



# Nonpoint Source News-Notes

February 2009, #86

*The Condition of the Water-Related Environment  
The Control of Nonpoint Sources of Water Pollution  
The Ecological Management & Restoration of Watersheds*



## Notes on the National Scene

### Draft Handbook Helps States Develop Watershed Total Maximum Daily Loads

State water quality programs are being challenged by the ever growing number of total maximum daily loads (TMDLs) that must be developed to comply with regulations for impaired waters. According to current Clean Water Act section 303(d) lists, states need to develop approximately 65,000 TMDLs. EPA expects that many of these TMDLs may require more complex analyses than the 34,300 TMDLs that states have developed to date. These more difficult TMDLs will require increasing amounts of staff resources and funding at a time when state budgets are either declining or remaining static. In response, EPA's Office of Water recently issued the draft *Handbook for Developing Watershed TMDLs*, a guidance document designed to help states expedite development of scientifically defensible TMDLs.

The handbook emphasizes the benefits of developing TMDLs on a watershed basis—rather than developing a separate TMDL for each impaired waterbody segment—



Portland's new stormwater marketplace should encourage more onsite stormwater features such as this planter. See article on page 6.

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and provides TMDL practitioners with technical and programmatic information needed to adopt watershed TMDLs as a standard approach in their TMDL programs.

### *Benefits of the Watershed TMDL*

EPA is encouraging states to develop watershed-based TMDLs because they can yield environmental, financial and programmatic benefits. For example, developing TMDLs on a watershed basis allows the practitioner to evaluate all the sources in a watershed and identify their relative impacts on water quality. Then, the TMDL can optimize allocations and target those sources that

#### **What is a TMDL?**

When waterbodies do not meet water quality standards, states identify these waters as impaired for the particular pollutants of concern (e.g., nutrients, bacteria, etc.). The states must then develop a total maximum daily load (TMDL) for that waterbody. A TMDL is essentially a pollution budget. It calculates the maximum amount of a pollutant allowed to enter a waterbody, also known as the loading capacity, so that the waterbody will meet and continue to meet water quality standards for that particular pollutant. The TMDL allocates that load to point sources and nonpoint sources, which include both human-caused and natural background sources of the pollutant. States use the TMDL to develop and implement plans to reduce pollution so the waterbody can meet standards.

will most efficiently and effectively result in attainment of standards. When addressing multiple pollutants that might be contributed by common sources, a watershed TMDL can target a source that will result in improvements for multiple pollutants, maximizing the potential for source controls. For example, some agricultural sources (e.g., livestock-related sources) and residential sources (e.g., septic systems) can be significant sources of bacteria and nutrients. By simultaneously developing TMDLs for both pollutants, the allocations can target those sources that control both bacteria and nutrients. If the state developed the TMDLs separately, it might allocate unnecessary and duplicative load reductions to watershed sources. Because the watershed approach to TMDL development evaluates source inputs and water quality impacts throughout the entire system, it can also protect threatened or unimpaired segments in the watershed and prevent the need to create future TMDLs.

States that develop TMDLs on a watershed basis rather than as single-segment TMDLs can also realize significant financial and programmatic benefits by decreasing the staff and funding resources needed. For example, developing a watershed-based TMDL can yield:

- Lower per-TMDL development costs
- More TMDL pollutant-waterbody combinations addressed
- More efficient use of resources and completion of tasks
- More effective use of public participation and stakeholder involvement
- Less possibility that the state will need to reopen and recalculate previously completed TMDLs
- More comprehensive and targeted monitoring programs
- More opportunity to integrate TMDLs with other watershed programs

Finally, in addition to seeing benefits during the TMDL development process, states can also realize benefits while actually implementing a watershed-based TMDL. For example, states will be able to more effectively target pollution source controls and better consider the relative magnitude and influence of all watershed sources while implementing projects. States will be better able to integrate watershed TMDLs into overall watershed management approach and more easily quantify and link on-the-ground actions with attainment of water quality standards over time. Some states will find that the organizational and quantitative framework provided by watershed-based TMDLs facilitates the use of innovative approaches to point source control such as watershed-based permitting and water quality trading.

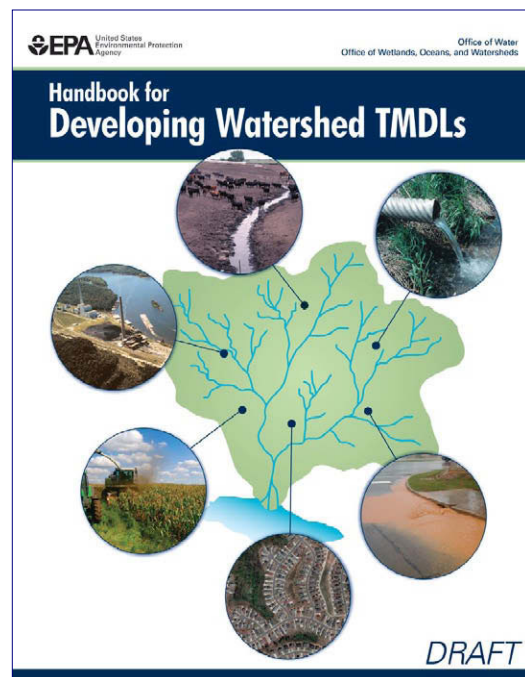
### *Handbook Design*

The handbook is written for TMDL practitioners who understand and are active in the TMDL process, such as state and federal environmental agencies, third-party TMDL developers, and private consultants. The handbook's information will also benefit those who are involved in TMDL implementation, such as National Pollutant Discharge Elimination System (NPDES) permitting authorities, municipalities that are responsible for implementing controls or are subject to

municipal separate storm sewer system (MS4) regulations, and watershed organizations working to coordinate and implement management efforts in the watershed.

The handbook is separated into several main sections and includes an appendix with eight comprehensive case study examples from around the nation. The handbook first introduces the concept of watershed TMDLs and discusses the environmental, financial and programmatic benefits associated with them. Next, it discusses a series of criteria or screening factors that TMDL practitioners can consider when defining the scope of a watershed TMDL, such as pollutant type, waterbody type, data quality and other issues. The handbook also discusses the topics that are relevant to watershed TMDLs at each step of the TMDL development process, including involving the public, characterizing the watershed, calculating loading capacity, allocating loads to point and nonpoint sources, and developing and submitting the TMDL report to EPA. Finally, the handbook offers information on a number of topics related to implementing watershed TMDLs, including coordinating with related watershed programs (e.g., watershed-based permitting), collecting follow-up data and identifying potential financial resources.

The draft handbook is available for public comment through February 18, 2009 and may be downloaded at [www.epa.gov/owow/tmdl/techsupp.html](http://www.epa.gov/owow/tmdl/techsupp.html). Please send any comments or questions to Michael Haire in EPA's Watershed Branch at [haire.michael@epa.gov](mailto:haire.michael@epa.gov).



The draft *Handbook for Developing Watershed TMDLs* is now online.

### New Draft TMDLs to Stormwater Permits Handbook also Available for Public Comment

The U.S. Environmental Protection Agency (EPA) also just released its *TMDLs to Stormwater Permits Handbook* to address challenges that are unique to TMDL development and implementation involving permitted stormwater discharges from municipal separate storm sewer systems (MS4s), industrial facilities and construction activities. Available at [www.epa.gov/owow/tmdl/pdf/tmdl-sw\\_permits11172008.pdf](http://www.epa.gov/owow/tmdl/pdf/tmdl-sw_permits11172008.pdf), this handbook is intended for federal and state TMDL writers and NPDES stormwater permit writers responsible for addressing waterbodies impaired by discharges from stormwater sources. It contains information to give TMDL and stormwater permit writers a better understanding of (1) cross-program regulatory requirements and programmatic processes; (2) current efforts to establish better cross-program connections; and (3) opportunities to further improve how the TMDL and NPDES stormwater programs interact to address stormwater-related water quality impairments. Real-world examples illustrate concepts and approaches for promoting improved implementation of TMDLs through stormwater permits. EPA welcomes comments on the methods and approaches presented in this draft handbook, as well information on other TMDL-stormwater case studies, implementation plans, other valuable resources, or permits and/or permit language that would be useful to include in the final version. Please send comments on the document to Christine Ruf ([ruf.christine@epa.gov](mailto:ruf.christine@epa.gov)), Dean Maraldo ([maraldo.dean@epa.gov](mailto:maraldo.dean@epa.gov)) or Jack Faulk ([faulk.jack@epa.gov](mailto:faulk.jack@epa.gov)) by February 27, 2009.

## Green Infrastructure Municipal Handbook Grows

EPA is developing *The Municipal Handbook* to help local officials implement green infrastructure in their communities. The handbook is presented as a series of documents (as separate chapters) that cover issues such as financing, operation and maintenance, incentives, designs, codes and ordinances, and a variety of other subjects. The handbook chapters are intended to serve as “how to” manuals on these topics, written primarily from the standpoint of municipal implementation. EPA is producing the handbook in sections, with each new element being released as it is completed.

The chapters may be downloaded at <http://cfpub.epa.gov/npdes/greeninfrastructure/munichandbook.cfm>.

To date, EPA has released chapters on:

1. **Funding Options.** This chapter describes strategies and provides case study examples of how local governments are generating reliable funding for green infrastructure. This document identifies and discusses stormwater fees and loan programs—the two most common funding options communities are using for green stormwater infrastructure. The chapter briefly mentions grant monies as a third source of funding, but notes that these are available in limited amounts and will not sustain large multi-year wet weather programs.
2. **Retrofit Policies.** This chapter explores policies and incentives used by municipalities to facilitate green retrofits within their stormwater programs. This document also troubleshoots the institutional and regulatory challenges of incorporating green retrofits into municipal infrastructure, and provides some solutions and case studies.
3. **Green Streets.** This chapter evaluates programs and policies used to integrate green infrastructure (e.g., street trees, permeable pavement, bioretention and swales) into public spaces, roads and other transportation networks. Municipal case studies highlight the benefits of greening transportation networks.
4. **Rainwater Harvesting Policies.** This chapter presents harvesting principles, designs, example code requirements, and policies and incentives for implementing a municipal rainwater harvesting program. The document also addresses barriers to implementation, and provides case studies of successful rainwater harvesting programs.

EPA expects to release two additional chapters in early 2009. The first, focusing on green infrastructure incentives, will suggest ways to develop a local incentive program and present case studies of successful programs in place around the United States. The second new chapter will focus on codes and ordinances. It will include a comprehensive review of local opportunities for incorporating green infrastructure at the municipal, neighborhood and site scales, including references from existing municipal programs.

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## Document Explores Success of Reverse Auction for Stormwater Control

How do government agencies apply free market economics to maximize water quality benefits at minimal cost in an existing typical suburban neighborhood? EPA's National Risk Management Research Laboratory's Sustainable Environments Branch just released *Using Economic Incentives to Manage Stormwater Runoff in the Shepherd Creek Watershed, Part I*. The report (available at [www.epa.gov/NRMRL/pubs/600r08129/600r08129.htm](http://www.epa.gov/NRMRL/pubs/600r08129/600r08129.htm)) describes an ongoing project that is testing a reverse auction methodology that communities can use to deliver stormwater management practices in the most economically and ecologically effective manner possible. The report describes the theories, methods and criteria that EPA used to distribute rain gardens and rain barrels to homeowners.

The project is testing an alternative approach to stormwater control using a decentralized approach, installing retrofit runoff detention practices throughout a small suburban watershed in Cincinnati, Ohio, thus reducing the amount of runoff reaching the sewer system. This study is a part of an ongoing effort to find a realistic market-based mechanism to alleviate the water quality and ecological problems caused by the typically large volumes of excess stormwater runoff in urban and urbanizing areas.

### *Applying Market Forces*

The project team hypothesized that deploying stormwater management practices in a watershed using market incentives would reduce stormwater runoff substantially, thus improving stream water quality and biotic integrity. To test this hypothesis, the team examined four market mechanisms:



command and control, cap and trade, fee and rebate, and auction. They modeled each policy using realistic cost functions, including the estimated opportunity cost of residential land dedicated to particular stormwater control practices. The team also used sound hydrologic models. In most cases, modeling results showed the incentive schemes to be economically efficient. However, several legal and regulatory obstacles prevented the team from imposing a cap on stormwater runoff (for a tradable credit mechanism) and an appropriately high stormwater fee (that would allow for a fee and rebate policy). Therefore, the team opted for a completely voluntary approach using a reverse auction.

The project's two primary objectives include testing the use of an auction to cost-effectively allocate stormwater management practices—rain barrels and rain gardens, in this case—among landowners, and determining how effective these practices are in terms of hydrological, water quality, and ecological measures. The team used an experimental design known as “before-after-control-impact.” They monitored streams for three years before installing the stormwater management practices in the treatment watersheds, and then will continue to monitor for an additional three years. The team used a reverse auction to determine where to install the management practices in a cost effective way. The reverse, or procurement, auction is often used when there are many potential sellers of an item (in this case, homeowners selling limited use of their property) and a single buyer (in this case, a government agency trying to buy as much stormwater retention capacity as economically feasible). To try to improve the subscription rate among homeowners and to test the hypotheses about iterative auctions, the team conducted the auction two years in a row.

### Results

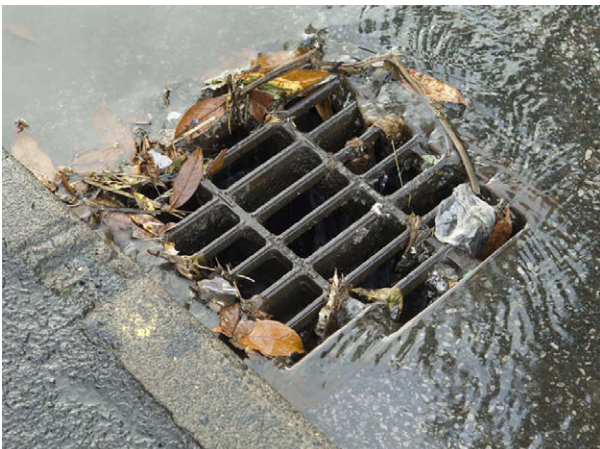
In 2007 the team installed 50 rain gardens and 100 rain barrels at 68 properties for a total bid payout of \$5,347. In 2008 the team received acceptable bids for 35 rain gardens and 74 rain barrels on 49 properties, including 12 properties that implemented some stormwater management practice(s) in 2007. The total bid payout in 2008 was \$4,178. After two auction years, the team has installed stormwater management practices on about 30 percent of the eligible properties in the treatment watershed. Additional work in this watershed will be limited to three years of follow-up monitoring to quantify the hydrologic and ecological effectiveness of the installed storm water management practices. The project team believes that this approach to stormwater management should be readily transferable to other residential watersheds. “We set the idea into motion,” explains EPA’s Hale Thurston. “We hope that municipalities around the country can pick up this concept and apply it.”

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## EPA’s Stormwater Program Aims for Cleaner Water

The U.S. Environmental Protection Agency (EPA) is working to improve its stormwater permitting program. In 1987 Congress brought stormwater control into the Clean Water Act and placed supervision in the hands of EPA. Wanting to improve the existing program, EPA recently sought advice from the National Research Council’s (NRC) Water Science and Technology Board. In October 2008 NRC released a report (see [www.epa.gov/npdes/pubs/nrc\\_stormwaterreport.pdf](http://www.epa.gov/npdes/pubs/nrc_stormwaterreport.pdf)) outlining its findings and offering recommendations.



The report, *Urban Stormwater Management in the United States*, explains how EPA can alter its current approach to produce a more accurate picture of the extent of the problem, and better control stormwater’s contribution to water quality impairments. At present, EPA’s stormwater and wastewater regulations require different permits for municipalities, industries, and construction sites. For more information on EPA’s existing stormwater program, see [www.epa.gov/npdes/stormwater](http://www.epa.gov/npdes/stormwater).

## The Big Ideas: Watershed-based Permitting and Controlling Flows

To improve program effectiveness, NRC recommended that EPA adopt a watershed-based permitting system that would encompass all discharges, including stormwater and wastewater, rather than having multiple permits within a watershed. NRC noted that if a change on this level is not possible, even bringing construction and industrial sites under the jurisdiction of their associated municipalities would be beneficial. Municipalities could then become the first tier of control over their storm sewer systems, and in turn report to federal and state permitting authorities.

The report also recommended that the stormwater program focuses less on chemical pollutants and more on the increased volume of water generated by greater urban land use. High stormwater discharge volumes and velocities contribute most significantly to receiving stream degradation, often with much more deleterious impacts than chemical pollutants. Currently, as noted in the report, EPA generally does not regulate the volume of discharges. Consistent with this finding, the report's authors also believe that stormwater management won't be effective without taking land use management, natural area conservation and urban retrofits into consideration because of the direct relationship between impervious cover and stormwater volume. Other recommendations included improving monitoring, modeling and evaluation approaches; reallocating resources within the National Pollutant Discharge Elimination System (NPDES) program to better fund the stormwater program; and increasing the amount of federal government financial support provided to state and local entities to control and regulate stormwater.

EPA is reviewing the findings and discussing possible next steps. In fact, EPA has already formed several working groups to consider the recommendations for managing flow and using a watershed-based approach, explains Jennifer Molloy with EPA's Municipal Stormwater Program. "The report serves as a foundation and a great driver for EPA to make changes to its stormwater program."

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## Notes from the States, Tribes, and Localities

### Portland Launches a Stormwater Marketplace

The City of Portland, Oregon, is a leader in onsite stormwater management. For almost 15 years Portland has actively sought natural solutions to its problems with combined sewer overflows. Beginning with a program in the mid-1990s to encourage homeowners to disconnect their roof downspouts from the sewer system, and expanding to include installing ecoroofs (a.k.a. green roofs), rain gardens, and other onsite stormwater management techniques, the city has led national efforts to focus more on "green" infrastructure such as vegetated swales and less on traditional "grey" infrastructure such as pipes. Now, Portland is adding a new twist—the city is looking to the free market to help it increase the amount of green infrastructure throughout the city.

#### Helpful Links

- Portland's Sustainable Stormwater Management Program:  
[www.portlandonline.com/bes/index.cfm?c=34598](http://www.portlandonline.com/bes/index.cfm?c=34598)
- Portland's Stormwater Marketplace:  
[www.portlandonline.com/bes/index.cfm?c=44048&](http://www.portlandonline.com/bes/index.cfm?c=44048&)

Sixty percent of Portland's population is served by a combined sewer system that collects stormwater runoff from streets and sewage from homes and businesses in the same pipes. Historically, these combined sewers overflowed to the Willamette River when it rained. To reduce overflows, the city is installing two large sewer tunnels (commonly referred to as Portland's Big Pipes) on both sides of the Willamette River to collect that mixture of stormwater and sewage and pump it to a wastewater treatment plant. The West Side Big Pipe is complete. When

the East Side Big Pipe is complete in 2011, the combined sewer system will overflow on average only four times each winter and once every three summers instead of nearly every time it rains. Reaching this level of CSO control will cost Portland ratepayers \$1.4 billion. Looking beyond 2011, Portland will need to supplement the system of Big Pipes to accommodate increased stormwater and wastewater flows caused by new developments, redevelopments and increased population density.

## Planning Ahead

Anticipating what the future will bring, the city is looking for new ways to manage its stormwater. “Portland’s stormwater program has evolved over time,” explains Dan Vizzini, Stormwater Marketplace Project Manager for Portland’s Bureau of Environmental Services. “Eventually we concluded that the best way for us to control stormwater is at its source—and largely on private property. Our challenge is to motivate private entities to invest in onsite stormwater management techniques.” Fortunately, Portland has already invested in more than a decade of education and outreach to produce a high level of public understanding about watershed health and the challenges of stormwater management. In a recent survey, 75 percent of respondents could identify a problem caused by stormwater runoff, and 71 percent could identify at least one city program to manage stormwater. Now, the city needs to convince more private property owners to take an active role in stormwater management.

To that end, in 2005 the city applied for and received a U.S. Environmental Protection Agency Science to Achieve Results (STAR) grant to study the feasibility of using market forces to implement sustainable stormwater management practices. In particular, the study focused on whether a credit trading system would be feasible to increase private investments in stormwater management improvements in Portland’s combined sewer basins. More information on EPA’s STAR grant program is available at <http://es.epa.gov/ncer/grants>.

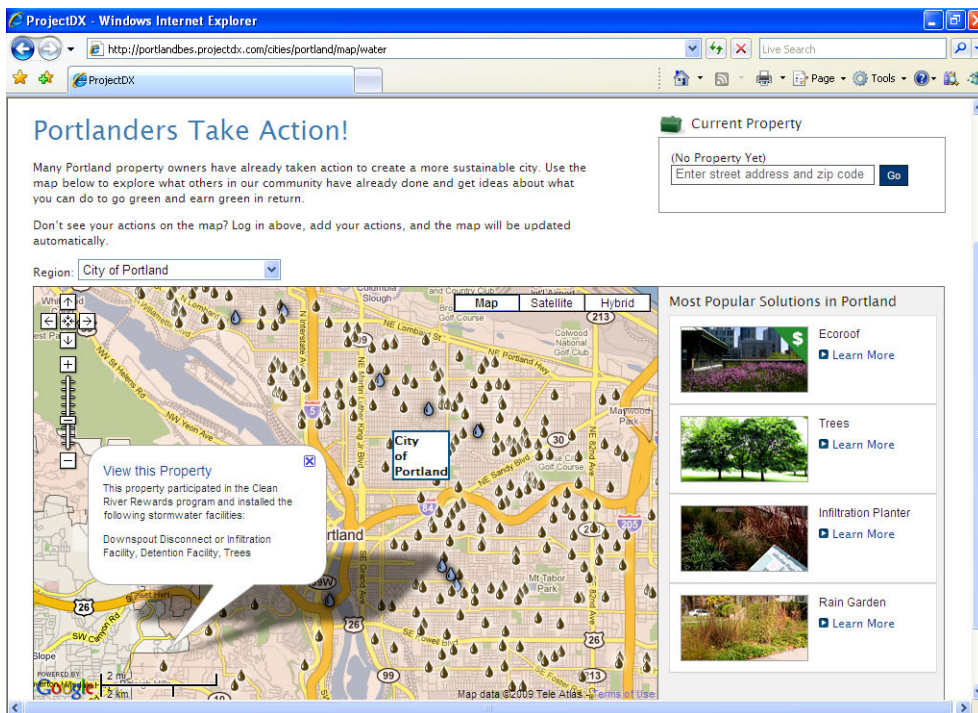
The study found that significant potential exists for sustainable stormwater management improvements on private property and in public rights-of-way. However, the study showed that the costs of implementing a credit-trading system for stormwater volume controls far exceed the potential benefits. Instead, the research team suggested that a comprehensive set of market-based initiatives (short of credit trading) could encourage property owners and developers to invest in stormwater management projects.

## Encouraging Private Investment

As part of its feasibility study, Portland performed market research to measure the city’s propensity for private, sustainable stormwater management investments. The city found that property owners are willing to invest if (1) the city provides financial assistance; (2) the improvements have a practical and tangible impact on the health of the river; and (3) the private actions complement public

investments in stormwater management systems. The research showed that the level of city subsidy or assistance needed for private action increases as the costs of stormwater retrofits increase. However, about 30 percent of the respondents were willing to double their private contribution to acquire improvements at five times more value.

Because many residential and commercial property owners appear to be ready and willing to participate in a market-based stormwater management program, the city is moving ahead. The city has a number of incentive programs planned or already in place, and will modify its market-based approach as needed to adapt to new information and situations. To help launch and monitor its market-based effort, the city is turning to the Web. Over the past few years the city has worked with



ProjectDX maps the locations of sustainable stormwater sites around the city. By clicking on a raindrop, a visitor can find out more general information about each site. Clicking on “View this property” will take the user to a page with more site-specific information.



Transformative Sustainable Solutions, Inc. to develop ProjectDX (<http://portlandbes.projectdx.com/cities/portland>), an interactive Web-based social marketing service that is designed to promote private sustainable stormwater management investments.

ProjectDX is a “mash-up”—a Web application that combines content from more than one Web-based source into an integrated tool. The application meshes together online mapping technology with stormwater management information from city databases. The site includes text, photos and video content, much of which is pulled from the city’s existing stormwater educational materials and available financial incentive information. A property owner can read about the different types of available onsite stormwater management systems and then enter an address into the mapping application to see what solutions are appropriate for that property. A little peer pressure never hurts—a property owner can also investigate what stormwater management techniques his or her neighbors have implemented. To complete the supply and demand circle, ProjectDX offers property owners information about local vendors who could supply stormwater management services.

Ultimately, ProjectDX will inform the city about the supply side of Portland’s marketplace, local stormwater vendors, suppliers and service providers. The city will use ProjectDX to monitor the size of the marketplace, identify gaps between supply and demand, and plan recruitment, training and certification programs to increase the responsiveness and quality of businesses in the local green economy.



**This stormwater planter captures and infiltrates runoff from the adjacent roadway.**

### Testing the Waters

Beginning this year, the city will test out the full potential of the stormwater marketplace in the Brooklyn Creek watershed as part of the *Tabor to the River* project (see [www.portlandonline.com/bes/index.cfm?c=47591](http://www.portlandonline.com/bes/index.cfm?c=47591)). The 1,400-acre Brooklyn Creek watershed stretches from Mt. Tabor on the east to the Willamette River on the west. Here, a combined sewer system serves 20,000 residents, collecting both sewage and stormwater runoff.

Over the next two decades, *Tabor to the River* will integrate hundreds of sewer, green stormwater management, tree planting and other watershed projects in the Brooklyn Creek watershed to improve sewer system reliability, stop sewer backups in basements and street flooding, control combined sewer overflows (CSOs) to the Willamette River, and restore watershed health. Specific project goals include:

- Repairing or replacing 21,000 feet of sewer pipe
- Adding more than 500 curb extensions (a stormwater retention technique), stormwater planters, and flow restrictors in the public right-of-way
- Installing a new 1.2 mile trunk sewer
- Installing 10 miles of new sewer pipe
- Planting nearly 4,000 street trees
- Implementing substantial stormwater management strategies on more than 80 high-priority private properties that will result in the management of as much as 11 acres of impervious area
- Maximizing the number of private properties that invest in simple, effective and sustainable stormwater management facilities throughout the Brooklyn Creek basin.



**A landscaped curb extension on a Portland street improves aesthetics, calms traffic, and captures and infiltrates runoff from the street.**

### Motivating Watershed Residents

The city has a number of incentives in place to encourage residents to take part in the *Tabor to the River* effort and help the city achieve its green infrastructure project goals. For example, as part of



the pilot project the city is launching a “treebate” program to offset the costs for residents who plant trees in the watershed. Residents who purchase and plant city-approved tree species in the watershed can receive rebates on the cost of the trees. The ProjectDX Web site provides detailed information about how trees help control stormwater, the types of trees that are city-approved and how to plant trees properly. “The concept of onsite stormwater management is catching on in Portland,” explains Vizzini. “Our ‘treebate’ program is an easy way for property owners to get involved.”

The “treebate” program is similar to a successful downspout disconnection incentive program that Portland has offered for more than a decade. In this program, the city pays residents to disconnect their downspouts from the combined sewer system in targeted watersheds. If the resident does not want to (or cannot) disconnect the downspout themselves, the city will send someone out to do it for free. For more details about this program, see [www.portlandonline.com/bes/index.cfm?c=43081](http://www.portlandonline.com/bes/index.cfm?c=43081) or read a summary article in News-Notes issue 74 ([www.epa.gov/owow/info/NewsNotes/pdf/74issue.pdf](http://www.epa.gov/owow/info/NewsNotes/pdf/74issue.pdf)).

Portland will be offering additional incentive programs throughout the Brooklyn Creek watershed and beyond, including subsidies for ecoroofs, stormwater user-fee discounts (Clean River Rewards—[www.cleanriverrewards.com](http://www.cleanriverrewards.com)) for documented onsite stormwater management efforts, and funds from the city-run watershed enhancement grants. These incentives should end up saving

the city money over the long term. For example, if the city dealt with its combined sewer system volume problem in the Brooklyn Creek watershed by using only pipe solutions (grey infrastructure), it would have to pay an estimated \$144 million. By adding green infrastructure stormwater management systems as per the goals listed above, the city reduces its estimated cost to \$86 million and enhances water quality and watershed health.

The city is looking to its *Tabor to the River* watershed pilot project to jump start its market-based stormwater program throughout the city. “We hope to double the number of local businesses involved in stormwater management,” explains Vizzini. “This includes companies that offer services ranging from installing and maintaining natural stormwater management system to providing planting supplies.” The city is also considering creating a watershed investment trust fund, where individuals and private companies could contribute money to support local stormwater projects. These funds would be directed to these projects through the city’s existing grant programs. “Companies looking for ways to ‘green’ their image could donate to the trust fund and then

advertise that they are investing in local, sustainable watershed restoration projects,” adds Vizzini. “We anticipate having information available on the ProjectDX site about potential projects that are waiting for funding. This function will allow companies and individuals to see where projects are proposed and what benefits the projects could provide. If they wish to financially support these projects, they can do so through the trust fund.”

### *Sharing the Market-based Message*

To spread the word about the Brooklyn Creek pilot project and the stormwater marketplace, the city will be relying on both traditional and Web-based methods of communication. “We have found that the people who seem to be most inclined to take advantage of our incentive programs are those that are tied into the Web,” notes Vizzini. “So, we will be starting a cyber campaign with advertising on local Web sites and discussions on local blogs.” The city will also use its traditional communication methods, such as through direct mail, television, newspaper and radio advertising, and will try to inform people and direct them to the ProjectDX Web site.

### **Portland to Host National Conference in May 2009**

EPA and the U.S. Department of Agriculture are teaming up to host the *5th National Conference for Nonpoint Source and Stormwater Outreach: Achieving Results with Tight Budgets* on May 11–14, 2009 in Portland, Oregon. The conference will provide practitioners from around the country the opportunity to learn and share ideas on developing and implementing nonpoint source and stormwater outreach strategies that produce positive, measurable outcomes, comply with NPDES requirements, and can be successfully implemented with modest budgets. The conference will explore practical, current examples of successful outreach programs and projects through facilitated training sessions, workshops, presentations with interactive discussion, group exercises and networking events. The conference will serve local, regional, state and federal professionals tasked with educating various audiences on nonpoint source pollution, stormwater pollution, watershed protection and promoting sustainable behavior changes in challenging economic times. The first 150 early registrants will receive \$100 off conference costs. For more information, see [epa.gov/nps/outreach2009](http://epa.gov/nps/outreach2009).

Portland continues to make progress in its effort to keep up with stormwater generated by developed properties across the city. It receives an average of 37 inches of precipitation annually, currently creating almost 20 billion gallons of stormwater runoff per year. In 2006 the city managed 16 percent of that runoff with sustainable, green stormwater facilities. By 2040 the city expects increased density and its associated impervious areas to add an additional 2.2 billion gallons of runoff. By that time, the city hopes its sustainable stormwater facilities will be managing more than 28 percent of its stormwater volume. The city is optimistic that its new and innovative market-based stormwater project will form the foundation of a self-motivating and self-sustaining marketplace for stormwater management improvements throughout Portland.

*[For more information, contact Dan Vizzini, Stormwater Project Manager for Portland's Bureau of Environmental Services, 1120 SW 5th Ave., Portland, OR 97204. Phone: 503-823-4038; E-mail: danv@bes.ci.portland.or.us]*

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## Stormwater Treatment Wetland Pays off in Philadelphia

Philadelphia is one of the most densely built cities in the United States. The city's many impervious surfaces—such as rooftops, roads and parking lots—prevent rain from infiltrating into the soil. Instead, the water moves across these surfaces, picking up pollution along the way, and flows untreated via storm sewers into the city's waterways, where it impairs stream health and increases the city's cost of drinking water treatment. In other areas of the city, the stormwater flows into combined sewers, which collect both municipal wastewater and stormwater. Heavy rain can create high volumes of stormwater, which sometimes cause the combined sewers to overflow, releasing sewage directly into local rivers. To address these problems, the Philadelphia Water Department (PWD) has embraced a comprehensive watershed management program that fosters regional cooperation and looks beyond traditional infrastructure projects as a solution to stormwater management. As part of this effort, Philadelphia unveiled its first stormwater treatment wetland—Saylor Grove—in early 2006.

The PWD constructed the one-acre Saylor Grove wetland to slow and filter stormwater before it enters Monoshone Creek, a tributary of Wissahickon Creek. These waters then flow into the Schuylkill River just above the drinking water intake for Philadelphia's Queen Lane Water Treatment Plant. Almost a quarter of Philadelphia's drinking water comes from the Queen Lane plant, prompting PWD to prioritize water quality protection efforts in the entire Wissahickon Creek watershed, including Monoshone Creek and its tributaries.

As part of the city's overall stormwater management effort, PWD decided to construct a demonstration project to show how wetlands can treat stormwater in an urban environment. PWD identified the 3.2-acre Saylor Grove Park as a perfect site for the project for several reasons. First, the city already owned the property. Second, the site offered adequate space for wetland construction. Third, the site included two sources of naturally-flowing spring water that could help sustain a treatment wetland during dry times. An existing drainage ditch in the park collected this spring water and some stormwater from a nearby street and conveyed it across a wet area of the park to Monoshone Creek. The new treatment wetland was placed in the same general area of the park.

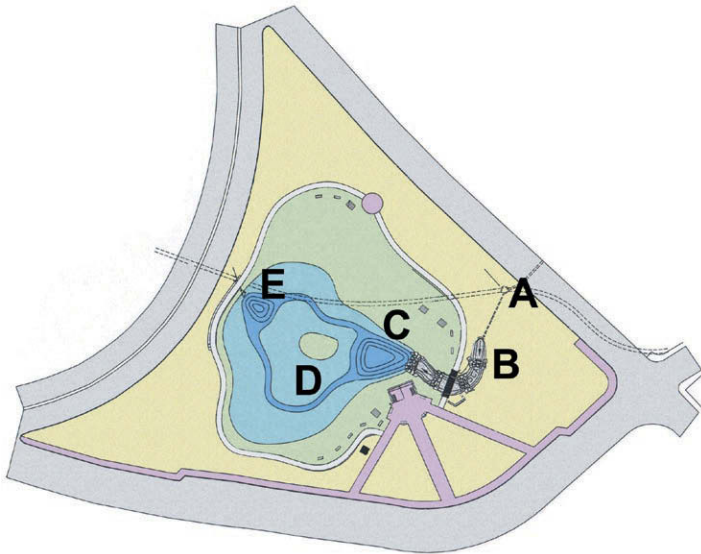
### *Creating the Wetland Treatment System*

PWD and its contractor designed the stormwater treatment system to filter a significant portion of the estimated 70 million gallons of stormwater per year flowing off the surrounding 156-acre subwatershed. The system is sized to treat the first 0.7 inch of rainfall, or "first flush" of stormwater. The multi-step treatment system, shown in Figure 1, includes:

- A. Stormwater from the surrounding watershed flows down the storm sewer (this part of the city does not have combined sewers) and is shunted into one of two diversion chambers. These chambers slow the stormwater, allowing sediment and associated pollutants to settle out. To prevent the wetland from flooding, the diversion chambers are designed with static weirs that are overtopped when storms in excess of 0.7 inch occur. Therefore, flows in excess

of 0.7 inch do not enter the wetland; instead, they continue down the original storm sewer and flow directly into Monoshone Creek.

- B. The stormwater from the diversion chambers enters a cascade, or energy dissipator system. Here, the stormwater flows through a series of rocks and pools that slows water flow and further removes coarse suspended sediment.
- C. Stormwater then enters a permanent pool at the base of the cascade, where fine particulate matter settles out of suspension.
- D. Next, the stormwater slowly flows through channels that cross a wetland meadow, where the native wetland vegetation filters the water and removes more pollutants.
- E. Finally, the water flows into a collecting pool next to the outlet structure. The outlet features an eight inch storm pipe that siphons water from below the surface of the collecting pool into the outlet structure. Here, the water flows back into the storm sewer before it enters the Monoshone Creek. The outlet structure regulates flow discharging from the wetland and maintains the appropriate base flow through the wetland system.



**Figure 1.** The Saylor Grove treatment wetland includes a diversion chamber (A), cascade (B), pool (C), wetland channel (D) and collecting pool/discharge outlet (E).

The Saylor Grove treatment wetland project cost approximately \$600,000, and included designing and constructing the wetland and its treatment components, purchasing

and planting vegetation, and upgrading or adding elements to the surrounding park. The project included interpretive signs, new sidewalks, new benches, a decorative bridge, and stonework. Project partners included PWD, the Fairmount Park Commission, Pennsylvania Department of Environmental Protection (DEP), and Center in the Park (a local Senior Environmental Corps group). Funding for the project included \$150,000 from a DEP Growing Greener grant. PWD capital improvement funds supported the balance of the cost. Marc Cammarata, Manager of the PWD Watershed Planning and Engineering section, expects future, similar projects to cost much less. “Saylor Grove was a demonstration project, which often carries a high price tag. The upgrades to the surrounding park added to the overall cost.”

### Results

The treatment wetland appears to be operating as intended. PWD installed automated samplers to collect water samples of the combined influent from both diversion structures, as well as the effluent as it leaves the site. PWD also installed a water level sensor in the storm sewer that bypasses the wetland to allow the agency to estimate how much of each event volume is diverted to the treatment wetland. So far, PWD has completed a detailed survey of the existing conditions and refined the stage-storage volume curve. Because PWD is still collecting and analyzing data, the agency can not yet draw conclusions about the treatment wetland’s performance. However, PWD notes that the BMP appears to be successfully removing total suspended solids from the stormwater runoff.

Water quality improvement isn’t the only intended benefit of the project. The upgraded park provides excellent wildlife habitat, serves as a haven for community members and offers opportunities for environmental education, notes Cammarata. “Someone is always there, enjoying the space.” Saylor Grove Park is a magnet for visitors—offering a half-acre wetland area, walking trail, interpretive signs, historic memorials, sculptures and inviting natural areas. Saylor Grove is also a popular spot for school field trips and other educational tours. “The Senior Environmental Corps helps to coordinate tours,” explains Cammarata. “The group also monitors the park for litter and takes water samples.” PWD and partners like the Senior Environmental Corps will continue to work to protect and monitor the Saylor Grove wetland for the long term.



### Building on a Successful Model

Buoyed by the success of the Saylor Grove project, the PWD is already planning two additional stormwater wetland treatment systems elsewhere in the Wissahickon Creek watershed. The schedule for completing these new projects will depend on available funding. “In the meantime,” explains Cammarata, “we are always looking for opportunities to add some natural stormwater management elements—such as bioretention areas or buffers—into our regular projects.” PWD’s goal is to reduce or forestall the need to build additional sewer infrastructure by instead investing in stormwater management features that will slow and filter runoff either onsite or before it reaches the city’s sewers and waterways.



Saylor Grove Park before (left) and after (right) Philadelphia installed the stormwater treatment wetland.

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### Recent Partnership Limits Phosphorus in New Jersey Fertilizer

New Jersey Department of Environmental Protection (NJDEP) has joined forces with representatives of the fertilizer industry to improve the health of the state’s waterbodies. In April 2008, NJDEP signed a Memorandum of Understanding (MOU) with two major fertilizer producers to address phosphorus use in lawn fertilizers. By signing the MOU, the fertilizer producers have agreed to reduce the amount of phosphorus in their lawn fertilizer products, distribute these products in garden centers statewide and work with the NJDEP to develop strategies to educate the public about proper selection and use of lawn fertilizer.

Under the MOU, Lebanon Seaboard and United Industries agreed to make low-phosphorus or no-phosphorus lawn fertilizer available in garden centers throughout the state starting in spring 2008, with a commitment to reduce the amount of phosphorus in their lawn fertilizer products by 50 percent by 2010. Scotts Miracle-Gro, which already has a similar program in place nationwide, is also an active participant in the effort. To measure progress toward this commitment, all three manufacturers will provide DEP with an annual report of the pounds of phosphorus sold at the retail level in the state. These three companies account for more than 90 percent of all fertilizer sold in retail centers across the state.

As part of the agreement, the partners are establishing two Fertilizer Initiative Workgroups consisting of representatives from Rutgers Cooperative Extension, NJDEP, New Jersey Water Supply Authority, New Jersey Green Industry Council, watershed stakeholder groups, Lebanon Seaboard, United Industries and Scotts Miracle-Gro. The first, a stewardship program workgroup, will develop a statewide outreach plan for phosphorous education that includes consistent information

and messages about how everyone can help reduce nonpoint source pollution. The group plans to have recommendations in place by the middle of 2009. The second, a technical workgroup, will evaluate whether reduction of other nutrients in fertilizer product, such as nitrogen, is warranted. More information about the Fertilizer Initiative Workgroups is available at <http://nj.gov/dep/fiw>.

### Similar Program Underway in Chesapeake Bay Watershed

New Jersey modeled its program after similar phosphorus-reduction programs around the country when developing the MOU, including one recently launched in the Chesapeake Bay watershed. In fall 2006, the Chesapeake Bay Executive Council and the fertilizer industry signed an agreement called the *The Healthy Lawns and Clean Water Initiative* ([http://archive.chesapeakebay.net/pubs/Lawn\\_Care\\_MOU.pdf](http://archive.chesapeakebay.net/pubs/Lawn_Care_MOU.pdf)). The executive council coordinates restoration efforts undertaken by Pennsylvania, Maryland, Virginia, the District of Columbia, U.S. Environmental Protection Agency and the Chesapeake Bay Commission. In this case, the executive council partnered with Lebanon Seaboard and Scotts corporations on the initiative—their agreement will achieve a 50 percent voluntary reduction in pounds of phosphorus applied in lawn care products in the Chesapeake Bay Watershed by 2009.

As in New Jersey, the Chesapeake Bay MOU also included an educational component. One of the outreach tools that grew from the Chesapeake Bay MOU was a 2007 advertising campaign launched in major media outlets in the Bay area, and included public service announcements and public speaking opportunities to promote “seven simple lawn care techniques that can help protect and improve water quality” (see [www.mwcog.org/](http://www.mwcog.org/)

[environment/water/chesapeake/scotts/default\\_scotts.asp](http://www.mwcog.org/environment/water/chesapeake/scotts/default_scotts.asp) for more information). Scotts Miracle-Gro is conducting similar outreach and consultation with environmental stakeholders in the Great Lakes and San Francisco Bay areas (see [www.thescottsmiraclegrocompany.com/socialresponsibility/stewardship/partnerships.html](http://www.thescottsmiraclegrocompany.com/socialresponsibility/stewardship/partnerships.html) for more information) and has worked closely with the Northeastern IPM (Integrated Pest Management) Center (<http://northeastipm.org>) to develop outreach materials.

*[For more information about the New Jersey partnership, contact Lawrence Hajna, New Jersey Department of Environmental Protection, P.O. Box 402, Trenton, NJ 08625-0402. Phone: 609-984-1795; E-mail: [larry.hajna@dep.state.nj.us](mailto:larry.hajna@dep.state.nj.us)]*

### Too Much Phosphorus Poses a Problem

In most freshwater systems (e.g., lakes, rivers, and streams), phosphorus is a limiting nutrient. Other nutrients such as nitrogen and potassium are needed for freshwater plant growth, but they usually exist in adequate levels. In such systems, phosphorus loadings control the growth of algae, so even small amounts of phosphorus entering a lake can go a long way toward stimulating runaway growth of algae and other aquatic plants. When unnaturally high levels of phosphorus reach freshwater systems, plants can grow unchecked, causing a proliferation of algae and aquatic weeds to the detriment of other organisms that share the ecosystem. An overabundance of surface algae prevents important sunlight from reaching organisms beneath the surface. Often, this unsustainable growth of algae (called a bloom) reaches a critical mass that triggers a catastrophic die-off of the bloom. As the bloom decays and sinks, it depletes the essential free oxygen from the aquatic habitat, typically resulting in mass kills of desirable organisms.

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## Notes on Watershed Management

### Florida Combines Local Buy-in with Enforceability to Improve Water Quality

Developing a total maximum daily load (TMDL) for an impaired waterbody is one thing—implementing the TMDL and successfully restoring that waterbody can be much more difficult, especially if the waterbody is large with multiple pollutants and pollution sources. Florida is hoping to overcome these difficulties through its Basin Management Action Plan (BMAP) effort. By securing stakeholder participation and consensus, requiring scientific investigations and establishing opportunity for enforcement action, BMAPs arm the state with the tools and partners it needs to carry the TMDL process seamlessly through to its final result—cleaner water.

Development of BMAPs and implementation of TMDLs are the last steps in Florida’s five phase watershed approach (see box, next page) to water management in the state. Florida Department of Environmental Protection (FDEP) uses BMAPs as a tool to implement the pollutant reductions required by TMDLs. In a nutshell, a BMAP aims to improve water quality by bringing FDEP

together with local stakeholders to collaboratively reduce pollution from wastewater facilities and municipal separate storm sewer systems (MS4) communities, implement urban and agricultural best management practices and implement conservation programs. The plan must establish a schedule for implementing strategies, develop a basis for evaluating the plan's effectiveness, and identify funding strategies. Phased implementation of management strategies can be used to promote timely, cost-effective actions.

### Florida's Five Phase Watershed Approach

Florida's Watershed Management Program is based on the following five-phase cycle that rotates through Florida's basins every five years:

- Phase 1. Initial Basin Assessment
- Phase 2. Coordinated Monitoring
- Phase 3. Data Analysis and TMDL Development
- Phase 4. Basin Management Plan Development
- Phase 5. Begin Implementation of Basin Management Plan

For more information, see [www.dep.state.fl.us/water/tmdl/cycle.htm](http://www.dep.state.fl.us/water/tmdl/cycle.htm)

To date, FDEP has completed and adopted 180 TMDLs but has only finalized four BMAPs. Each BMAP may include more than one TMDL area or pollutant. FDEP and local stakeholders are in various phases of BMAP development in several basins throughout the state. Progress is slow because the BMAP process can be extremely time consuming. FDEP and the watershed stakeholders must work very closely to study available data and reach a consensus on BMAP requirements, explains FDEP's John Abendroth. "Our group considers any new data that have become available since the TMDL for that waterbody was developed. We collaboratively agree on pollutant allocations for each group. Then we work together to develop a list of projects that help each participant achieve their necessary pollutant reductions. The development process can take several years, but we end up with a valuable product. By the time we have finished, people accept what their respon-

sibilities are and they commit to moving ahead." Once finalized, BMAPs are adopted by Secretarial Order to allow FDEP to enforce BMAP requirements. Examples of completed BMAPs and associated project schedules are available at [www.dep.state.fl.us/water/watersheds/bmap.htm](http://www.dep.state.fl.us/water/watersheds/bmap.htm).

### *Incorporating BMAPs into an Enforcement Structure*

Once the interested parties agree on allocations and projects, FDEP takes the next step of working with these groups to integrate projects into any existing permits. For example, if an industry has agreed to lower its pollutant load discharge, FDEP will add that new requirement to its wastewater discharge permit the next time the permit is up for review. Likewise, a MS4 community will incorporate new BMAP requirements for specific pollution-reducing projects—such as a new street sweeping program—by referencing it into the MS4 permit.

BMAP participants prefer to have requirements made a part of their permits, notes Abendroth. "They have it in writing, which protects them from outside influences that might try to force them to do more." It also helps in the quest for funding. For example, since a MS4 is required to imple-

ment the BMAP projects as part of its permit, it can ask the state for money, increase taxes or establish a utilities fee to help meet requirements. "Having the projects as part of the permit gives the MS4 a leg to stand on," adds Abendroth.

Although having project requirements incorporated into existing permits enables FDEP to enforce the BMAP, Abendroth doesn't foresee enforcement actions becoming necessary. "By the time we get through the BMAP process, everyone is committed to seeing the process through," he says. This commitment holds true for stakeholders in areas with non-permitted nonpoint source pollution sources in urban areas as well as agricultural areas. "The state's Department of Agriculture and Consumer Services is responsible for working with agricultural interests to implement agricultural BMPs," adds Abendroth. "Everyone must commit to reducing their nonpoint source load or demonstrate that they are not a source."

### What is a TMDL?

When waterbodies do not meet water quality standards, states identify these waters as impaired for the particular pollutants of concern (e.g., nutrients, pathogens, mercury, etc.) The states must then develop a total maximum daily load (TMDL) for that waterbody. A TMDL is essentially a pollution budget. It calculates the maximum amount of a pollutant allowed to enter a waterbody, also known as the loading capacity, so that the waterbody will meet and continue to meet water quality standards for that particular pollutant. The TMDL allocates that load to point sources and nonpoint sources which include both human-caused and natural background sources of the pollutant. States use the TMDL to develop and implement plans to reduce pollution so the waterbody can meet standards.



Abendroth expects that landowners with non-permitted nonpoint source pollution sources will find ways to reduce pollutants by taking advantage of available technical and financial assistance. For example, since a BMAP qualifies as a comprehensive watershed management plan, the watershed becomes eligible for Clean Water Act section 319 grant funds. These funds are distributed through states from the U.S. Environmental Protection Agency and are specifically designated to help reduce nonpoint source pollution. Projects included in BMAPs will also be given priority for funding through the State Revolving Fund loan program and other state TMDL program funding.

### *Reviewing and Adapting a BMAP*

Once a BMAP is in place, FDEP reviews it annually. The review process includes noting which projects were completed and whether monitoring data show any water quality changes. Every five years FDEP will completely reassess the BMAP and make changes or collect additional data. In some cases, existing data could suggest that implementing a different project might achieve better results. Or, in other cases, the funding might not be available to allow a particular project to progress on schedule—and the schedule will be adjusted. Like other states, Florida is currently facing a budget shortfall. “We recognize the financial reality. As long as we see, for example, that a MS4 is trying to get things done, we will work with them. On the other hand, if we find that a MS4 has made absolutely no effort after five years, there is enforcement action that can be taken.” This five-year BMAP review cycle will repeat indefinitely—allowing each BMAP to be continually adjusted and adapted until the TMDL pollutant load reduction requirements are met and FDEP no longer considers the waterbody impaired.

### *The Future Looks Bright*

Abendroth views the BMAP effort as a key to the state’s economic future. “Our state relies on water-based recreation and tourism as a big part of the economy—as residents, we all know that we need to do what we can to protect and improve our waterways,” he explains. “The BMAP provides us with the tools we need.” The BMAP program’s emphasis and reliance on stakeholder involvement at every stage, combined with the possibility of enforcement as needed, makes the program a recipe for success.

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### **Florida to Develop Numeric Nutrient Water Quality Criteria**

In the waning days of the recent Bush administration, the U.S. Environmental Protection Agency (EPA) issued a formal determination under the Clean Water Act that Florida needs to have “numeric” nutrient water quality criteria. As a result, Florida is accelerating its efforts to adopt numeric nutrient criteria into state regulations. EPA expects that Florida will have criteria for lakes and flowing waters in place by early 2010, and for estuaries and coastal waters by early 2011. Anticipating the need for such criteria, Florida just released a Numeric Nutrient Criteria Development Plan ([www.dep.state.fl.us/water/wqssp/nutrients](http://www.dep.state.fl.us/water/wqssp/nutrients)). To read EPA’s decision letter, which details why these criteria are needed, see [www.epa.gov/waterscience/standards/rules/#det](http://www.epa.gov/waterscience/standards/rules/#det).

Fortunately, Florida has already invested substantial resources to collect and analyze nutrient data and involve stakeholders. The federal determination will build upon this investment. The new numeric nutrient water quality standards will help Florida improve the efficiency and effectiveness of its water quality management tools, identify waters impaired because of nutrient pollution, establish TMDLs and BMAPs and derive NPDES permit limits. Overall, numeric nutrient criteria will significantly improve Florida’s ability to address nutrient pollution in a timely and effective manner.

Why are numeric nutrient water quality criteria necessary? Water quality degradation from nutrient pollution is a significant environmental issue in Florida. Excess nitrogen and phosphorus levels (nutrient pollution) in waterbodies can harm aquatic ecosystems and threaten public health. Nutrient pollution can lead to water quality problems such as harmful algal blooms, low-oxygen “dead zones” in water bodies and declines in wildlife and wildlife habitat. These effects also disrupt recreational activities and pose threats to public health.

How bad is the Florida’s nutrient problem? The state’s 2008 Integrated Water Quality Assessment ([www.dep.state.fl.us/water/docs/2008\\_Integrated\\_Report.pdf](http://www.dep.state.fl.us/water/docs/2008_Integrated_Report.pdf)) revealed that nutrients impair approximately 1,000 miles of rivers and streams, 350,000 acres of lakes, and 900 square miles of estuaries. The actual number of miles and acres of waters impaired for nutrients is likely higher, since many waters have not yet been assessed and might also be impaired.

## Multifaceted Approach in Washington State Improves Water Quality

Water quality in Washington's South Fork of the Skagit River is improving, thanks to a watershed-wide effort to reduce pollution. In the mid-1990s Washington Department of Ecology classified the South Fork as impaired for fecal coliform (FC) bacteria, triggering state and local government entities to jump into action. They implemented a variety of best management practices, launched education efforts and upgraded a wastewater treatment plant (WWTP). Bacteria levels have decreased, and the South Fork now meets water quality standards.

### Background

At more than 160 miles long, the Skagit River is the third largest river on the West Coast of the contiguous United States, after the Columbia and Sacramento rivers. Its 3,130 square mile watershed is the largest that drains into Washington's Puget Sound—providing 20 percent of the estuary's freshwater. The lower Skagit River (Figure 1) divides into the North and South Forks before emptying into Skagit Bay in northwest Washington. Land uses in the watershed include forestry;



Figure 1. The lower Skagit River flows through the city of Mount Vernon, Washington.

rural residential areas; several rapidly urbanizing areas; and dairy, ranching and other forms of agriculture. In the early 1990s the Washington Department of Health classified portions of the shellfish beds in Skagit Bay as restricted or conditionally approved because of bacterial contamination, raising concerns about the Skagit River's quality. A 1994/1995 monitoring study showed that the lower Skagit River and several tributaries violated water quality standards for FC. Therefore, Washington Department of Ecology (Ecology) added these waters to the state's list of impaired waterbodies required by section 303(d) of the Clean Water Act.

Ecology developed a total maximum daily load (TMDL) for FC for the lower Skagit River watershed in 2000. The TMDL estimated that likely sources of FC contributing to violations of the water quality standard include stormwater, failing septic systems, agricultural manure and effluent (including combined sewer overflows) from a WWTP. The state bacteria standard has two parts: (1) FC levels must not exceed a geometric mean value of 100 colony forming units (cfu)/100 milliliters (mL), and (2) no more than 10 percent of all samples obtained for calculating the geometric mean value can exceed 200 cfu/100 mL. Because the lower Skagit River discharges to a shellfish habitat, the TMDL outlines water quality targets that are more stringent than the minimum state standards. The TMDL requires that (1) FC levels not exceed a geometric mean value of 24 cfu/100 mL and (2) that no more than 10 percent of samples exceed 74 colonies/100 mL.

### Project Highlights

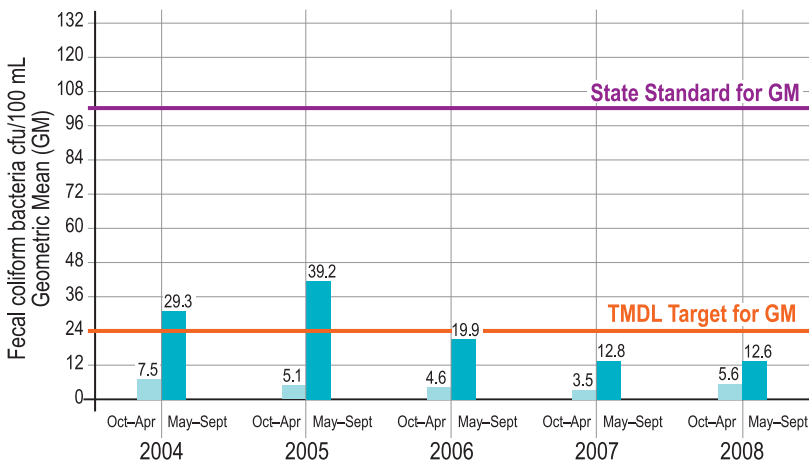
Efforts to improve water quality in the lower Skagit River and its tributaries have been underway for more than 10 years. Beginning in 1998 Ecology required that all dairies have farm plans, and dairies are subject to inspection by the Washington State Department of Agriculture. The farm plans require farmers to manage manure to protect water quality and to apply vegetative practices, such as riparian plantings and buffer maintenance, to protect watercourses from surface runoff of sediment, nutrients and bacteria. Approximately 25 dairy operations with more than 10,000 animals operate under farm plans in the watershed.

Since 2000 the Skagit County Public Health Department has intensified efforts to reduce the number of failing septic systems. Through its septic improvement pilot project, it offers rebates to homeowners for septic system inspections and installing lids and risers to promote access. To teach homeowners how to properly operate and maintain septic systems, it held 110 *Septic 101* clinics since September 2000, with more than 2,800 attendees as of October 2008. It has increased numbers of septic system inspections—from about 100 in the second half of 2005 to more than 600 during the first half of 2008. It developed public service announcements and is increasing its social marketing efforts to spread the word about proper septic operation and maintenance.

Additionally, the city of Mount Vernon undertook a major infrastructure expansion and improvement project at its WWTP. This has reduced combined sewer overflow discharges from an average of 116 million gallons (MG) in the mid-1990s to 11 MG in 2007. The cities of Burlington and Sedro-Woolley have expanded or improved their municipal sewer systems, which discharge to the Skagit, and likely eliminated failing septic systems. Both cities are also working with citizens and nonprofit organizations to restore reaches of Gages Slough and Brickyard Creek, small tributaries to the Skagit.

### Restoration Pays Off

Monitoring data for the past five years in the South Fork show that it has consistently met both parts of the state bacteria standard. Additionally, the river has met the first part of the stricter TMDL target year-round for the past five years (see Figure 2). It has met the second part of the



**Figure 2. FC monitoring data for South Fork Skagit River—compliance with the first part (GM value) of the state standard and TMDL target.**

TMDL target during the wet season (October through April) since 2005 and during the rest of the year since 2006 (Table 1). Therefore, the river has met both the state standard and the TMDL target for the past three years.

Because the South Fork consistently meets the state standard, Washington plans to remove this 0.9-mile segment from the state impaired waters list in the next reporting cycle. More work is still needed in some lower Skagit River tributaries, including Nookachamps, Fisher, Hansen and Brickyard creeks, which continue to violate state bacteria standards.

Many organizations contributed to the success of the South Fork Skagit River water quality improvement project, including Ecology, Washington

Department of Agriculture, Skagit Conservation District, Skagit County Public Health Department, Skagit County Public Works, Skagit County Planning and Development Services, local organizations and the cities of Mount Vernon, Burlington and Sedro-Woolley.

Funding for projects came from several sources. Ecology's Centennial Clean Water Funds supported projects to install Mount Vernon's larger CSO interceptor (\$434,735), develop a watershed action plan and education efforts in the Nookachamps Creek watershed (\$164,511), monitor water quality (\$495,000), improve septic systems (\$152,976), and implement TMDL-related outreach and technical assistance projects in lower Skagit River tributaries (\$499,000). Washington State Water Pollution Control Revolving Funds supported an ongoing local loan program for replacing or repairing failing septic systems (\$5.8 million) and WWTP upgrades (\$27 million). A \$246,000 Clean Water Act section 319 grant supported watershed education and riparian restoration efforts in Nookachamps Creek.

**Table 1. FC monitoring data for South Fork Skagit River—compliance with the second part (% exceedances) of the state standard<sup>1</sup> and the TMDL target<sup>2</sup>**

Water year	October–April		May–September	
	% > 200	% > 74	% > 200	% > 74
2004	0%	7%	0%	18%
2005	0%	0%	0%	27%
2006	0%	0%	0%	10%
2007	0%	0%	0%	0%
2008	0%	0%	0%	9%

<sup>1</sup> State standard, part 2: No more than 10% of samples exceed 200 cfu/100 mL FC.

<sup>2</sup> TMDL target, part 2: No more than 10% of samples exceed 74 cfu/100 mL FC.

The successful South Fork Skagit River restoration effort shows how a coordinated, watershed-wide effort can lead to significant water quality improvement. To recognize this achievement, the U.S. Environmental Protection Agency posted a fact sheet about the South Fork Skagit on its Clean Water Act section 319 Success Stories Web site, which features stories about restored waterbodies across the nation (see box, next page).

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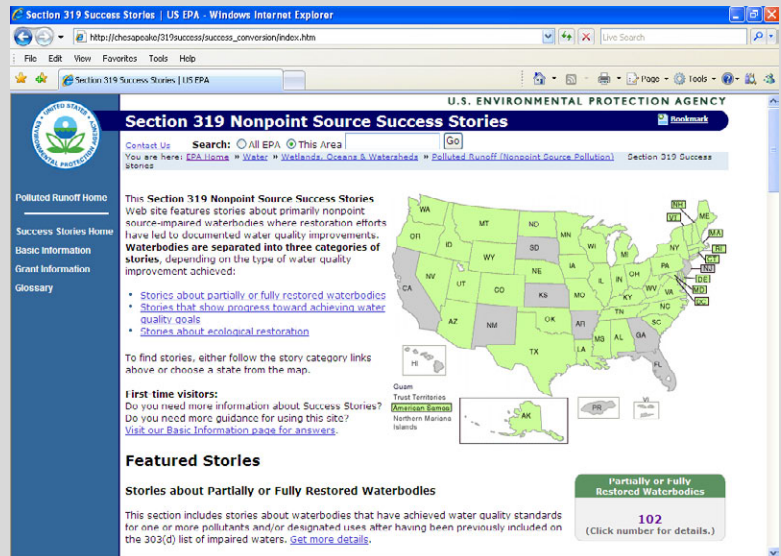


## Number of Section 319 Success Stories Grows

The number of fully or partially restored waterbodies featured on EPA's *Section 319 Success Stories Web site* recently passed the 100 story mark. This Web site highlights real world examples of nonpoint source (NPS) pollution-impaired waterbodies where NPS control and restoration projects led to documented water quality improvements or removal of the waterbody from a state's Clean Water Act section 303(d) list. The site includes stories about projects that have received section 319 funds and, in many cases, other funding sources dedicated to solving NPS impairments.

In its 2008 National Water Program Guidance, EPA estimates that almost 6,000 assessed waterbodies are primarily impaired by NPS pollution. EPA and states are working with local governments, watershed groups, property owners, tribes and others to implement programs and management practices to control NPS-polluted runoff throughout the country. Typical efforts include educating the public about NPS pollution, restoring damaged streams and wetlands, and implementing best management practices (BMPs) in urban, suburban and agricultural areas. In some cases, these efforts have already improved water quality enough that the waterbodies are either no longer considered impaired or have certain designated uses that have been restored (these are considered fully or partially restored). Other waterbodies are showing measurable water quality improvements. EPA is spotlighting as many of these waterbodies as possible on its NPS Success Stories Web site.

At press time, the success stories Web site features 106 success stories that highlight water quality restoration or measurable progress in 122 waterbodies across the country. Of these, 102 waterbodies are partially or fully restored. EPA plans to continue adding success stories as they are realized. For more information, see [www.epa.gov/owow/nps/success319](http://www.epa.gov/owow/nps/success319).



The screenshot shows the EPA's Section 319 Nonpoint Source Success Stories website. The page title is "Section 319 Nonpoint Source Success Stories". It includes a search bar, a navigation menu, and a map of the United States. The map shows the number of success stories in each state. A box on the right side of the page states "Partially or Fully Restored Waterbodies 102 (Click number for details.)". The page also features a "Featured Stories" section with the heading "Stories about Partially or Fully Restored Waterbodies".

EPA's Section 319 Success Stories Web site.

## Notes on Education

### New Curriculum Encourages Estuary Education

Learning about the links between watersheds and estuaries just became easier. The National Oceanic and Atmospheric Administration (NOAA) recently launched Estuaries 101, a new online science curriculum from NOAA's National Estuarine Research Reserve System (NERRS). Designed for 9<sup>th</sup> through 12<sup>th</sup> grade classrooms, but flexible enough to adapt to college level or lower grades, Estuaries 101 meets key National Science Education Standards and can be aligned readily to all state standards. The curriculum enables students to learn fundamental concepts in science, develop scientific thinking skills and explore the nation's biologically rich and economically important estuaries.

#### Curriculum Structure

The Estuaries 101 curriculum ([www.estuaries.gov/estuaries101](http://www.estuaries.gov/estuaries101)) is comprised of four modules, each of which includes three or four comprehensive learning activities that incorporate data analysis, field experiences and classroom experiments. All activities within each module include a comprehensive teacher's guide, answer key, student readings, student worksheets and data sheets, and an assessment guide. Each module takes approximately two to three weeks to complete. The modules include:

##### (1) Earth Science Module

Students investigate landforms and features associated with estuaries, tides and salinity in estuaries, watersheds and their relationship to the dynamic changes that occur in estuaries due to drainage and runoff, and how hurricanes can affect estuaries.

### (2) **Life Science Module**

Students investigate the range of conditions that selected animal and plant species need to survive in an estuary, model estuaries, consider algae blooms in estuaries, study how nutrients cycle through an estuary, suggest recommendations for reducing nutrient inputs to estuary waters, and investigate the incredible biodiversity that exists in estuarine environments.

### (3) **Physical Science Module**

Students investigate water quality parameters to study the nature of, and the cyclical changes inherent in, the chemistry of estuarine water; learn about dissolved oxygen and its effects on life, with a focus on the chemistry; model a pollution spill that occurred at Bangs Lake (a tidal lake within Mississippi's Grand Bay NERR); and study the actual spill and how it changed water quality parameters in the estuary.

### (4) **Chesapeake Bay Module**

Students investigate the Chesapeake Bay in the mid-Atlantic region of the U.S., examine the dynamics of the Bay—how it changes on daily, tidal, and seasonal cycles—and then conduct their own investigations into living shorelines. Exploring maps and using real (and often current) data, students look at the terrain of the Bay and its watershed, investigate changes in salinity, temperature, pH and other abiotic factors, and consider how these influence—and are affected by—changes in the life and habitats of the Bay.

#### **What is the National Estuarine Research Reserve System?**

The National Estuarine Research Reserves System (NERRS) is a network of 27 areas representing different biogeographic regions of the United States that are protected for long-term research, water-quality monitoring, education and coastal stewardship. Established by the Coastal Zone Management Act of 1972, the reserve system is a partnership program between NOAA and the coastal states. NOAA provides funding, national guidance and technical assistance. Each reserve is managed on daily basis by a lead state agency or university, with input from local partners. For more information, see <http://nerrs.noaa.gov>.

Using these four modules, teachers can weave the study of estuaries into existing earth, life or physical science courses, explains Atziri Ibañez, national education coordinator for NERRS. “Our goal was to create a product that would make it meaningful to a student to explore and discover our nation’s estuaries and at the same time learn how to use real data to support their investigations.”

For example, activity #3 within the earth science module focuses on the relationship between an estuary and its watershed. This module uses San Francisco Bay as a case study. In this activity, students investigate the nature of watersheds and their relationship to the dynamic changes that occur in estuaries due to drainage and runoff. Students begin by examining the San Francisco Bay Estuarine Research Reserve and tracing the extent of the watershed using Google Earth (<http://earth.google.com>). Then they identify possible sources of pollution and contami-

nation along the major rivers that feed into the bay. Students also examine water quality data in the San Pablo region of the estuary and identify changes that occur due to a storm event. This activity has four parts: (1) Exploring the San Francisco Watershed, (2) What’s Upstream Comes Downstream, (3) Water Quality at the Mouth of a Watershed and (4) Optional Extension: Mapping Your Local Watershed.

#### *Building on Existing Resources*

Estuaries 101 is the central feature of the NERRS’ newly designed estuaries.gov Web site, launched in the fall of 2008. NERRS originally created estuaries.gov in 2001 to host the NERRS’ annual EstuaryLive Webcasts, in which scientists and educators lead virtual field trips to estuaries around the country. Now, the Estuaries 101 curriculum takes advantage of the media resources provided by the estuaries.gov site to expand opportunities for exploration and discovery. For example, students and educators can access complementary videos, animated interpretations of water quality and weather data, fish fact sheets, current news, and training and professional development opportunities.

In the near future, NERSS plans to add new features to Estuaries 101, including a tool to query the NERRS’ real time and archived data for water quality and weather from throughout the system. Teachers will also soon be able to take students on pre-packaged virtual field trips, including those now in archived versions of past EstuaryLive shows.

For the long term, NERRS sees its new curriculum as the start of a wider, comprehensive national program to help improve ocean and estuarine literacy, building on and integrating educational and scientific resources across the full NERRS system. Ibañez expects to begin creating curriculum for middle school grades beginning in 2009. Ultimately, NERRS plans to expand Estuaries 101 to include modules and activities for students in kindergarten through 12<sup>th</sup> grade.

[For more information, contact Atziri Ibañez, National Oceanic and Atmospheric Administration, National Estuarine Research Reserve System, 1305 East West Highway NORM/5, Silver Spring, MD 20910. Phone: 301-713-3155 x164; E-mail address: [Atziri.Ibanez@noaa.gov](mailto:Atziri.Ibanez@noaa.gov)]

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## Reviews and Announcements

### *Agencies Revise Guidance to Protect Wetlands and Streams*

EPA and the U.S. Army Corps of Engineers are issuing revised guidance to ensure America's wetlands, streams and other waters are better protected under the Clean Water Act (CWA). The guidance clarifies the geographic scope of jurisdiction under the CWA. The revised guidance replaces previous policy issued in June 2007 and clarifies a June 2006 Supreme Court decision in *Rapanos v. United States* regarding the scope of the agencies' jurisdiction under the CWA. The guidance follows the agencies' evaluation of more than 18,000 jurisdictional determinations and review of more than 66,000 comments received on the June 2007 policy. For more information, see [www.epa.gov/owow/wetlands/guidance/CWAwaters.html](http://www.epa.gov/owow/wetlands/guidance/CWAwaters.html).

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### *Army Releases Low Impact Development Manual*

The U.S. Army Corps of Engineers recently released a low impact development guidance manual that has wide applicability. Titled *Low Impact Development for Sustainable Installations: Stormwater Design and Planning Guidance for Development within Army Training Areas* (Public Works Technical Bulletin 200-1-62; October 2008), the document begins with a review of LID and its purpose and methods. The document addresses topics such as soil and water conservation, nonpoint source pollution reduction and removal, and enhanced environmental aesthetics. It provides numerous examples of the application of LID at Department of Defense training areas. It includes a set of fact sheets on topics including "Secondary Roads," "Maneuver Corridors," and "Bioretention Technology." The fact sheets include general LID information that is widely applicable. The document is posted on the Whole Building Design Guide Web site ([www.wbdg.org](http://www.wbdg.org)), a growing resource produced by and for federal agencies to enable them to successfully address the broad variety of requirements established by Executive Orders, the Energy Infrastructure and Security Act, and other energy and environmental policies. The full document is available for download at [www.wbdg.org/ccb/ARMYCOE/PWTB/pwtb\\_200\\_1\\_62.pdf](http://www.wbdg.org/ccb/ARMYCOE/PWTB/pwtb_200_1_62.pdf).

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### *Concentrated Animal Feeding Operations under New Manure Wastewater Rule*

EPA has finalized a rule to help protect the nation's water quality by requiring concentrated animal feeding operations (CAFOs) to more safely manage manure. This is the first time EPA has required a nutrient management plan (NMP) for manure to be submitted as part of a CAFO's Clean Water Act permit application. EPA estimates CAFO regulations will prevent 56 million pounds of phosphorus, 110 million pounds of nitrogen and two billion pounds of sediment from entering streams, lakes and other waters annually. Previous rules required CAFO operators to use NMPs for controlling manure, but the regulation builds on that by requiring NMPs to be submitted with permit applications. Each NMP will be reviewed by the permitting authority and conditions based on it will be incorporated as enforceable terms of each operator's permit. Each proposed NMP and permit will be available for public review and comment before going final. The deadline for newly defined facilities to apply for permits is February 27, 2009. More CAFO information is available at [www.epa.gov/npdes/caforule](http://www.epa.gov/npdes/caforule).



## *Decline in Maryland Brook Trout Linked to Temperature and Land Cover Changes*

A new study by Maryland Department of Natural Resources (DNR) biologists highlights the detrimental impact that development, loss of forest and temperature changes has on brook trout, Maryland's only native trout species. The study analyzed three decades' worth of brook trout distribution and abundance data collected by the DNR's Fisheries Service against stream temperatures and land cover in Baisman, Goodwin, Timber and Red Runs, Sawmill Branch and Stillwater Creek. For every one percent increase in impervious land cover (parking lots, roadways, rooftops, etc.) in a stream's watershed, the odds of brook trout survival decreased by nearly 60 percent. A press release is available at [www.dnr.state.md.us/dnrnews/pressrelease2008/100308.html](http://www.dnr.state.md.us/dnrnews/pressrelease2008/100308.html). An abstract of the study, recently published in the *North American Journal of Fisheries Management*, is available online at <http://afs.allenpress.com/perlserv/?request=get-abstract&doi=10.1577%2FM07-032.1>.

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## *Draft Sustainable Sites Initiative Guidelines Released*

The Sustainable Sites Initiative just released *Sustainable Sites Initiative Guidelines and Performance Benchmarks – Draft 2008* ([www.sustainablesites.org/report](http://www.sustainablesites.org/report)) to help people understand and work toward ecosystem sustainability. By creating and implementing clear and robust design, construction, operations and maintenance criteria, the Initiative aims to supplement existing green building and landscape guidelines, as well as to become a stand-alone tool for site sustainability. The Sustainable Sites Initiative is an interdisciplinary partnership led by the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center, the United States Botanic Garden and a diverse group of stakeholder organizations, including the EPA, working together to foster a transformation in land development and management practices. The draft guidelines are the product of more than two years of work by a diverse group of experts in soils, hydrology, vegetation, materials and human health and well being. It is expanded and updated from a preliminary report that was released in November 2007. This report focuses on measuring how a site can protect, restore and regenerate ecosystem services—such as clean air and water, climate regulation and human health benefits. This report contains more than 50 draft prerequisites and credits that cover all stages of the site development process from site selection to landscape maintenance. The Initiative works to develop sustainable land practices that will enable built landscapes to support natural ecological functions by protecting existing ecosystems and regenerating ecological capacity where it has been lost. The guidelines in this report can be applied immediately to support new sustainable practices wherever possible.

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## *EPA Requests Comments on Proposed Construction and Development Guidelines*

EPA recently proposed guidelines to control the discharge of pollutants from construction sites. The proposal would require all construction site managers to implement erosion and sediment control best management practices to reduce pollutants in stormwater discharges. In addition, for certain large sites located in areas of the country with high rainfall intensity and soils with high clay content, stormwater discharges from the construction site would be required to meet a numeric limit on the allowable level of turbidity, which is a measure of sediment in the water. In order to meet the proposed numeric turbidity limit, many sites would need to treat and filter their stormwater discharges. This proposal, if implemented, would significantly reduce the amount of sediment and other pollutants discharged from construction sites. EPA estimates that this proposed rule would cost \$1.9 billion dollars per year with annual monetized benefits of \$332.9 million. This proposed rule requests comment and information on the proposed regulation and an alternate option with a different numeric limit based on different technologies, as well as specific aspects of the proposal such as technologies, costs, loading reductions and economic achievability. Comments must be received on or before February 26, 2009. For more information on the proposal and to learn how to submit comments go to [www.epa.gov/ost/guide/construction](http://www.epa.gov/ost/guide/construction).

## *Nation's Coastal Conditions Improve Slightly*

A recently released environmental assessment report shows that the overall condition of the nation's coastal waters has improved slightly. The *National Coastal Condition Report III* (NCCRIII) is the third in a series of environmental assessments of U.S. coastal and Great Lakes waters. The report, a collaboration of the EPA; the National Oceanic and Atmospheric Administration; the U.S. Geological Survey; the U.S. Fish and Wildlife Service; coastal states; and the National Estuary Program, assessed America's coastal conditions using five indicators of condition: water quality, sediment quality, benthic community condition (the health of the water's bottom-dwelling invertebrate species), coastal habitat loss as indicated by changes in wetland area and fish tissue contaminants. Based on these five indicators, the overall condition of America's coasts is rated fair. By comparing the most recent condition scores with those considered for the first two NCCRs (released in 2001 and 2005, respectively) the report shows that overall conditions in U.S. coastal waters have improved slightly since the 1990s. The next NCCR is expected to be released in 2011 and will provide an assessment of the status of U.S. coastal waters from 2003 to 2006, along with trends in condition since the 1990s. To read NCCRIII and learn more about the indicators and criteria used in the report, see [www.epa.gov/owow/oceans/nccr](http://www.epa.gov/owow/oceans/nccr).

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## *NPDES Compliance Monitoring Strategy Released by EPA*

EPA's Office of Enforcement and Compliance Assurance has issued its Clean Water Act National Pollutant Discharge Elimination System (NPDES) Compliance Monitoring Strategy for the Core Program and Wet Weather Sources. This new strategy, which takes effect in 2009, outlines inspection and compliance goals for the entire NPDES program, including major and minor NPDES facilities, pretreatment programs, biosolids, combined sewer overflows, sanitary sewer overflows, stormwater and confined animal feeding operations. It places increased emphasis on wet weather issues, particularly stormwater sources, and sets ambitious targets for audits and inspections of Phase I and II municipal separate storm sewer systems, construction sites and industrial facilities. For more information, see [www.epa.gov/compliance/monitoring/programs/cwa/npdes.html](http://www.epa.gov/compliance/monitoring/programs/cwa/npdes.html).

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## *Nutrient Control Implementation Initiative Recommended*

In a recent report, the National Research Council (NRC) recommended that EPA and U.S. Department of Agriculture jointly establish a Nutrient Control Implementation Initiative (NCII) to learn more about the effectiveness of actions meant to improve water quality throughout the Mississippi River basin and into the northern Gulf of Mexico. The report advises how to move forward on the larger process of allocating nutrient loading caps—which entails delegating responsibilities for reducing nutrient pollutants such as nitrogen and phosphorus—across the basin. In addition, the report suggests that the two agencies should jointly establish a Mississippi River Basin Water Quality Center to administer the NCII and to conduct related water-quality monitoring and research. For more detailed summary information, see the NRC press release at [www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12544](http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12544). To view the final report, see [www.nap.edu/catalog.php?record\\_id=12544](http://www.nap.edu/catalog.php?record_id=12544).

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## *Opinion Might Change Course of Development in Puget Sound*

In September 2008 the National Marine Fisheries Service (NMFS) released a biological opinion on the effects of the Federal Emergency Management Agency's National Flood Insurance Program (NFIP) throughout Puget Sound. The opinion, required by a decision by the U.S. District Court on 15 November 2004, finds that the NFIP has the ability to change the way the program is implemented in Puget Sound communities to reduce impacts on critical habitat areas for certain species of salmon and Southern Resident killer whales. Implementation of the NMFS biological opinion will likely change the way more than 270 Puget Sound communities manage their floodplains. For example, these communities might have to increase the use of low impact development and on-site stormwater management practices or risk losing NFIP coverage. For more information see [www.nwr.noaa.gov/Salmon-Habitat/ESA-Consultations/FEMA-BO.cfm](http://www.nwr.noaa.gov/Salmon-Habitat/ESA-Consultations/FEMA-BO.cfm).

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## *Organic Chemicals Found in Source Water*

A U.S. Geological Survey (USGS) study found that low levels of certain man-made chemicals remain in public water supplies after being treated in selected community water facilities. Scientists tested water samples from nine rivers for about 260 commonly used chemicals, including pesticides, solvents, gasoline hydrocarbons, personal care and household-use products, disinfection by-products and manufacturing additives. The most commonly detected chemicals in the source water were herbicides, disinfection by-products and fragrances. This study did not analyze water to specifically detect the presence of pharmaceuticals and hormones. Low levels of about 130 of the man-made chemicals were detected in streams and rivers before treatment at the public water facilities (source water). Nearly two-thirds of those chemicals were also detected after treatment. Most of the chemicals found were at levels equivalent to one thimble of water in an Olympic-sized pool, and therefore not necessarily a concern to human health. Many of the chemicals considered in this study are among those often found in ambient waters of 186 rivers and streams sampled by USGS since the early 1990s, and are highly correlated with the presence of upstream wastewater sources or upstream agricultural and urban land use. For more information, see the USGS Source Water Quality Assessment Web site at <http://water.usgs.gov/nawqa/swqa>.

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## *Parties Agree to Improve Septic System Management*

In November 2008 EPA and 14 national organizations signed a memorandum of understanding (MOU) to improve wastewater treatment systems serving 25 million homes across the country. The organizations will work together to better manage septic wastewater systems by exchanging information and providing technical assistance to their members, states and local municipalities. This MOU renews an original 2005 MOU and adds an additional six organizations that will help communities address key problem areas and improve their onsite wastewater management programs. More information resources, including the MOU, a downloadable Webinar, list of partners and a recent progress report, are available at [www.epa.gov/owm/septic](http://www.epa.gov/owm/septic).

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## *Study Shows Perennial Strips Minimize Erosion*

Preliminary data from an Iowa State University's Leopold Center-funded project shows that perennial prairie strips planted at critical points in fields of corn and soybean have minimized soil erosion, even during periods of heavy rainfall. The project involves 14 small watersheds within the Neal Smith National Wildlife Refuge in Iowa's Jasper County that are managed as restored prairie and for row-crop production. Native grasses have been planted in plots representing 10 or 20 percent of the total drainage area in each watershed, and placed at the bottom or midway up the slope. During a three-month period from April 1 to June 30, the average sediment loss from watersheds with no prairie strips was 8.5 tons per acre, compared to an average 0.5 ton/acre sediment loss on the watersheds with prairie plantings. The period included 10 runoff events that produced measurable sediment loss. More information about the project, including a short video segment, is available at [www.leopold.iastate.edu/research/ecology.htm](http://www.leopold.iastate.edu/research/ecology.htm).

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## *Trash BMP Tool Box Helps Clean Up*

Staff from California's Santa Clara Valley Urban Runoff Pollution Prevention Program conducted an extensive literature review on best management practices that are available to control trash. Using this information, they developed the *Trash BMP Tool Box*, which includes 12 technical information sheets that describe the effectiveness of BMPs, how much they cost and other considerations. The Tool Box provides stormwater managers, municipal officials and other stakeholders with information about options for controlling and capturing trash within a storm drain conveyance system. For more information, see [www.scvrppp-w2k.com/trash\\_bmp\\_toolbox\\_2007.htm](http://www.scvrppp-w2k.com/trash_bmp_toolbox_2007.htm).

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## Universities Launch New Low Impact Development Consortium

Researchers from the University of Maryland, Villanova University and North Carolina State University have joined forces to conduct collaborative stormwater “green” infrastructure research, creating the Low Impact Development—Mid-Atlantic Research Consortium (LID-MARC). The group’s research focuses on making science-based recommendations for the design and performance of LID bioretention and bioinfiltration best management practices (BMPs). The group’s goal is to understand and optimize the use of these BMPs as a stormwater control measure at the watershed scale. The research team integrates diverse expertise and experience from three established stormwater research programs with differing climatic and soil conditions in the mid-Atlantic coastal zone. For more information, see [www.bae.ncsu.edu/stormwater/LID-MARC](http://www.bae.ncsu.edu/stormwater/LID-MARC).

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## Wetland Video Available Online

EPA Region 8 has produced a 12-minute video, “Wetlands and Wonder: Reconnecting Children with Nearby Nature,” presenting a case for protecting urban wetlands as places to experience nature. The video focuses on urban and suburban wetlands as valuable resources to be restored, protected and enjoyed. The video was produced by Darcy Campbell of EPA, Gene Reetz, a former EPA wetlands expert, and ECOS Communications. The video features interviews with Julia McCarthy, Joan Almon, Richard Louv and Robert Michael Pyle. The video is available online at [www.epa.gov/owow/wetlands/education/wetlandsvideo](http://www.epa.gov/owow/wetlands/education/wetlandsvideo). Copies of the DVD are available from the National Service Center for Environmental Publications at 800-490-9198 or at [www.epa.gov/nscpep](http://www.epa.gov/nscpep) (Publication number: EPA 980-V-08-002; September 2008).

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## Recent and Relevant Periodical Articles

### Alberta Bans Weed and Feed Lawn Products

By CBC News ([www.cbc.ca/consumer/story/2008/11/13/alberta-weed-feed-ban.html](http://www.cbc.ca/consumer/story/2008/11/13/alberta-weed-feed-ban.html))

This article, posted on CBC News on November 13, 2008, describes the Canadian province’s effort to ban the use of fertilizer/herbicide combination products beginning on January 1, 2010.

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### Eutrophication of U.S. Freshwaters: Analysis of Potential Economic Damages

By Dodds et al., 2009 (<http://pubs.acs.org/doi/pdf/10.1021/es801217q>)

This article, printed in the January 1, 2009 issue of *Environmental Science & Technology*, discusses how human-induced eutrophication degrades freshwater systems worldwide by reducing water quality and altering ecosystem structure and function. The authors calculated potential annual value losses in recreational water usage, waterfront real estate, spending on recovery of threatened and endangered species and drinking water. The authors concluded that eutrophication of U.S. freshwater costs approximately \$2.2 billion annually.

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### Green Roofs Offer More than Color for the Skyline

By Ken Belson ([www.nytimes.com/2008/08/28/nyregion/28roof.html](http://www.nytimes.com/2008/08/28/nyregion/28roof.html))

This *New York Times* article discusses the impact of a year-long tax abatement in New York to developers and building owners who install green roofs. In August 2008, New York Governor David Paterson approved the abatements, which can cut as much as \$100,000 a year from a building’s taxes. The green roofs include a layer of vegetation and rock that absorbs rainwater, insulates buildings and extends roof life. The new abatement program is expected to jump start a green roof revolution in New York City.

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## New Tool Fertilizes Fields and Reduces Runoff Nutrients

By Laura McGinnis (<http://www.ars.usda.gov/is/pr/2008/081223.htm>)

This article, posted on the U.S. Department of Agriculture's Agricultural Research Service Web site on December 23, 2008, describes a new manure application tool that can help reduce nutrient runoff. This tool applies poultry litter to fields in shallow bands, reducing runoff of excess nutrients such as phosphorus and nitrogen. The tool digs shallow trenches about two to three inches deep in the soil. It then places the poultry litter in the trenches and covers it with soil.

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## Organic Weed Control: Scientists Serve up Mustard Meal to Tame Weeds

([www.sciencedaily.com/releases/2008/12/081228192713.htm](http://www.sciencedaily.com/releases/2008/12/081228192713.htm))

This article, posted on the January 4, 2009 online issue of *Science Daily*, explains a new U.S. Department of Agriculture discovery. Scientists found that sinalbin, the same compound that gives white mustard its pungent flavor, can also fight weeds. The scientists' studies suggest sinalbin and other compounds released into soil by applications of white mustard seed meals can kill or suppress certain weedy grasses and annual broadleaf weeds.

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## PAHs Underfoot: Contaminated Dust from Coal-Tar Sealcoated Pavement is Widespread in the United States

By Van Meter et al., 2009 (<http://pubs.acs.org/doi/pdfplus/10.1021/es802119h>)

A U.S. Geological Survey (USGS) study published in the January 1, 2009, issue of *Environmental Science & Technology (ES&T)* showed that dust collected from coal-tar sealcoated parking lots in Central and Eastern U.S. cities contains concentrations of polycyclic aromatic hydrocarbons (PAHs) that are about 1,000 times greater than levels found in Western cities where coal-tar sealcoat is less commonly used. The new study also shows that coal-tar sealcoat—the shiny black material applied to many parking lots and driveways—is contributing to PAH contamination in many of the nation's urban lakes. PAHs are an environmental concern because they are toxic to aquatic life and several are suspected carcinogens. A USGS press release is available at [www.usgs.gov/newsroom/article.asp?ID=2077](http://www.usgs.gov/newsroom/article.asp?ID=2077).

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## Walking the Walk

By Dan Rafter ([www.onsitewater.com/ow\\_0803\\_walking.html](http://www.onsitewater.com/ow_0803_walking.html))

This article, featured in the March/April 2008 issue of *Onsite Water Treatment*, highlights the new “green” Little Rock, Arkansas-based headquarters of Heifer International, a nonprofit group committed to aiding impoverished communities. The company built on a Brownfield site, using sustainable technology, with an emphasis on local building materials. An innovative constructed wetlands and gray water storage system supplies a majority of its water needs and has prevented any stormwater from leaving the site and entering the nearby stormwater system.

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## Web Sites Worth a Bookmark

*Green Infrastructure Community of Practice* ([www.greeninfrastructure.net/content/community-practice](http://www.greeninfrastructure.net/content/community-practice))

The Conservation Fund developed the Community of Practice, which serves as a virtual knowledge hub that helps promote the application of green infrastructure concepts and principles. This portal is designed for both those who create, design and implement green infrastructure plans and for those who use these plans. The site offers profiles of organizations and description of projects, resources and events related to green infrastructure around the United States.

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## Green Streets ([www.lowimpactdevelopment.org/greenstreets](http://www.lowimpactdevelopment.org/greenstreets))

This site, launched by the nonprofit Low Impact Development (LID) Center, provides information on basic LID research, pilot projects, standards and specifications, and planned and constructed projects along transportation corridors. The Center has worked on LID projects with EPA, the National Academy of Sciences, industries, municipalities, and federal, state and local departments of transportation, among others. The site also offers links to other green streets programs and resources.

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## Keep Oceans Clean (<http://keepoceansclean.org>)

This Web site is part of the Oceans Awareness Campaign, a collaborative effort by federal agencies and private organizations designed to help people understand that trash and pollution discarded on land can make its way into the oceans. Interactive content and games, plus the use of ocean-related Disney characters and content make this Web site entertaining for all ages.

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## Managing Stormwater with Trees and Structural Soils ([www.cnr.vt.edu/urbanforestry/stormwater](http://www.cnr.vt.edu/urbanforestry/stormwater))

This site offers information about a collaborative project that developed and evaluated a system for capturing and retaining stormwater under pavement in structural soil: a specialized soil mix that supports pavement and supports extensive tree root growth. With funding from the USDA-Forest Service's Urban and Community Forestry Grants Program, the project began in 2004 as a collaborative effort between the Urban Forestry and Urban Horticulture programs at Virginia Tech, the Urban Horticulture Institute at Cornell University, and the Department of Land and Water Resources at the University of California at Davis. Ultimately, the team hopes to see a full-canopy parking lot that allows trees to serve their natural role as mediators of the hydrologic cycle. This site offers a BMP design manual based on the team's research, a presentation for explaining how this system works, and many other resource links.

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## Calendar

For an updated events calendar,  
see [www.epa.gov/newsnotes/calendar.htm](http://www.epa.gov/newsnotes/calendar.htm).

### February 2009

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|---------|--|
| 2/17–20 | <i>The International Conference: Stormwater and Urban Water Systems Modeling</i> , Toronto, Canada. For more information, see <a href="http://www.computationalhydraulics.com/Training/Conferences/confsem.html">www.computationalhydraulics.com/Training/Conferences/confsem.html</a> .                             |
| 2/18    | <i>EPA Webcast: Green Roofs</i> . For more information, see <a href="http://www.epa.gov/watershedwebcasts">www.epa.gov/watershedwebcasts</a> .   |
| 2/18–20 | <i>Soil and Water Conservation Service Technical Conference</i> , Rapid City, SD. For more information, see <a href="http://www.ndswcs.org/News.htm">www.ndswcs.org/News.htm</a> .   |
| 2/23–24 | <i>Fifth Annual Conference on Hydrogeology, Ecology, Monitoring, and Management of Groundwater in Karst Terrains</i> , Safety Harbor, FL. For more information, see <a href="http://www.ngwa.org/DEVELOPMENT/conferences/details/0902235018.aspx">www.ngwa.org/DEVELOPMENT/conferences/details/0902235018.aspx</a> . |
| 2/22–24 | <i>9th Annual Pesticide Stewardship Conference</i> , Albuquerque, NM. For more information, see <a href="http://tpsalliance.org">http://tpsalliance.org</a> .  |
| 2/26    | <i>Webinar: Low Impact Development for Public Works</i> . For more information, see <a href="http://www.apwa.net/Education/web.asp">www.apwa.net/Education/web.asp</a> .   |
| 2/26–27 | <i>International Water Conservation and Xeriscape Conference</i> , Albuquerque, NM. For more information, see <a href="http://www.xeriscapenm.com/xeriscape_conferences/2009">www.xeriscapenm.com/xeriscape_conferences/2009</a> .   |

### March 2009

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| 3/2–4 | <i>Pretreatment, Pollution Prevention &amp; Stormwater Conference 2009</i> , Monterey, CA. For more information, see <a href="http://www.cwea.org/et_attendees_conferences.shtml">www.cwea.org/et_attendees_conferences.shtml</a> . |
| 3/4–5 | <i>Water Quality Credit Trading Workshop</i> , Easton, MD. For more information, see <a href="http://www.conservationinformation.org/?action=article&amp;id=48">www.conservationinformation.org/?action=article&amp;id=48</a> .     |
| 3/4–7 | <i>2009 Benthic Ecology Meeting</i> , Corpus Christi, TX. For more information, see <a href="http://benthicecologymeeting2009.org">http://benthicecologymeeting2009.org</a> .   |



- 3/18 *Designing for Water Conservation—Audio/Web Conference*, hosted by the American Institute of Certified Planners. For more information, see [www.planning.org/audioconference](http://www.planning.org/audioconference).
- 3/22–26 *2009 International Master Gardener Conference*, Las Vegas, NV. For more information, see [www.unce.unr.edu/imgc](http://www.unce.unr.edu/imgc).
- 3/23–26 *Urban Water Management 2009*, Overland Park, KS. For more information, see [www.urbanwatermgt.com](http://www.urbanwatermgt.com).
- 3/24–26 *Professional Development Workshop: Stream Morphology Assessment*, Raleigh, NC. For more information, see [www.ncsu.edu/srp/rc\\_100.html](http://www.ncsu.edu/srp/rc_100.html).

## April 2009

- 4/6–7 *Applying the Principles of Water Harvesting: Using Rainwater, Greywater, and A/C Condensate in the Landscape*, Phoenix, AZ. For more information, see [www.harvestingrainwater.com](http://www.harvestingrainwater.com).
- 4/8 *Webcast: Water Resources in the West*. For more information, see [www.awwa.org/Conferences/WebcastsHome.cfm?ItemNumber=3551&navItemNumber=1520](http://www.awwa.org/Conferences/WebcastsHome.cfm?ItemNumber=3551&navItemNumber=1520).
- 4/14–16 *Professional Development Workshop: Introduction to Taxonomy and Pollution Ecology of Aquatic Insects*, Asheville, NC. For more information, see [www.ncsu.edu/srp/ept\\_workshop.html](http://www.ncsu.edu/srp/ept_workshop.html).
- 4/14–16 *Professional Development Workshop: Natural Channel Design Principles*, Raleigh, NC. For more information, see [www.ncsu.edu/srp/rc\\_200.html](http://www.ncsu.edu/srp/rc_200.html).
- 4/19–23 *Groundwater Summit*, Tucson, AZ. For more information, see [www.ngwa.org/2009summit](http://www.ngwa.org/2009summit).
- 4/19–24 *Freshwater Mollusk Conservation Society's 2009 International Symposium*, Baltimore, MD. For more information, see [www.cpe.vt.edu/fmcs2009](http://www.cpe.vt.edu/fmcs2009).

## May 2009

- 5/4–6 *Managing Water Resources and Development in a Changing Climate*, Anchorage, AK. For more information, see [www.awra.org/meetings/Anchorage2009](http://www.awra.org/meetings/Anchorage2009).
- 5/5–8 *12th National Mitigation and Ecosystem Banking Conference*, Salt Lake City, UT. For more information, see [www.mitigationbankingconference.com](http://www.mitigationbankingconference.com).
- 5/11–14 *Fifth National Conference for Nonpoint Source and Stormwater Outreach—Achieving Results with Tight Budgets*, Portland, OR. For more information, see [www.epa.gov/nps/outreach2009](http://www.epa.gov/nps/outreach2009).
- 5/12–13 *Professional Development Workshop: Assessment and Identification of Riparian Vegetation*, Pittsboro, NC. For more information, see [www.ncsu.edu/srp/veg\\_workshop.html](http://www.ncsu.edu/srp/veg_workshop.html).
- 5/17–21 *World Environmental and Water Resources Congress 2009*, Kansas City, MO. For more information, see <http://content.asce.org/conferences/ewri2009>.
- 5/18–20 *Annual New England NPS Conference*, Portland, ME. For more information, see [www.neiwpcc.org/npsconference](http://www.neiwpcc.org/npsconference).
- 5/18–20 *Fifth Annual National Sustainable Design Expo*, Washington, D.C. For more information, see [http://es.epa.gov/ncer/events/news/2009/04\\_18\\_09\\_feature.html](http://es.epa.gov/ncer/events/news/2009/04_18_09_feature.html).
- 5/18–22 *Professional Development Workshop: Strategic Conservation Using a Green Infrastructure Approach*, Shepherdstown, WV. For more information, see [www.conservationfund.org/node/239](http://www.conservationfund.org/node/239).
- 5/19–21 *Professional Development Workshop: Stream Morphology Assessment*, Raleigh, NC. For more information, see [www.ncsu.edu/srp/rc\\_100.html](http://www.ncsu.edu/srp/rc_100.html).
- 5/29–6/1 *2009 National River Rally*, Baltimore, MD. For more information, see [www.rivernetnetwork.org/rn/rally](http://www.rivernetnetwork.org/rn/rally).

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