups, and charged the new organization with the goal of watershed protection. PWD realized that the daunting task of addressing nonpoint source pollution and combined sewer overflows would require innovation and a much more collaborative, multi-disciplinary approach. Therefore, additional OOW personnel have training and experience in environmental education, urban planning, environmental engineering, and landscape architecture.

OOW has begun establishing *Watershed Partnerships* for each of the City's waterways (see Figure 1). Watersheds do not conform to municipal and county jurisdictional boundaries, so the need for multi-jurisdictional partnerships is critical. These partnerships provide a forum for regional stakeholders to work together to develop strategies that embrace the dual focus of improving water quality while improving the quality of life in Philadelphia's communities. Similarly, the *Drinking Water Source Protection Program* also recognizes that regional cooperation is the key to success. This award-winning program has identified thousands of potential sites of contamination to the Schuylkill and Delaware Rivers and has assessed their impacts on 50 drinking water facilities throughout Southeastern Pennsylvania. A model Source Water Protection Program, including a first-of-its-kind early warning system for contamination events, is now under development, partially funded through $1.3 million in State and Federal grants.

The *Stream-Based Programs* include extensive monitoring and modeling for water quality and the physical attributes of waterways, both inside and outside the City. Fluvial geomorphology studies and an ongoing wetland inventory allow OOW

Figure 1: Philadelphia watersheds.

to plan for and implement major stabilization projects along the City's creeks and define opportunities for wetland protection and enhancement. OOW is also leading the implementation of a $48 million, five-year *Capital Improvement Program* to upgrade infrastructure and improve the capture and treatment of sewage and stormwater in the combined sewer system. One example project is the largest installation of "inflatable dam technology" in the world to more efficiently utilize existing infrastructure for in-pipe storage.

The *Clean Water Act Programs*, specifically the Stormwater Management Program and Combined Sewer Overflow (CSO) Program, are making progress through the implementation of both traditional infrastructure and non-traditional low impact development (LID) projects. OOW has been a proponent of advocating for better urban and suburban design that views stormwater as an asset and not a liability.

Vacant Land and Neighborhood Transformation

The City of Philadelphia is at a crossroads. At its height, over 2 million people lived within the City. However, over the last 50 years population has been steadily declining due to rapid development of the suburbs, decline of the City's manufacturing sector, and a number of other factors. The result has been widespread vacancy and abandonment. A recent survey conducted by the City identified 30,730 vacant lots and 25,992 vacant buildings within the City, equaling about 2,600 acres. While the extent of disinvestment is daunting, the City has chosen to view vacant land as an opportunity to build new neighborhoods that meet the needs of 21st century residents. The presence of vacant land is also an opportunity for PWD to work with other City agencies and local developers to radically change the City's approach to stormwater management.

Low-impact development (LID) is a design approach that attempts to minimize the adverse environmental impacts typically associated with development. A combination of LID site design techniques and stormwater best management practices can help attain the three major goals of stormwater management: reduction of peak flow, reduction of total volume, and reduction of pollutants in runoff. Design features such as rain gardens, green roofs, permeable paving, and infiltration areas are fully integrated into and distributed throughout the landscape and built environment.

The majority of vacant land and buildings in the City is located within areas served by combined sewers (see Figure 2). By incorporating LID and site-specific infrastructure projects that detain stormwater runoff during storm events, or keep it out of the combined sewers entirely, PWD hopes to alleviate combined sewer overflows and minimize the scale of future large infrastructure projects. PWD recognizes that LID and other site-specific projects will not solve the City's CSO problem on their own, but views LID as one valuable tool for CSO mitigation. Furthermore, PWD believes that LID designs can effectively balance development costs and water pollution controls with projects that enhance community aesthetics, quality of life, sustainability, and environmental education.

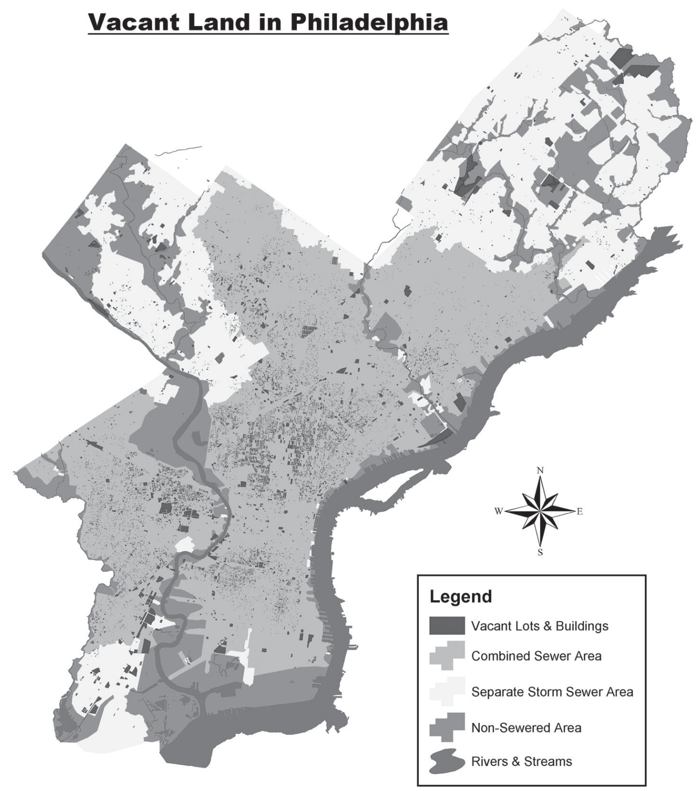

Figure 2: Vacant land in Philadelphia, mostly located in areas served by combined sewers.

Technical Assistance and Demonstration Projects

Recognizing that LID design strategies are new to most people in the Philadelphia area, OOW has taken the lead in providing technical assistance and implementing demonstration projects. Through financial assistance from the Pennsylvania Department of Environmental Protection (DEP), OOW has been able to provide conceptual design services to many institutional and nonprofit partners, such as the Philadelphia School District and community development corporations. Furthermore, OOW has been designing and implementing projects on its own, again through support from PA DEP.

Technical assistance and demonstration projects in the Philadelphia area can be divided into six broad categories:

1) Vacant lot stabilization and transformation
2) School yard projects
3) Parking lot projects
4) Recreation courts

5) Rooftops, and
6) Large scale redevelopment projects

Vacant Lot Stabilization and Transformation

The first demonstration project designed and implemented by OOW was the conversion of an overgrown, trash-strewn vacant lot into an outdoor classroom for Sulzburger Middle School in West Philadelphia. The site was designed to mimic the transformation of a watershed from "natural" to "man-made," with the back planted with trees and understory plantings and the front paved with concrete (see Figure 3). Stormwater reaches the site as direct rainfall and from the downspout of a neighboring property. A rain barrel collects the initial roof run-off to provide a watering source for the onsite vegetation and the overflow is allowed to flow across the site. The sub-surface stormwater management feature is an infiltration trench excavated to an approximate depth of four feet and backfilled with layers of gravel and sand (see Figure 4). Because of the close proximity of the houses on either side of the lot, the trench was lined with an impervious liner and slowly underdrained by a perforated PVC pipe. The surface of the lot is gently graded to the middle, and the lot is sloped from back to front to emulate a watershed's topography. Three small check dams were installed on the surface above the trench to allow water flowing down the site to puddle and infiltrate down through the mulch, soil, sand, and gravel. Finally, the City's Mural Arts Program was engaged to paint a mural that represents the Schuylkill River as it flows through rural and urban areas. Because this site was built in a combined sewer area, the primary design emphasis was on delaying the time it takes for stormwater from the site to reach the sewer in the street.

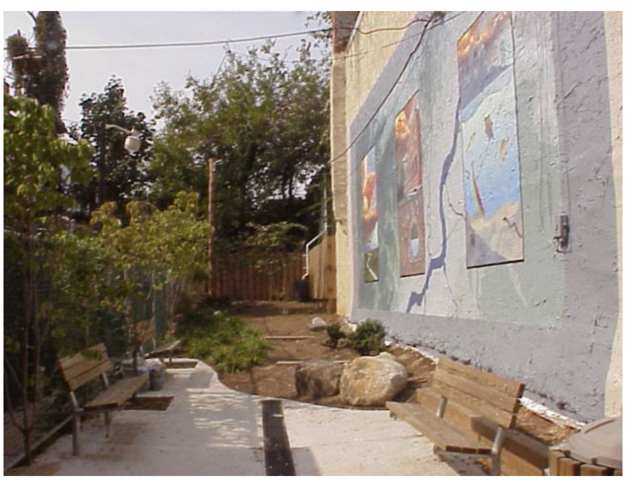

Figure 3: Outdoor demonstration for Sulzburger Middle School in West Philadelphia, mimicking transformation of a watershed from natural to man-made.

While the project above transformed a vacant lot into a productive use, the intensity of the project is not appropriate for most vacant lot stabilization projects. Since the City of Philadelphia is pursuing an aggressive policy of demolishing derelict vacant properties, OOW felt it was necessary to demonstrate rather simple grading techniques to ensure that stormwater stays on site and does not unnecessarily drain into the sewers. The demonstration site, with an approximate area of 14,250 square feet, was re-graded to direct runoff to the middle of the site, planted with a few trees and a flowering ground-cover border for aesthetic appeal, and fenced to prevent short dumping. As such, in the interim while properties such as this site are land-banked and awaiting development, most runoff is directed into small depressions and swales and allowed to infiltrate, easing the burden especially on the City's combined sewer system.

Figure 4: Construction of infiltration trench at Sulzburger Middle School demonstration site.

A more permanent vacant lot strategy involves identifying lots that are appropriate for long-term open space, often as community pocket parks or gardens. OOW's demonstration of this kind of project targeted a small corner lot at the end of a block. Although this parcel had been developed as a community pocket park several decades ago, deferred maintenance had essentially rendered the park unusable, except for the most unsavory of activities. Given the location of this lot at the downward slope of the block, it was a logical choice for demonstrating how bioretention and sub-surface storage can be easily incorporated into a neighborhood. The site was cleared and graded toward a small bioretention garden along the perimeter of the site, with gravel storage below the soil (see Figure 5). Furthermore, a new porous walkway, benches, and trees were installed. Currently only runoff from the parcel itself is managed by the bioretention garden, but it is hoped that future funding can be used to retrofit the design to manage roof runoff from many of the block's properties. In this scenario, property rain leaders would be connected to a storm line installed under the rear alleyway and runoff would be directed into the subsurface storage. Because of the small rear yards on this particular block, on-property bioretention is not feasible.

School Yard Projects

One of the largest institutional landholders in the City is the School District of Philadelphia, with 276 schools serving nearly 215,000 students. Unfortunately, over the years many school campuses have become nearly entirely paved, which results in schools that are completely divorced from the natural environment. The School District recognized the value in restoring green space to schoolyards and has established the Campus Park Ini-

Figure 5: Vacant lot demonstration site under construction.

tiative. OOW has been closely collaborating with the District and individual schools on their updated campus plans to ensure that stormwater management is included as an integral component, both of site plans and environmental education.

The first school project to include LID in the schoolyard design was at the newly constructed Penn Alexander School. Three key elements of the site design manage much of the site runoff: (1) Play field with subsurface stormwater storage/infiltration area; (2) Bioretention "rain garden;" and (3) porous asphalt play yard with subsurface storage (see Figures 6 and 7). Runoff from about 40% of the school's roof area is collected and piped under the play field into an 18-inch gravel bed, where it is allowed to freely infiltrate. The gravel itself provides storage volume for runoff from about 1.5 inches of rainfall. A pipe from the infiltration bed daylights onto the lawn and allows overflow to flow overland to street inlets. Runoff from another section of roof (about 20%) is collected and conveyed to the rain garden. The roughly 1,400 square foot garden area is designed for a maximum ponding depth of about 3 inches, providing about 170 cubic feet of surface storage. This surface storage manages runoff from the first ½-inch of rainfall from the contributing roof area. However, additional water volume control is provided via storage in the mulch and soil layers as well as infiltration. The infiltration bed beneath the porous play yard receives overflow from the rain garden in addition to the rainfall that falls directly on the play yard. The porous portion of the play yard is almost 5,000 square feet, with the gravel infiltration bed beneath the playground providing approximately 400–500 cubic feet of storage. Overflow from the infiltration bed flows directly to the combined sewer in the street.

Figure 6: Planting vegetation at Penn Alexander School raingarden.

Figure 7: Penn Alexander School porous asphalt play yard under construction.

Two other schoolyard projects have been designed with assistance from OOW, with construction anticipated in 2004. Turner Middle School will be converting over 60,000 square feet of pavement area to a garden and outdoor classroom/learning lab that will rely on overland flow to collect and infiltrate stormwater runoff from the surrounding schoolyard. Wissahickon Charter School, an elementary school with an environmental education focus, will construct a similar project at the front of their school. The design will "daylight" surface runoff and a portion of roof runoff into a naturalized watercourse that terminates in a bioretention basin located at the lowest site elevation. This school is located within an area served by separate storm sewers that outfall upstream of a drinking water intake, so the design is especially attuned to improving the quality of site runoff, via careful attention to subsurface filtering media and plant selection, in addition to reducing/delaying the quantity of runoff.

Parking Lot Projects

Within all urbanized areas, a significant proportion of land area is devoted to parking. Thus, OOW sees great value in offering alternatives to traditional parking lot designs that collect and convey stormwater offsite as quickly as possible. Low-impact parking lots often use simple and relatively inexpensive features, such as utilizing medians or landscaped buffers as bioretention or infiltration areas, to manage stormwater. The City's new Police Forensics Laboratory, converted from a long-vacant school building, directs parking lot runoff into landscaped medians through several curb cuts (see Figure 8). The medians were designed as slightly depressed planting areas, and storm inlets within the medians were raised to allow some ponding and encourage infiltration. Another project to be constructed this year will retrofit an oversized teachers' parking lot by removing pavement around the existing inlet, amending the soil, planting the area as a bioretention garden, and raising the inlet to allow ponding to provide some surface storage and encourage infiltration. A new parking lot to be constructed adjacent to the Schuylkill River will also rely on bioretention/infiltration to manage and treat, at a minimum, the most polluted "first-flush" of runoff before it is discharged into the river upstream of one of the City's drinking water intakes. The garden will also be designed as a gateway feature for the East Falls neighborhood.

Figure 8: Low impact parking lot with landscaped median at Philadelphia's new Police Forensic Laboratory.

Recreation Courts

Another significant proportion of City land area is devoted to recreation courts, such as basketball and tennis courts. OOW is working with the City's Recreation Department on a demonstration of porous pavement for court surfaces. The two basketball courts at the Mill Creek Playground will be replaced, one with a standard asphalt covering and the other with a porous paving above a gravel storage basin. The impervious court will drain onto the pervious, and runoff from other portions of the site will be conveyed into the gravel storage via modified storm inlets. Nearly two feet of gravel will be necessary to provide the necessary storage volume. Due to poor soil conditions, the design will not rely on infiltration. A perforated riser within the gravel basin will slowly drain the detained runoff, and in times of particularly heavy rainfall the riser will provide direct overflow to the sewer system. Because this project is located within a combined sewer area, the primary design objective is to increase the time of concentration for site runoff. After construction this fall, the project will be monitored to measure the efficacy of the stormwater management design and also to determine how basketball players react to the different surface material.

Rooftops

Rooftops are another impervious surface that can be readily converted to a stormwater management feature. Following the recent lead of Chicago, Portland, and Toronto and many years of implementation in Germany, Philadelphia is beginning to construct vegetated roofs. The first "green roof" constructed in Philadelphia was a 3,000 square foot demonstration project at the Philadelphia Fencing Academy completed in 1998. Currently, two nonprofit agencies in Philadelphia are in the process of implementing green roof designs for their facilities. Norris Square Civic Association, a community development corporation serving a growing Hispanic community in North Philadelphia, has renovated a former industrial building into a community marketplace and will install a green roof on the building as part of the project. Although the roof area is quite small (5,440 square feet), the location adjacent to the City's elevated rail line with a daily average ridership of 50,000 ensures that the project will have high visibility and educational benefit. The Enterprise Center CDC has also proposed a green roof for their new building, Enterprise Heights, which will provide office space for start-up businesses. This will be the first new construction project in Philadelphia to incorporate a green roof, and will include other green building features. Finally, OOW has begun collaborating with the City's Capital Program Office to begin incorporating green roofs, where feasible, when facilities are scheduled for roof replacement or when new facilities are constructed.

Large Scale Redevelopment Projects

The small-scale projects designed and implemented to date are meant to demonstrate the effectiveness of various stormwater best management practices within a very dense urban context. However, pursuing LID techniques is most effective when incorporated from the onset of project planning and design. Early participation in the design process ensures that every surface in a design is considered in the hydrologic context and that stormwater management features are integrated into every element of the development project. Too often, stormwater management is viewed as a requirement that can be squeezed onto the "leftover" land at the end of the design process. The greatest challenge and opportunity of LID is to design stormwater management facilities that provide multiple benefits, including improved aesthetic appeal, recreational opportunities, wildlife habitat, and a positive environmental message.

To date, OOW has had the opportunity to participate in one large-scale redevelopment project. In 2001, the Philadelphia

Continued on p. 9

NCSU Water Quality Group Publications List and Order Form (February 2004)

Publication Number	Reports & Journal Articles	Price($)	Quantity	Total($)
WQ-131*	Stream Restoration: A Natural Channel Design Handbook (2003) (129p) *http://www.ncsu.edu/sri/stream_rest_guidebook/guidebook.html*	35.00	_______	_______
WQ-130*	Changes in a Stream's Physical and Biological Conditions Following Livestock Exclusion (2003) (7p)	Free	_______	_______
WQ-129*	Changes in Land Use/Management and Water Quality in the Long Creek Watershed (2002) (11p)	Free	_______	_______
WQ-128	2002 NC Stream Restoration Conference (Conference Agenda and Proceedings) (2002) (73p)	10.00	_______	_______
WQ-127	Hydraulic Geometry Relationships for Urban Streams Throughout the Piedmont of North Carolina (2002) (11p)...	Free	_______	
WQ-126	Pollutant Export from Various Land Uses in the Upper Neuse River Basin (2002) (9p)...	Free	_______	
WQ-125	Efficiencies of Temporary Sediment Traps on Two North Carolina Construction Sites (2001) (9p)...	Free	_______	
WQ-124	Section 319 Nonpoint Source National Monitoring Program: Successes and Recommendations (2000) (32p)... *(http://www.ncsu.edu/waterquality/section319/index.html)*	Free	_______	
WQ-123	Nonpoint-Source Pollutant Load Reductions Associated with Livestock Exclusion (2000) (9p)	Free	_______	
WQ-120	Comparing Sampling Schemes for Monitoring Pollutant Export From a Dairy Pasture (1998)	Free	_______	
WQ-119	Performance Evaluation of Innovative and Alternative On-Site Wastewater Treatment Systems in Craven County, NC (1998) (12 p)	Free	_______	
WQ-109**	Techniques for Tracking, Evaluating, and Reporting the Implementation of Nonpoint Source Control Measures: Forestry (EPA/841-B-97-009) (1997)	Free	_______	
WQ-108**	Techniques for Tracking, Evaluating, and Reporting the Implementation of Nonpoint Source Control Measures: Agriculture (EPA/841-B-97-010) (1997)	Free	_______	
WQ-103	WATERSHEDSS: A Decision Support System for Watershed-Scale Nonpoint Source Water Quality Problems (Journal of the American Water Resources Association) (1997) (14p)	Free	_______	
WQ-105	Linear Regression for Nonpoint Source Pollution Analyses (EPA-841-B-97-007) (1997) (8p)	Free	_______	
WQ-104	Water Quality of First Flush Runoff from 20 Industrial Sites (Water Environment Research) (1997) (6p)	Free	_______	
WQ-100	Water Quality of Stormwater Runoff from Ten Industrial Sites (Water Resources Bulletin) (1996) (10p)	Free	_______	
WQ-96	Goal-Oriented Agricultural Water Quality Legislation (Water Resources Bulletin) (1996) (14p)	Free	_______	
WQ-92	The Rural Clean Water Program: A Voluntary, Experimental Nonpoint Source Pollution Control Program and its Relevance to Developing Countries (1995) (18p)	Free	_______	
WQ-83	Effective Monitoring Strategies for Demonstrating Water Quality Changes from Nonpoint Source Controls on a Watershed Scale (Wat. Sci. Tech.) (1993) (6p)	Free	_______	
WQ-21	Setting Priorities: The Key to Nonpoint Source Control (EPA 841-B-87-110) (1987) (50p)	Free	_______	
WQ-22	Interfacing Nonpoint Source Programs with the Conservation Reserve Program: Guidance for Water Quality Managers (EPA/506/2-88/001) (1988) (24p)	4.00	_______	_______
WQ-60	Selecting Priority Nonpoint Source Projects: You Better Shop Around (EPA/506/2-89/003) (1989) (39p)	5.00	_______	_______
WQ-24	Selecting Critical Areas for NPS Pollution Control (J. Soil & Water Conservation) (1985) (4p)	Free	_______	
WQ-25	Practical Guidelines for Selecting Critical Areas for Controlling Nonpoint Source Pesticide Contamination of Aquatic Systems (USEPA) (1985) (5p)	Free	_______	
WQ-26	Appropriate Designs for Documenting Water Quality Improvements from Agricultural NPS Control Programs (USEPA) (1985) (5p)	Free	_______	
WQ-27	Increasing Sensitivity of NPS Control Monitoring Programs (Water Res. Assoc. Proc.) (1987) (15p)	Free	_______	
WQ-30	Pollution From Nonpoint Sources: Where We Are and Where We Should Go (J. Env. Science & Technology) (1987) (6p)	Free	_______	
WQ-32	Determining Statistically Significant Changes in Water Pollutant Concentrations (J. Lake & Reservoir Mgmt.) (1987) (7p)	Free	_______	

* new addition to publication list
** Only available by calling EPA's National Service Center for environmental publications at 1-800-490-9198

Publication Number	Reports & Journal Articles (continued)	Price($)	Quantity	Total($)
WQ-33	Water and Sediment Sampler for Plot and Field Studies (J. Environmental Quality) (1987) (6p)	Free	_______	
WQ-34	Extension's Role in Soil and Water Conservation (J. Soil & Water Conservation) (1988) (4p)	Free	_______	
WQ-35	Agricultural Nonpoint Source Control: Experiences from the Rural Clean Water Program (J. Lake & Reservoir Management) (1988) (6p)	Free	_______	
WQ-36	Determining the Statistical Sensitivity of the Water Quality Monitoring Program in the Taylor Creek Nubbin Slough, Florida, Project (J. Lake & Reservoir Management) (1988) (12p)	Free	_______	
WQ-65	Determining and Increasing the Statistical Sensitivity of Nonpoint Source Control Grab Sample Monitoring Programs (Colorado Water Resources Research Institute) (1990) (17p)	Free	_______	
WQ-70	North Carolina's Sediment Control Program (Public Works) (1991) (3p)	Free	_______	
WQ-06	Best Management Practices for Ag. Nonpoint Source Pollution Cntrl: I. Animal Waste (1982) (67p)	8.00	_______	_______
WQ-07	Best Management Practices for Ag. Nonpoint Source Pollution Cntrl: II. Commercial Fertilizer (1982) (55p).	6.00	_______	_______
WQ-08	Best Management Practices for Agric. Nonpoint Source Pollution Cntrl: III. Sediment (1982) (47p)	5.00	_______	_______
WQ-09	Best Management Practices for Agric. Nonpoint Source Pollution Cntrl: IV. Pesticide (1984) (87p)	8.00	_______	_______
WQ-98	Farm*A*Syst Fact Sheets (7 fact sheets) (1997) (*http://h2osparc.wq.ncsu.edu/info/farmassit/index.html*)	Free	_______	
WQ-99	Home*A*Syst Fact Sheets (5 fact sheets) (1997) (*http://h2osparc.wq.ncsu.edu/info/farmassit/homeindx.html*)			
WQ-89	Rural Clean Water Program Technology Transfer Fact Sheets (10 fact sheets) (1995) (*http://h2osparc.wq.ncsu.edu/info/concepts.html*)	Free	_______	
WQ-91	Watershed Management: Planning and Managing a Successful Project to Control Nonpoint Source Pollution (contains a list of resources specific to North Carolina) (1995) (8p) (*http://www.bae.ncsu.edu/bae/programs/extension/publicat/wqwm/ag522.html*)	Free	_______	
WQ-86	Paired Watershed Study Design (EPA 841-F-93-009) (1993)	Free	_______	
WQ-48	Pesticide Fact Sheets (10 fact sheets) (1988)	4.00	_______	_______
	Literature Reviews and Bibliographies			
WQ-121	Nonpoint Sources (Review of 1998 Literature) (Water Environment Research) (1999) (16p)	Free		
WQ-118	Nonpoint Sources (Review of 1997 Literature) (Water Environment Research) (1998) (17p)	Free	_______	
WQ-106	Nonpoint Sources (Review of 1996 Literature) (Water Environment Research) (1997) (17p)	Free	_______	
TOTAL =	Total Amount of Purchase		$__________	

IMPORTANT NOTES ABOUT ORDERING PUBLICATIONS:

Prices include postage within the U.S. Prices for publications to be sent outside the U.S. may be higher. Please call or write for this information. All prices are subject to change without notice. The price list is updated with each issue of *NWQEP NOTES*. Requests are filled while supplies last. Only one copy of each free publication is available.   FEIN #56-6000-756

To order: Fill out order form and enclose with payment. ____ Check here if requesting we bill your institution
Please make checks payable to **NCSU Water Quality Group** ____ Check here if enclosing payment

Please note: Only institutions can be billed. Individuals must enclose payment with order form.

Send order to: Publications Coordinator, NCSU Water Quality Group, Campus Box 7637, North Carolina State University, Raleigh, NC 27695-7637 Fax: 919-515-7448, email: wq_puborder@ncsu.edu. An electronic order form is also available at: http://www.ncsu.edu/waterquality/issues/pub_order.html.

Ordered by: Name:____
Institution:____
Street Address:____
City, State, Zipcode: ____
Telephone:____

________ Please place my name on the mailing list for *NWQEP NOTES*, the quarterly newsletter on nonpoint source pollution published by the NCSU Water Quality Group (with support from the U.S. Environmental Protection Agency) (subscriptions are free).

- NCSU Water Quality Group home page: http://www.ncsu.edu/waterquality/
- U.S. Environmental Protection Agency's Office of Water publications list: http://www.epa.gov/OW/info
- WATERSHEDSS — Water, Soil, Hydro-Environmental Decision Support System, Internet-based management tool: http://www.water.ncsu.edu/watershedss/
- Understanding the Role of Agricultural Landscape Feature Function and Position in Achieving Environmental Endpoints: Final Project Report (to the U.S. Environmental Protection Agency) (1996) (118p) (*abstract and instructions for downloading the report available at: ftp://ftp.epa.gov/epa_ceam/wwwhtml/software.htm*

Housing Authority (PHA) was awarded a $35 million HOPE VI grant from the U.S. Department of Housing and Urban Development to demolish and rebuild the Mill Creek housing development and invest in the surrounding areas. In the grant application, PHA committed to working with the Philadelphia Water Department (PWD) to create an innovative stormwater management design. This demonstrated a significant departure from the typical redevelopment approach in the older sections of Philadelphia, in which housing infrastructure and street inlets are connected to the existing combined sewer system.

The initial design for the development included LID design features such as vegetated swales, disconnected roof leaders, and distributed infiltration of stormwater. However, as design concepts were more clearly developed, PHA became concerned about site maintenance and liability issues that it perceived would result from accepting the LID concepts. Because these designs were new to Philadelphia's densely populated urban setting, the City Planning Commission and some units within the Water Department also expressed reservations about many of the proposed LID elements for similar reasons. Furthermore, much of what was proposed was in direct conflict with existing City codes and ordinances.

As a result, most of the innovative "softscape" design features were replaced with more traditional infrastructure. For instance, instead of using vegetated swales to convey runoff to a detention/infiltration area, the parties involved opted to construct two dedicated stormwater lines. All detention and infiltration of site runoff is subsurface and is therefore not visible to community residents. Furthermore, infiltration zones are not distributed throughout the site, but instead are concentrated in one area. Therefore, at the surface, very little separates this development from other past developments. However, despite the design challenges faced during the course of the project, the ultimate goal was realized: this final design separates a sizable portion of the site runoff from the existing combined sewer system.

The Future of Stormwater Management and Watershed Planning in Philadelphia

Philadelphia is in the very beginning stages of implementing a better approach to stormwater management. However, the experience with the PHA project described above clearly indicates that many challenges still remain. The City's existing stormwater ordinance must be overhauled to reflect the most current practices in watershed sciences and encourage watershed-wide planning. The City's land development codes also must be updated to ensure that they are not an impediment to implementing LID designs. Economic incentives need to be created to reward those that carry out truly innovative designs that exceed minimum requirements. And most importantly, OOW must continue to educate others on the merits of LID and its important role in ensuring the long-term health of the region's watersheds.

For More Information

Glen J. Abrams, AICP
Urban Watersheds Planner
Philadelphia Water Department
Office of Watersheds
1101 Market St., 4th floor
Philadelphia, PA 19107
Phone: 215-685-6039
Fax: 215-685-6043
Glen.Abrams@phila.gov ■

Information

Decision Support System for NPS Control Available on the Web

The North Carolina State University Water Quality Group has developed a watershed-level, web-based decision support system called WATERSHEDSS (WATER, Soil, and Hydrologic Decision Support System), which allows users to conduct a preliminary watershed evaluation in order to determine appropriate best management practices (BMPs). WATERSHEDSS is available at: **http://www.water.ncsu.edu/watershedss/**

The site's two primary objectives are to:

1. Transfer water quality and land treatment information to watershed managers in order to assist them in making appropriate land management decisions to achieve water quality goals.
2. Assess and evaluate sources, impacts, and potential management options for control of nonpoint source pollution in a watershed based on user-supplied information and decisions.

The site provides educational information covering diverse topics on water quality, monitoring, land treatment, watershed management, and watershed projects. The site also provides a searchable database of over 6,000 annotated articles on NPS pollution control developed by the NCSU Water Quality Group over the past 20 years.

Getting to Smart Growth: 100 Policies for Implementation, Volume 2

EPA and ICMA recently released *Getting to Smart Growth II: 100 More Policies for Implementation*. Free copies are available for a limited time. This document provides states and communities with 100 policy options that can be mixed and matched to fit local circumstances, visions, and values, and highlights steps that the private sector can take to encourage more livable communities. It follows on the heels of the extremely popular first volume of Getting to Smart Growth. The publication serves as a road map for states and communities that have recognized the need for smart growth but are unclear on how to achieve it.

Like the first volume, Getting to Smart Growth II provides 10 policy options to achieve each of the 10 Smart Growth Principles. These policies are supported with *Practice Tips* that offer additional resources or brief case studies of communities that have applied the approach to achieve smart growth. Features of the new volume include

- An entirely new list of 100 policies for implementation
- More case studies and examples in each chapter
- An appendix listing funding resources for smart growth projects.

To get a free hard copy of this publication from the Smart Growth Network and EPA, call EPA's Development, Community, and Environment Division at 202-566-2878.

To download an electronic copy of the publication in PDF format, go to: **http://www.smartgrowth.org/library/articles.asp?art=870**

For information on joining the Smart Growth Network, visit **http://www.smartgrowth.org/sgn/join.asp.**

2003 Summary Report of Section 319 National Monitoring Program Projects

The annual report of the Section 319 National Nonpoint Source Monitoring Program (NMP) is available on-line at **http://www.ncsu.edu/waterquality/**. This report provides profiles for 24 watershed projects selected under the NMP that are being monitored over a 6- to 10-year period to evaluate effectiveness of best management practices in reducing nonpoint source water pollution. Printed copies are available by contacting Cathy Smith at 919-515-3723 or cathy_scache@ncsu.edu.

■

Meetings

Meeting Announcements — 2004

April

STORMWATER: Emerging Issues for Local Communities, 2004 Southeast Regional Conf: April 19-21, 2004, Raleigh, NC. Contact Dr. Bill Hunt at bill_hunt@ncsu.edu. Website: www.soil.ncsu.edu/swetc/stormwaterconf/main.htm.

17th Annual Nat'l Conf: Enhancing The States' Lake Management Programs: Effective Monitoring Programs for Lakes & Reservoirs: April 20-23, 2004, Chicago, IL. Contact Bob Kirschner, Chicago Botanic Garden, 1000 Lake Cook Road, Glencoe, IL 60022; Email: bkirschn@chicagobotanic.org; Web site: http://www.nalms.org/symposia/chicago/index.htm

May

4th Nat'l Monitoring Conf: Building & Sustaining Successful Monitoring Programs: May 17-20, 2004, Chattanooga, TN. Contact the conference coordinator at nwqmc2004@tetratech-ffx.com or 410-356-8993. Web site: www.nwqmc.org

Stormwater Program Mgmt & BMPs: Pollutants, Selection & Maintenance Workshops & Exposition: May 19, 2004, Myrtle Beach, SC. Contact Steve Di Giorgi, Program Director. Tel: 805-682-1300 x129; Email: stevedg@forester.net

June

Environmental Statistics Short Course: June 7-9, 2004, Colorado State University. E-mail: loftis@engr.colostate.edu; Website: www.engr.colostate.edu/~loftis/

Southeastern Regional Conf on Stream Restoration: June 21-24, 2004, Winston-Salem, NC. NC Stream Restoration Institute. Web site: http://www.bae.ncsu.edu/programs/extension/wqg/sri/2004_conference/index.html

Riparian Ecosystems & Buffers: Multi-scale Structure, Function & Mgmt: June 28-30, 2004, Olympic Valley, CA. American Water Resources Association. Web site: http://www.awra.org/meetings/Olympic2004/index.html

July

Soil & Water Conservation Society 2004 Annual Conf: July 24-28, 2004, St. Paul, MN. Contact Nancy Herselius, SWCS meetings coordinator. Tel: 515-289-2331, ext. 17; Email: nancy.herselius@swcs.org; Website: www.swcs.org/t_what_callforpapers04.htm.

StormCon 2004, the North American Surface Water Quality Conference & Exposition: July 26-29, 2004, Palm Desert, CA. Website: www. StormCon.com.

September

Self-Sustaining Solutions for Streams, Wetlands, & Watersheds: Sept 12-15, 2004, St. Paul, MN. ASAE. Contact Andy Ward, Conference Chair, The Ohio State University, Tel: 614-292-9354; Email: ward.2@osu.edu; Web site: http://www.asae.org/meetings/streams2004/Index.html

Second Nat'l Conf on Coastal & Estuarine Habitat Restoration: Sept 12-15, 2004, Seattle, WA. Contact Nicole Maylett at nmaylett@estuaries.org; Web site: http://www.estuaries.org/2ndnationalconference.php

12th Nat'l Nonpoint Source Monitoring Workshop: Sept 26-30, 2004, Ocean City, MD. Contact Tammy Taylor at 765-494-1814; Email: taylor@ctic.purdue.edu; Web site: http://www.ctic.purdue.edu/NPSWorkshop/NPSWorkshop.html (see Call for Abstracts on p. 11).

■

Call For Abstracts

12th National Nonpoint Source Monitoring Workshop: Managing Nutrient Inputs and Exports in the Rural Landscape

September 27-30, 2004
Ocean City, Maryland

About the Conference: The 12th year of this workshop will once again bring together land managers and water quality specialists to share information on the effectiveness of best management practices in improving water quality, effective monitoring techniques, and statistical analysis of watershed data. The workshop will focus on the successes of Section 319 National Monitoring Program projects and other innovative projects from throughout the U.S. The agenda will include three days of sessions, posters presentations and a field trip. Plus, two half-day workshops will focus on Project Evaluation and Nonpoint Source Modeling.

Session Topics:

- Detecting change in water quality from agricultural BMP implementation
- Modeling applications for NPS pollution
- Integrating monitoring into management activities
- Innovative management strategies in the agriculture landscape
- Agricultural nonpoint source pollution TMDLs
- Volunteer monitoring in 319 projects
- Innovative monitoring in the agricultural landscape
- Riparian area and stream protection/restoration in the agricultural landscape
- Programs and approaches for animal operations and nutrient management

Presentations will be 20 minutes, followed by 10 minutes for discussion. Poster presentations are also encouraged. Proposals can be submitted two ways. Pick **one** of the following:

1. Submit online at: http://www.ctic.purdue.edu/NPSWorkshop/Abstracts.html.
2. Email or mail a proposal with the following information included: (MS Word or Text file)
   a) Author name, affiliation, session topic the presentation will address, and preferred presentation format (oral or poster). Also include mailing address, phone, fax and email.
   b) The circumstances creating the need for the project.
   c) The measurable objectives of the project.
   d) The project design and methods employed in: designing the project, enlisting cooperators, developing implementation programs or approaches, measuring implementation, monitoring the effectiveness of the implementation, and developing TMDLs or models.
   e) Partnerships (public and private) supported and/or created by this project, including partner role and contribution to the project.
   f) A description of how the project integrated monitoring and implementation.
   g) A discussion of results:
      - Did the monitoring indicate the project goals were accomplished?
      - What changes in land treatment/land uses occurred?
      - How did these changes relate to water quality monitoring results?
      - How was the model used in conjunction with the implementation?
      - How was the TMDL implemented?

Mail to: Nonpoint Source Workshop
1220 Potter Drive, Suite 170
West Lafayette, IN 47906
Phone (765) 494-9555; Fax (765) 494-5969
Email: taylor@ctic.purdue.edu
Conference Website: http://www.ctic.purdue.edu/NPSWorkshop/NPSWorkshop.html

Deadline for submission of abstracts is **March 15, 2004.**

Authors will be notified by April 15, 2004 regarding the status of their abstract.

If you have questions, contact Tammy Taylor at taylor@ctic.purdue.edu

Production of NWQEP NOTES is funded through U.S. Environmental Protection Agency (EPA) Grant No. X825012. Project Officer: Tom Davenport, Office of Wetlands, Oceans, and Watersheds, EPA. 77 W. Jackson St., Chicago, IL 60604. Website: http://www.epa.gov/OWOW/NPS

NCSU Water Quality Group
Department of Biological and Agricultural Engineering
North Carolina Cooperative Extension Service
Campus Box 7637
North Carolina State University
Raleigh, NC 27695-7637

NONPROFIT ORG.
U.S. POSTAGE
PAID
RALEIGH, NC
PERMIT No. 2353

NC STATE UNIVERSITY

NCSU Water Quality Group
Campus Box 7637
North Carolina State University
Raleigh, NC 27695-7637
Telephone: (919) 515-3723
Fax: (919) 515-7448
Web Site: http://www.ncsu.edu/waterquality/

Personnel

Jean Spooner	Garry L. Grabow
Robert O. Evans	Karen R. Hall
Kristopher Bass	Frank J. Humenik
David Bidelspach	William F. Hunt
Michael R. Burchell II	Daniel E. Line
Jon Calabria	Laura A. Lombardo
Daniel Clinton	Catherine S. Smith
Barbara A. Doll	Dani E. Wise