



Nonpoint Source News-Notes

April 2014, #95

*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

TMDL Visioning Framework Emphasizes Collaborative and Individual Goals

In December 2013 the U.S. Environmental Protection Agency (EPA) announced a new collaborative framework for implementing the [Clean Water Act \(CWA\) section 303\(d\) program](#), often referred to as the total maximum daily load (TMDL) program. The framework is outlined in a new EPA document, *A Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program*. The document describes a new vision for the CWA section 303(d) program, outlines a series of goals, and presents implementation plans for achieving these goals nationwide. The new vision and goals provide states with more flexible approaches to addressing and preventing impairments, particularly those caused by nonpoint source pollution.



Volunteers remove pavement to make way for a new Parking Forest. See article on [page 12](#).

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Note: Issue #92 (October 2012) was the final printed issue of *Nonpoint Source News-Notes*. Beginning with Issue #93, all issues will be available on EPA's *Nonpoint Source News-Notes* website for viewing and download. If you have not already done so, please subscribe to the News-Notes notification service (instructions available at www.epa.gov/newsnotes) and we will notify you by email when each new issue becomes available.

“The Vision is the new lens through which to view the CWA 303(d) Impaired Waters and TMDL Program—one that facilitates strategic and concentrated efforts to achieve environmental results,” explains John Goodin, Chief of EPA’s Watershed Branch.

EPA and state CWA section 303(d) program managers launched the effort to develop a new long-term vision and establish new goals for the program in August 2011. First, state program managers worked with their staff to identify a wish list of potential program improvements. Over the span of several months, state and EPA participants discussed these improvements and formulated a vision and six goal statements that would significantly contribute to achieving that vision. While the new vision provides an altered framework for implementing the CWA 303(d) program, it does not change state and EPA responsibilities or authorities under the CWA 303(d) regulations.

The new CWA 303(d) program vision states, “The Clean Water Act Section 303(d) Program provides for effective integration of implementation efforts to restore and protect the nation’s aquatic resources, where the nation’s waters are assessed, restoration and protection objectives are systematically prioritized, and Total Maximum Daily Loads and alternative approaches are adaptively implemented to achieve water quality goals with the collaboration of States, Federal agencies, tribes, stakeholders, and the public.”

The six CWA 303(d) program goals may be viewed in their entirety in the document. The main ideas include:

- Prioritization – Beginning with the 2016 integrated reporting cycle, states will review, prioritize, and report watersheds or waters for priority restoration and protection.
- Assessment – By 2020, states will use site-specific assessments to identify the extent of healthy and CWA section 303(d)-impaired waters in priority watersheds or waters.
- Protection – Beginning with the 2016 reporting cycle, states will identify protection planning priorities, define approaches for future protection, and develop schedules to help prevent impairments in healthy waters. This goal aligns with EPA’s [Healthy Watersheds Initiative](#).
- Alternatives – By 2018, states will use alternative approaches, in addition to TMDLs, that incorporate adaptive management and are tailored to specific circumstances that are better suited to implement priority actions, including identifying and reducing nonpoint source pollution.
- Engagement – By 2014, EPA and the states will more actively engage the public and other stakeholders to improve and protect water quality.
- Integration – By 2016, EPA and the states will identify and coordinate implementation of key point source and nonpoint source control actions that foster effective integration across CWA programs, other statutory programs, and other federal agencies’ water quality efforts.

New Framework Offers Flexibility

The new CWA 303(d) program vision acknowledges that a TMDL is but one tool among many that can be used to maintain and achieve the integrity of U.S. waters. Recognizing the challenges and costs associated with restoration actions, states are sometimes better off spending money to prevent healthy waters from becoming impaired rather than trying to correct impairments after the fact. Under the old approach, states were asked to emphasize restoration over protection efforts. The new protection goal allows each state to account for all actions undertaken to achieve its specific water quality objectives.

Along those same lines, EPA recognizes that some alternative restoration approaches might allow a water body to achieve water quality standards faster than would a typical TMDL approach. Therefore, EPA encourages states to pursue appropriate alternative restoration approaches—a plan and set of actions pursued in the near-term (other than a TMDL)—that are designed to attain water quality standards. For example, in some rural watersheds, nonpoint source pollution problems are relatively easy to pinpoint and address. By identifying key problems, establishing a watershed plan, and implementing best management practices, water quality standards might be met in the near-term, removing the need for TMDL development altogether. Examples of this type

of approach include CWA section 319 plans, “straight to implementation” projects, and source water protection plans. Note that impaired waters remain on the CWA 303(d) list, but are assigned lower priority for TMDL development while alternative restoration approaches are pursued until water quality standards are achieved.

Next Steps

Moving forward, states and EPA are encouraging state CWA 303(d) program managers to adopt the new framework and implement it on two levels. At one level, state and federal program managers will work together and measure their collective progress. At another level, states will follow more state-tailored strategies and will work toward their own goals for addressing point source and nonpoint source pollution. The new vision recognizes the importance of collaboration between EPA and states to set priorities that reflect overall state objectives such as addressing nonpoint source-related impairments.

A workgroup of states and EPA is developing a metric to replace the currently used metric, which tracks the total number of TMDLs developed. The workgroup hopes to have the new metric in place by fiscal year 2015. The new metric will be developed to measure the extent of a state’s priority waters that have been addressed through TMDL implementation (or alternative implementation approaches in impaired waters) or by protection approaches in waters of existing good quality. The metric will have a defined universe, baseline, and annual targets. Recognizing that TMDLs and alternative approaches might take several years to be developed, and that states engage in actions outside of priority areas, a complementary measure will likely be developed to track incremental progress of these outside actions. The complementary metric approach will allow states to report on their focused progress within their priority waters and communicate overall progress.

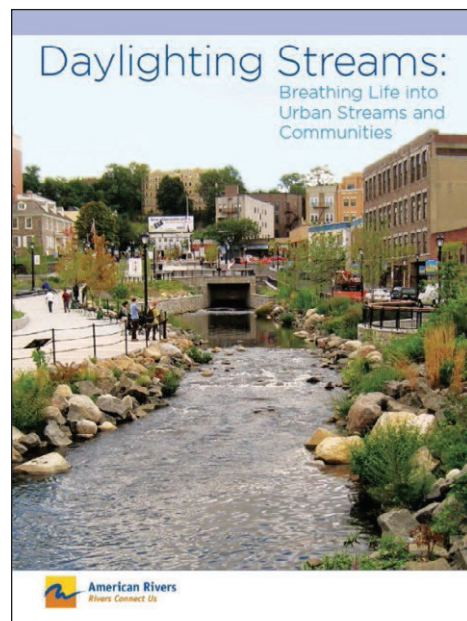
Daylighting Streams Brings Buried Waterways Back to Life

A new report by American Rivers shows how daylighting streams—freeing them from underground pipes and restoring them aboveground—can improve water quality, create parks and open space, and revitalize communities across the United States. The 32-page report, *Daylighting Streams: Breathing Life into Urban Streams and Communities*, identifies and analyzes the benefits of stream daylighting.

In urban areas everywhere, streams have been re-routed through culverts, pipes, or ditches and paved over. A project designed to daylight a stream brings these previously hidden waterways back to the surface. A daylighting project typically reestablishes a stream in its old channel where feasible, or creates a new channel if necessary. The goal of these projects is to allow streams to return to a more natural state so they can filter pollutants, slow floodwaters, and provide habitat for fish and wildlife.

The report covers a range of topics, including:

- The multiple benefits of healthy streams.
- How development impacts small streams.
- Ways that stream daylighting can improve water quality, mitigate flooding, and revitalize communities.
- Potential policy changes that could improve protection of small streams or restore small streams through daylighting.



A new report reviews the economic, aesthetic, and water quality benefits that can be realized by revealing and restoring once-buried streams.

- Availability of funding mechanisms for communities interested in implementing a daylighting project.

In addition, the report highlights case studies of communities that have implemented daylighting projects, including Bee Branch Creek, Dubuque, Iowa; Arcadia Creek, Kalamazoo, Michigan; Saw Mill River, Yonkers, New York; Peyton Creek, Staunton, Virginia; and Blackberry Creek, Berkeley, California.

Notes on Agriculture

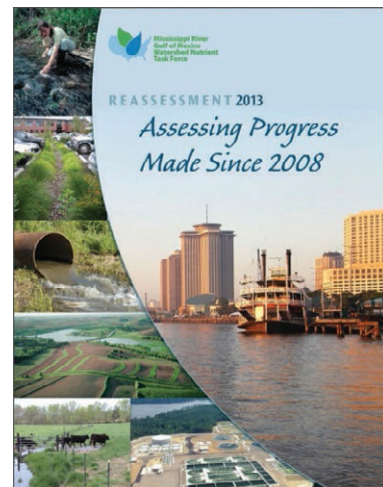
Progress Made, More Work Needed in Mississippi River and Gulf of Mexico

The Mississippi River/Gulf of Mexico Watershed Nutrient Task Force released a new report, *Reassessment 2013: Assessing Progress Made Since 2008*, which reviews the work done during the past five years since development of the Task Force's Gulf Hypoxia 2008 Action Plan. The 2013 report highlights the progress made and identifies areas that need improvement in the efforts to address excess nutrient loads in the Mississippi/Atchafalaya River Basin and to reduce Gulf hypoxia.

The 2008 Action Plan describes a national strategy to reduce, mitigate, and control hypoxia in the northern Gulf of Mexico and improve water quality in the Mississippi River Basin.

The 2008 plan outlines 11 key actions needed to complete and implement nitrogen and phosphorus reduction strategies, promote effective conservation practices and management practices, track progress, reduce existing scientific uncertainties, and promote effective communications to increase awareness of Gulf hypoxia. Action 11 of the 2008 Action Plan calls for the Task Force to “in five years (2013), reassess nitrogen and phosphorus load reductions, the response of the hypoxic zone, changes in water quality throughout the Mississippi/Atchafalaya River Basin, and the economic and social effects, including changes in land use and management, of the reductions in terms of the goals of this Action Plan.” The 2013 Reassessment is the Task Force's response to the Action 11 commitment. The report identifies key areas of progress to date (2008–2013) toward these goals:

- States are making progress in developing and implementing [nutrient reduction strategies](#). Seven states—Iowa, Indiana, Louisiana, Minnesota, Mississippi, Ohio, and Wisconsin—have finalized or released drafts of nutrient reduction strategies, and the remaining states expect to have draft strategies completed in 2014.



A new Nutrient Task Force report reviews progress in the Mississippi River Basin.

What is Gulf Hypoxia?

Every summer, a large hypoxic zone forms in the Gulf of Mexico. This hypoxic zone, where dissolved oxygen is too low for many aquatic species to survive, is fueled by nutrient (nitrogen and phosphorus) runoff from the Mississippi/Atchafalaya River Basin (MARB) and is also affected by stratification (layering) of waters in the Gulf. Nutrient-laden freshwater from the MARB is warmer and less dense than the deep ocean water, and tends to collect in an upper, less saline, surface layer. This stratification of the water column restricts mixing of oxygen-rich surface water with oxygen-poor deep water. Excessive nutrient loads trigger an overgrowth of algae that rapidly consume oxygen when decomposed. This decomposition in bottom waters, coupled with water column stratification, results in hypoxia. Mobile animals (e.g., adult fish) can typically survive hypoxic events by moving to areas of higher oxygen, but this might push them into less optimal habitats, often along the edge of the hypoxic zone. Less mobile animals (e.g., clams, worms) that typically constitute critical food sources for fish populations cannot move to higher oxygen waters and are often killed during hypoxic events. More information about hypoxia is available on the U.S. Environmental Protection Agency's [Hypoxia 101 website](#).

- The U.S. Department of Agriculture continues to provide strong assistance for conservation practices.
- Science and monitoring continue to improve.
- The goal for reducing the Gulf hypoxic zone remains reasonable.

The 2013 Reassessment report also noted that the Task Force must accelerate the implementation of nutrient reduction activities and identify ways to better measure progress at a variety of scales, from small streams to the mouth of the Mississippi River.

In September 2013 the federal agencies on the Task Force released a strategy, *Looking Forward*, which focuses on supporting the development, refinement, and implementation of state nutrient reduction plans. The new strategy emphasizes federal efforts that will support state nutrient strategies with

new science, programs, and approaches that can be tailored to particular needs associated with implementing individual state nutrient reduction strategies. Federal agencies will:

- Provide more scientific and technical assistance, such as monitoring and modeling efforts to help demonstrate progress locally, basin-wide, and in the Gulf, as well as additional research to better target conservation practices on the ground.



The Mississippi-Atchafalaya River Basin is the third largest in the world. Parts or all of 31 states plus two Canadian provinces drain into the Mississippi River, totaling 41 percent of the contiguous United States. Before reaching the Gulf of Mexico, the Mississippi meets up with its distributary, the Atchafalaya River.

Nitrate Levels Continue to Increase in Mississippi River; Signs of Progress in the Illinois River

According to a new U.S. Geological Survey (USGS) study, *Nitrate in the Mississippi River and Its Tributaries, 1980–2010: An Update*, nitrate levels continue to increase in the Missouri and Mississippi Rivers. However, it isn't all bad news: nitrate levels in the Illinois River decreased between 2000 and 2010, marking the first time substantial, multi-year decreases in nitrate have been observed in the Mississippi River Basin since 1980. Nitrate trends from 1980 to 2010 were determined at eight long-term USGS monitoring sites in the Mississippi River Basin, including four major tributaries (Iowa, Illinois, Ohio, and Missouri rivers) and four locations along the Mississippi River using [methodology](#) that adjusts for year-to-year variability in streamflow conditions. Findings included:

- Consistent increases in nitrate concentrations occurred between 2000 and 2010 in the upper Mississippi River (29 percent) and the Missouri River (43 percent).
- Nitrate concentrations increased at the Mississippi River outlet by 12 percent between 2000 and 2010.
- Nitrate concentrations steadily decreased by 21 percent in the Illinois River from 2000 to 2010. Decreases were also noted in the Iowa River during this time, but the declines were not as large (10 percent).
- Nitrate concentrations in the Ohio River are the lowest among the eight Mississippi River Basin sites and have remained relatively stable over the last 30 years.

Legacy nitrate may be the predominant source of nitrate during low flows. If that is the case, it could take decades before decreases in nitrate concentrations could be measured in these rivers, irrespective of improvements in agricultural practices. If point sources predominant, there is a potential to affect nitrate concentrations sooner. The USGS report and information on nitrate trends in concentration and flux for each of the eight sites are available [online](#). Additional information on USGS long-term monitoring sites in the Mississippi River Basin is also available online ([Water-Quality Monitoring and Modeling in the Mississippi and Atchafalaya River Basin](#)). Research on nitrate trends is conducted as part of the USGS [National Water-Quality Assessment](#) program. This program provides an understanding of water quality conditions, whether conditions are getting better or worse over time, and how natural features and human activities combine to affect water quality.

- Work on economic analyses of conservation practices to help producers identify the conservation practices that provide the most economic and environmental benefits.
- Support regulatory activities that provide reductions in nutrient runoff.
- Use innovation and leveraging to offer financial and technical assistance.
- Explore ways to expand market-based approaches.

“Achieving significant water quality improvements in water bodies as large as the Mississippi River and Gulf of Mexico takes time, and the increasing impacts of climate change such as more frequent extreme weather events pose additional challenges. The progress we’ve made across the board during the past five years provides an excellent foundation and we will work to accelerate our progress over the next five years,” said Nancy Stoner, acting Assistant Administrator for Water for the U.S. Environmental Protection Agency and co-chair of the Task Force.

Conservation Practices that Reduce Runoff of Nutrients and Sediment Are on the Rise in the Chesapeake Bay Basin

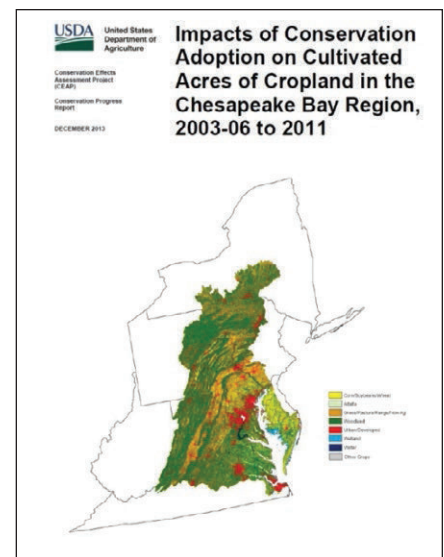
Conservation practices adopted by Chesapeake Bay farmers are helping to reduce pollution. In early December 2013, the U.S. Department of Agriculture’s (USDA’s) Natural Resources Conservation Service (NRCS) released a report that models the effects of conservation practices implemented on cropland in the Chesapeake Bay region in recent years. This new report, *Impacts of Conservation Adoption on Cultivated Acres of Cropland in the Chesapeake Bay Region, 2003–2006 to 2011*, is part of USDA’s Conservation Effects Assessment Project (CEAP). The report finds that since 2006, agricultural producers have significantly increased their use of some conservation measures to improve and protect water and soil quality in the Chesapeake Bay region. These conservation practices can generate substantial natural resource benefits for producers and the communities of the Chesapeake Bay region.

This study reports on a farmer survey of changes in conservation adoption, estimates the impact of these changes on reduction of both edge-of-field losses and in-stream sediment and nutrient loads delivered to the Chesapeake Bay, and evaluates the need for additional conservation treatment on cropland in the region. The analyses reflect the environmental impact of management of the region’s cropped acres, which make up 10 percent of the Chesapeake Bay region (4.35 million acres). The Chesapeake Bay watershed touches six states and is home to 17 million people and almost 84,000 agricultural operations. Agriculture contributes about \$10 billion annually to the region’s economy.

This new report is a follow-up to the NRCS’ March 2011 *Assessment of the Effects of Conservation Practices on Cultivated Cropland in the Chesapeake Bay Region*. The 2011 report relied on data collected between 2003 and 2006; therefore, it provides a point of reference by which to measure progress in conservation adoption and conservation practice efficacy in the region.

Since 2006, land with cover crops in a cropping system increased from 12 percent of acres to 52 percent. Farmers are using a variety of other conservation practices, such as no-till, that help keep nutrients and sediment on fields and out of nearby waterways. Notably, some form of erosion control has been adopted on 97 percent of cropland acres in the Chesapeake Bay watershed.

Although significant gains were made in the controlling and trapping components of the Avoid, Control, Trap (ACT) conservation system approach, progress is needed in avoiding nutrient losses through improved nutrient application management. Specifically, avoidance could be achieved



A new USDA report describes the anticipated effects of cropland conservation practice implementation in the Chesapeake Bay region.

through better incorporation of the 4Rs (the right rate, the right timing, the right method, and the right form) into nutrient management plans. Appropriate rate, timing, and method of nitrogen fertilizer and manure applications on all crops in rotation declined from 13 percent in the first report to 7 percent in the 2013 report.

Targeting of Priority Watersheds is Key

To better target conservation efforts in the region, the Chesapeake Bay Watershed Initiative, or CBWI, was authorized in the 2008 Farm Bill. NRCS used CBWI to accelerate the adoption of conservation systems in the region. NRCS targeted funding to priority watersheds and practices that would have the biggest impact on watershed health. The majority of the conservation practices implemented in the Chesapeake Bay were made possible through Farm Bill conservation programs. The new Farm Bill, enacted in February 2014 authorizes approximately \$56 billion in conservation spending nationwide over the next ten years. Conservation efforts in the Chesapeake Bay watershed can continue to target acres with high potential conservation benefits, offering the greatest potential for further reductions in sediment and nutrients.

CEAP Agricultural Conservation Practice Implementation Aligns with the Chesapeake Bay Program Partnership

Both the USDA and the U.S. Environmental Protection Agency (EPA) agree that farmers have stepped up their efforts to implement conservation practices to clean up the Chesapeake Bay watershed. The progress in implementing these practices on the ground reported by USDA is consistent with the rates reported through the Chesapeake Bay Program (CBP) Partnership.

While CEAP and the CBP Partnership use different processes, they both show that Chesapeake Bay watershed farmers are implementing more conservation practices to reduce nitrogen, phosphorus, and sediment pollution to local and Bay waters.

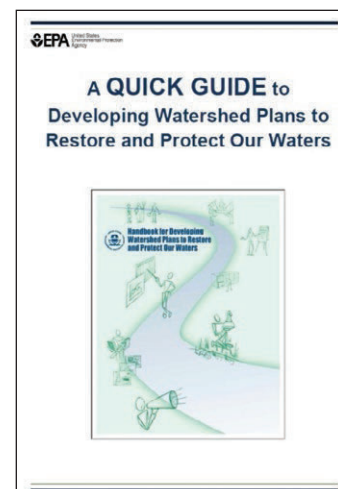
These practices help to inform the CBP partnership's process for developing and tracking progress towards the Chesapeake Bay total maximum daily load. EPA and USDA will continue to coordinate closely with the full CBP partnership to ensure an accurate accounting of farmers' pollution reduction efforts and to improve understanding of how these conservation actions on the ground will ultimately result in benefits to local and Bay waters. EPA will also continue working with USDA to focus federal funding that helps farmers implement practices to reduce nitrogen, phosphorus, and sediment pollution.

Notes on Watershed Management

Quick Guide for Developing Effective Watershed Plans Released

In late 2013 the U.S. Environmental Protection Agency (EPA) released a new document called *A Quick Guide to Developing Watershed Plans to Restore and Protect Our Waters* (Quick Guide). This document is designed as a helpful introduction and guide to the information presented in EPA's 2008 *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (Handbook). The Quick Guide also describes recently released data and social media resources.

The Quick Guide is intended for a wide audience—from the novice to experienced practitioners working on watershed-related issues at the federal, state, tribal, and local levels. It is also intended for managers involved in other integrated resource planning efforts, such as water and wastewater utilities, transportation departments, and local zoning offices.



EPA's new Quick Guide serves as a valuable resource for watershed managers.

Why the Quick Guide?

EPA published the 2008 Handbook to serve as a comprehensive resource to help watershed practitioners develop more effective watershed plans as a means to improve and protect the nation's waters. The Handbook also provides guidance on how to incorporate the nine minimum elements from the Clean Water Act Section 319 Nonpoint Source Program's funding guidelines into the watershed plan development process. The Quick Guide provides supplemental information describing new resources that have become available as EPA and other entities have stepped up watershed plan implementation, introduced new initiatives, developed new tools, and provided additional funding sources.

An online Web module called "An Introduction to Watershed Planning" is available through the [Watershed Academy Web's](#) free online training in watershed management. The module summarizes the 2008 Handbook and provides helpful technical training information for states, watershed groups, and others on how to develop more effective watershed plans to help restore and protect water resources.

The Handbook has been used by watershed practitioners, incorporated into training courses, and even adopted as part of college curricula. The purpose of the new Quick Guide, developed in response to feedback concerning the length and complexity of the full Handbook, is to provide a streamlined, easy-to-read summary. The guide also incorporates new watershed-related resources (data and communication tools) that have been developed since the Handbook was initially released. The Quick Guide is not meant to replace the Handbook, but rather to provide a brief guide to watershed planning and highlight new information that can be used for more effective decision-making, which in turn can lead to improved water resource management.

Organization of the Quick Guide

The Quick Guide is divided into two sections:

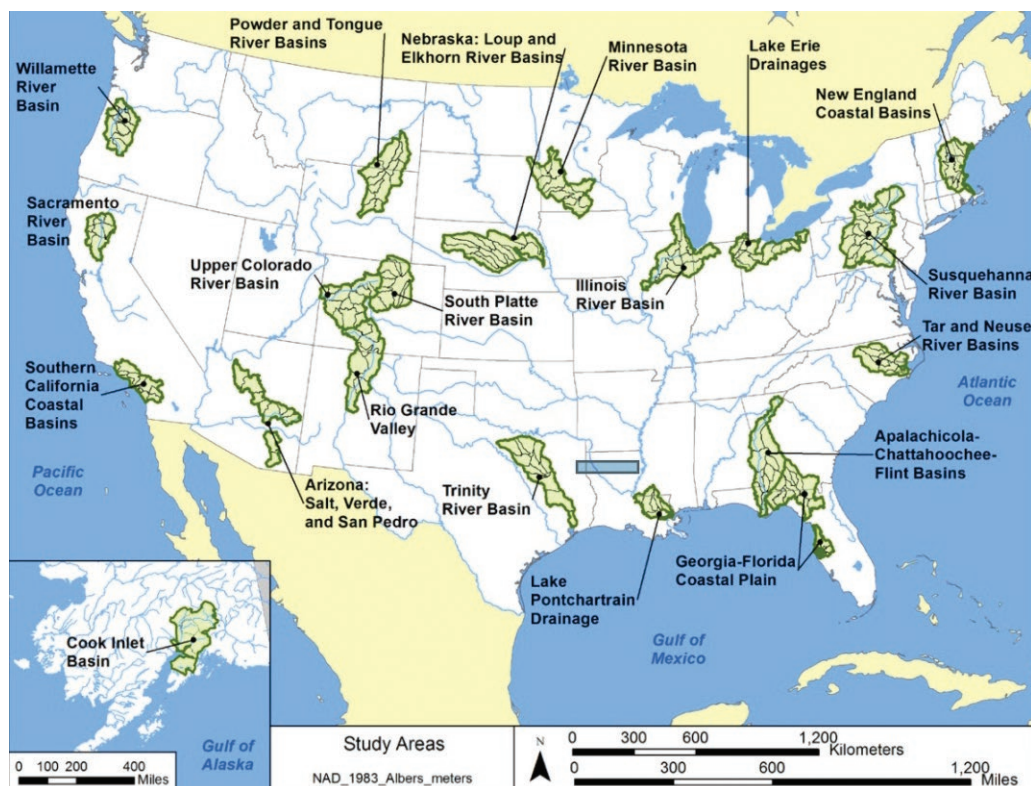
- **Section I: The Basics** provides a streamlined summary of the Handbook. It includes the major steps in the watershed planning process and a brief overview of the nine minimum elements to be included in watershed plans under EPA's Clean Water Act Section 319 Nonpoint Source Program.
- **Section II: What's New** highlights recent EPA watershed-related initiatives and presents new tools that practitioners can access to improve water quality across the country. This section includes tools for accessing data and prioritizing watershed restoration and protection, tools for sharing information and finding training opportunities, descriptions of new national initiatives, and information about recent success stories and lessons learned.

For more information, and to download both the Quick Guide and the Handbook, see EPA's website on the [Handbook for Developing Watershed Plans to Restore and Protect Our Waters](#).

Climate Change and Urban Development: Looking Ahead

In September 2013 the U.S. Environmental Protection Agency (EPA) released [Watershed Modeling to Assess the Sensitivity of Streamflow, Nutrient, and Sediment Loads to Potential Climate Change and Urban Development in 20 U.S. Watersheds](#). This report details watershed modeling that was conducted in 20 large U.S. watersheds (6,000–27,000 square miles) to characterize the sensitivity of streamflow, nutrient (nitrogen and phosphorus), and sediment loading to a range of plausible mid-21st century climate change and urban development scenarios. The study shows that integrating existing tools (e.g., climate models, downscaling approaches, and watershed models) and data sets to address these scientific questions is challenging.

To conduct the modeling, EPA used the Soil Water Assessment Tool (SWAT) and Hydrologic Simulation Program—FORTRAN (HSPF) models. Scenarios of future climate change were developed based on statistically and dynamically downscaled climate model simulations representative of the period 2041–2070. Scenarios of urban and residential development for this same period were developed from the EPA's [Integrated Climate and Land Use Scenarios](#) (ICLUS) project.



Twenty watersheds across the nation were selected for the modeling study.

Results provide an improved understanding of the complex and context-dependent relationships between climate change, land-use change, and water resources in different regions of the country. As a first-order conclusion, results indicate that in many locations future conditions are likely to be different from past experience.

In many study areas the simulations suggest hydrologic changes during the 2041–2070 time horizon, such as:

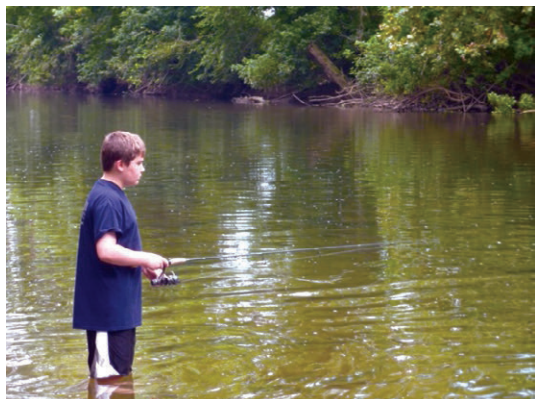
- Potential streamflow volume is likely to decrease in the Rockies and interior southwest but increase in the east and along the southeast coasts.
- Higher peak streamflow will increase erosion and sediment transport; loads of nitrogen and phosphorus will also likely increase in many watersheds.
- Many watersheds will likely experience significant changes in the timing of streamflow and pollutant delivery. In particular, hydrologic systems will tend to shift from snowmelt-dominated spring runoff systems to rain-dominated systems with greater winter runoff.

The ultimate significance of any given simulation of future change will depend on local context, including the historical range of variability and interaction with other stressors. The simulation results in this study do, however, clearly illustrate that the potential streamflow and water quality response in many areas could be large. Given these uncertainties, successful climate change adaptation strategies will need to encompass practices and decisions to reduce vulnerabilities and risk across a range of potential future climatic conditions. For more information, see EPA's [Global Change Impacts & Adaptation website](#).

This report consists of a main volume and 26 appendices. The main volume describes the study methods, models, scenarios, and results. The appendices contain additional information on model setup, calibration, and additional modeling results not included in the main report. Supplementary data sets summarizing SWAT simulation results for all 20 study areas are available at EPA's [ICLUS website](#).

EPA Releases 2013 Edition of *Getting In Step: Engaging Stakeholders in Your Watershed*

The U.S. Environmental Protection Agency (EPA) has released an update to its popular 2001 publication, *Getting in Step: Engaging Stakeholders in Your Watershed*. This second edition update presents the tools watershed practitioners need to effectively engage stakeholders in efforts to restore and maintain healthy environmental conditions through community support and cooperative action.



A boy fishes in a tributary of Virginia's Shenandoah River. Stakeholders are active in numerous watershed-related groups throughout this 3,000-square-mile basin.

The 91-page stakeholder guide is intended primarily for federal, state, tribal, and local agency personnel, as well as members of nongovernmental organizations, involved in watershed management activities.

The guide introduces the watershed management planning process and discusses the importance of including input from stakeholder groups—formal or informal assemblies that represent a variety of interests and points of view within a watershed. It can also help private organizations interested in recruiting and involving stakeholders in local or regional watershed efforts.

The guide describes how to identify the driving forces and goals within a watershed and how to organize and build the stakeholder group. For example, after identifying the key members that should participate in the stakeholder group, the watershed practitioner must convince them to make an initial participation commitment. Once they've made this commitment, the group members must remain engaged and enthusiastic and be provided with the pertinent materials needed to spread watershed messages to local

constituents and beyond. An organized and well-run outreach plan will increase productivity and make these tasks easier to implement. Outreach information pertaining to generating interest, engaging stakeholders, and properly equipping them is presented throughout this guide.

This publication is part of EPA's *Getting In Step outreach series* and is available within EPA's Nonpoint Source Outreach Toolbox (the updated guide is listed at the bottom of the Web page). The outreach series includes several resources designed to help watershed managers strengthen their watershed outreach efforts. For example, EPA's *Getting in Step: A Guide for Conducting Watershed Outreach Campaigns* provides advice on how watershed groups, local governments, and others can maximize the effectiveness of public outreach campaigns to reduce nonpoint source pollution. A Web-based training module and an archived webcast seminar are also available.

EPA's Nonpoint Source Outreach Toolbox

The Nonpoint Source (NPS) [Outreach Toolbox](#) contains a searchable catalog of sample NPS outreach and educational materials in the form of existing TV, radio, and print public service announcements in digital formats as well as slogans, logos, and mascots. It also includes surveys on NPS awareness and evaluations of the effectiveness of real-world NPS mass media campaigns, and a "how to" guide for conducting watershed outreach campaigns to improve water quality. The Toolbox focuses on providing tools and resources to reach the general public with sound NPS messages about personal stewardship, including general storm water and storm drain awareness, lawn and garden care, motor vehicle care, pet care, septic system care, and household chemicals and waste.

New Watershed Academy Webcasts Available for Free

The U.S. Environmental Protection Agency's [Watershed Academy](#) sponsors free Webcast seminars for watershed stakeholders, state and local government leaders, and the general public. Offered on a monthly basis, live webcasts are conducted by expert instructors on a range of watershed topics including low impact development, the Clean Water Act, watershed protection and planning, nutrient management, and much more.

Participants must pre-register to participate in a [live webcast](#). Past Watershed Academy webcast seminars are available on EPA's [archived webcasts](#) page. The Watershed Academy offers a certificate

to those who attend live webcasts or listen to archived webcasts. Seminars held during the past year include:

- New Recreational Criteria to Better Protect Public Health (01/30/2013)
- Water Quality Exchange: A Tool for Tribes, Volunteer Monitors, and Others to Share Water Quality Data (03/13/2013)
- Draft National Rivers and Streams Assessment 2008–2009: A Collaborative Survey (04/03/2013)
- Using Social Indicators in Watershed Management Projects (05/01/2013)
- USDA's NIFA–CEAP Watershed Synthesis: Lessons Learned (05/12/2013)
- Overview of Harmful Algal Blooms and their Impacts in Marine and Freshwater Ecosystems (06/25/2013)
- Perspectives on the Impact to Public Health of Harmful Algal Blooms (7/25/2013)
- How to Track a HAB: New Technologies and Methods for Identifying and Monitoring Harmful Algal Blooms (08/20/2013)
- Wetlands Supplement: Integrating Wetlands Into Watershed Planning (09/17/2013)
- Linking Nutrient Pollution and HABs: State of the Science and EPA Actions (09/25/2013)
- National Stormwater Calculator (10/23/2013)
- Re-engaging Your Volunteer Monitoring Organization (11/19/2013)
- EPA's Healthy Watersheds Program Promotes Planning for Green Infrastructure at the Landscape Scale—A Case Study of New York (1/14/2014)

Notes on Green Stormwater Infrastructure

Infrastructure is Going Green in Communities Across America

By Nancy Stoner, Acting Assistant Administrator for Water, U.S. Environmental Protection Agency

[Ms. Stoner published this blog post on December 10, 2013, on EPA Connect, EPA's leadership blog. The blog highlights regular posts from EPA's leadership across the country, spanning all program areas on a range of topics.]

When I released the [Water Technology Innovation Blueprint](#) last spring, it framed the top ten opportunities to help solve current water resource issues. Green infrastructure is one of my favorites in the top ten, and it is rapidly expanding across the country. Green infrastructure decreases pollution to local waterways by treating rain where it falls and keeping polluted stormwater from entering sewer systems. Green infrastructure tools and techniques include green roofs, permeable materials, alternative designs for streets and buildings, trees, rain gardens, and rain harvesting systems.



Green roof on top of Syracuse University's LEED Platinum certified Gateway Center. *Photo Credit: Caitlin Eger, Syracuse Environmental Finance Center*

Green infrastructure is also a critical tool for addressing climate change and mitigating its impacts by making communities more resilient. Green infrastructure can increase the capacity of sewer systems by reducing the flow into them, making the systems more resilient.

This fall I attended the first national [Community Summit on Green Infrastructure](#), co-hosted by the [Syracuse Environmental Finance Center](#) and EPA in partnership with [Onondaga County, New York](#) and the City of Syracuse. The summit provided an opportunity for communities across the country to share experiences and innovation in green infrastructure, while also strengthening

the [EPA Green Infrastructure Community Partnerships](#). The pioneering cities who attended this community summit are ahead of the curve, paving the way for more natural stormwater controls through the use of green infrastructure.

EPA also released its new [2013 Green Infrastructure Strategic Agenda](#) during the summit, which was held at the new LEED Platinum [Gateway Center](#) on the campus of the State University of New York College of Environmental Science and Forestry (SUNY-ESF). At the Gateway Center I toured one of the first green roofs in the country to use plant species that are native to the area.

Some attendees of the summit participated in a green infrastructure tour of [projects installed in Syracuse](#), which included visiting a ground-breaking [hockey rink](#) at the War Memorial Arena. Syracuse Crunch fans have the first hockey rink in the country made of captured rainwater. The water harvesting system at the arena captures an estimated 400,000 gallons of rainwater and snow melt per year. In the basement is a 15,000 gallon cistern system that captures, filters, and uses the rainwater for the hockey rink and other purposes.

The need for improvements to the nation's water and sewer infrastructure is staggering, estimated to cost over \$650 billion dollars over the next 20 years. Increased emphasis should be placed on green infrastructure for stormwater management and decentralized approaches that can reduce pumping and treatment costs, as well as provide other local environmental and economic benefits. EPA has released a [new report analyzing the economic benefits](#) of green infrastructure in 13 locations to help utilities, states, municipalities, and other stormwater professionals understand the potential financial benefits in their communities.

The many benefits of green infrastructure are why EPA recently provided [\\$400,000 to help six communities](#) expand their use of green infrastructure to reduce water pollution and boost resilience to the impacts of climate change. In the last two years, EPA has provided \$1.35 million to more than 20 communities for green infrastructure projects. The conference in Syracuse reaffirmed my belief that countless communities across the country are also driving this change in how we handle water.

Nancy Stoner is EPA's Acting Assistant Administrator in EPA's Office of Water. Since February 1, 2010, Nancy Stoner has been serving as the Deputy Assistant Administrator for Water. Ms. Stoner's extensive career in environmental policy and law began in 1987 as a trial attorney in the Environment and Natural Resources Division of the U.S. Department of Justice. Most recently Ms. Stoner served as the Co-Director of the Natural Resources Defense Council's Water Program. Ms. Stoner is a 1986 graduate of Yale Law School and a 1982 graduate of the University of Virginia.

Parking Forest: A Natural, Sustainable Development Approach

"What if Mother Nature designed a parking lot?" wondered Mr. Brian Wegener, a staff member of the [Tualatin Riverkeepers](#), after learning that nearly 5,000 acres of impervious surfaces contributed nonpoint source pollution directly into Oregon's Tualatin River's 712-square-mile watershed. After discussing the problem, Mr. Wegener and his fellow Riverkeepers established the group's 5,000 Acres Initiative—designed to identify, demonstrate, and test innovative low impact development practices to reduce stormwater runoff from parking lots using low-cost retrofit techniques that do not reduce parking capacity. The concept for the Parking Forest was born.

Traditionally, parking lots are underlain by heavily compacted soils that prevent trees from growing properly. Conversely, Parking Forest design specifications incorporate linear tree wells that extend under parking areas. These wells are filled with engineered "structural tree soil," a mix of angular rocks, clay soil, and other materials that partly fill the voids between the rocks. The rocks help to support the weight of pavement and vehicles, while soil-filled void spaces allow water to infiltrate and roots from nearby trees to spread out. By installing Parking Forests, communities can combine parking lots and urban forests without losing parking spaces in both redevelopment and retrofit projects.

Installing a Parking Forest Project in Portland

The Tualatin Riverkeepers recently partnered with local agencies and organizations to install a Parking Forest project at Portland Community College's (PCC) Sylvania campus. "The Parking Forest is exciting to me because it's an opportunity to integrate healthy, low-maintenance trees into the built environment," explains Maria Cahill, the technical project manager for the PCC Parking Forest demonstration.

In June 2013 the nonprofit group [Depave](#) helped to coordinate a team of volunteers to remove a 12-foot by 34-foot section of impervious asphalt (approximately 400 square feet total) from the center aisle of the parking lot (Figures 1 and 2). A local contractor helped to excavate the existing 2 feet of base rock and soil under the asphalt, leaving a 12-foot-wide and 2-foot-deep hole that would become the tree well. Once removed, the asphalt was taken to a recycling facility and the base rock and soil were reused at other nearby sites.



Figure 1. PCC parking lot, pre-construction.



Figure 2. Depave volunteers remove asphalt.

An excavation contractor filled two outer, 4-foot-wide strips of the tree well with structural tree soil. The middle 4-foot-wide strip was filled with compost-amended native soil that promotes tree growth and water infiltration (Figure 3). Once the wells were filled with soil, a paving contractor installed impervious asphalt pavement over the outer two tree well strips and the contractor came back to add wheel stops for each parking spot (Figure 4). Figure 5 shows a cross-section of the tree well design. PCC students helped to complete the project by volunteering to plant native Douglas fir trees in October 2013.



Figure 3. Unpaved tree well.



Figure 4. Paved tree well.

Results

As seen in Figure 6, the 4-foot-wide landscaped area now visible between the parking stalls looks like typical parking lot landscaping; however, this area now serves as a 12-foot-wide, 2-foot-deep stormwater infiltration zone made up of structural tree soil, native soil, and vegetation. The stormwater infiltration area treats runoff from approximately 6,000 square feet of parking lot and landscaped areas—runoff that once flowed across the parking lot, into a storm sewer, and directly into a Tualatin River tributary. The new landscaped area was placed directly across the parking lot,

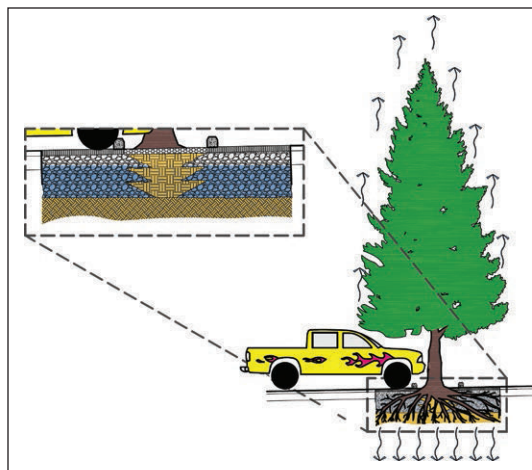


Figure 5. Cross-section of the tree well design.



Figure 6. Parking Forest, just after tree planting.

allowing it to intercept almost all of the site's runoff. Project managers estimate that the volume of runoff leaving the PCC Sylvania Lot 10 will be reduced by 90 percent annually. They also expect that at least 80 percent of the total suspended solids carried in the stormwater will be captured by the infiltration system.

To assess the success of the system, Portland Bureau of Environmental Services (Bureau) will collect and analyze stormwater grab samples for a minimum of 15 storm events over the next 3–5 years. The Bureau will analyze both the stormwater and the sediments in the stormwater for a variety of parameters, including metals. To date, the team has observed that the Parking Forest has successfully captured runoff from frequent small rain storms. Some runoff has occurred in larger storms. Specific data are not yet available.

Project Costs

The Tualatin Riverkeepers secured \$32,668 in Clean Water Act section 319 U.S. Environmental Protection Agency grant funding through the Oregon Department of Environmental Quality to install the Parking Forest at PCC's Sylvania campus. Of that, \$10,908 was spent on construction, including \$1,246 on soil, \$200 on compaction testing during structural soil placement, and \$145 on trees. A consulting arborist (\$450) assisted the project team during the design phase. The Norcross Wildlife Foundation provided \$700 to install a long-term monitoring device. Approximately \$6,000 supported contract management and indirect costs. Additional costs supported by the grant included engineering, design, and education services.

The project team opted to use a costly proprietary mix for the structural soil because the local contractors were unfamiliar with this type of soil. In future, teams installing similar projects might consider using the Olympia, Washington's successful [recipe](#) for structural soil mix to reduce total project costs.

Looking to the Future

The project partners also installed a second, larger tree well project at the Tualatin Hills Park and Recreation District's Sunset Swim Center (SSC) in late summer 2013. In this case, the project included installing tree wells during the construction of a new pervious concrete parking lot, rather than as part of a retrofit in an existing parking lot.

In November 2013 the Parking Forest project team hosted a seminar for 47 local professionals (e.g., landscapers, engineers, planners, arborists, architects, public works staff, and scientists). They discussed both the PCC and SSC projects and explained how to incorporate tree wells into existing and new parking lots. For more information about both projects, see:

- The Parking Forest [website](#)
- The *Green Heron Herald* (Fall 2013) the Tualatin Riverkeepers' newsletter
- 5,000 Acres Initiative [Project Description](#)

Interest in the concept is growing. Two more Parking Forest demonstrations are planned in the near future, one at Clackamas High School in Clackamas County and one in the city of Gresham. “The Parking Forest concept allows our built environment to provide a vast array of social, environmental, and economic benefits,” adds Cahill.

[For more information contact Maria Cahill, Sustainability Consultant and Technical Project Manager, Green Girl Land Development Solutions, LLC. 2124 SE Woodward Street, Portland, OR 97202, Phone: 503-334-8634; Email: greengirl@greengirlpdx.com; Web: www.parkingforest.org]

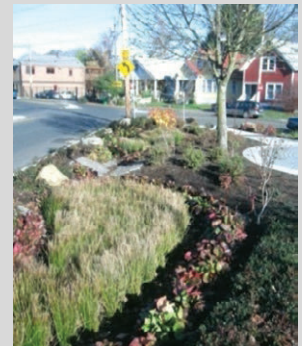
New Strategy Focuses on Making Green Infrastructure Business as Usual

The U.S. Environmental Protection Agency (EPA) and its partner organizations have promoted the use of green infrastructure (GI) for many years as part of a comprehensive approach to help communities achieve healthier waters. In 2013 EPA launched a new strategy to expand the use of GI, with the goal of making GI “business as usual” for local communities. EPA’s [Green Infrastructure Strategic Agenda 2013](#) builds on strategies developed by the Agency in 2008 and 2011: *Managing Wet Weather with Green Infrastructure: Action Strategy 2008* and *A Strategic Agenda to Protect Waters and Build More Livable Communities Through Green Infrastructure* (2011).

The 2013 strategy outlines the key objectives that EPA will pursue to support community efforts to build GI. The new strategy maintains a focus on information exchange and community engagement, while adding a new focus on integrating GI as standard practice across different levels of government by expanding the focus on improving federal coordination, Clean Water Act regulatory support, research and information exchange, funding and financing, and capacity building. Through this strategy, EPA aims to increase national and local capacity to evaluate the role of GI and the benefits that it can provide. For the latest information, see EPA’s [Green Infrastructure Support website](#).

What is Green Infrastructure?

Green infrastructure uses natural systems and/or engineered systems designed to mimic natural processes to more effectively manage urban stormwater and reduce impacts on receiving waters. These systems are often soil or vegetation-based and include planning approaches such as tree preservation and impervious cover reduction, as well as structural interventions such as rain gardens (as seen in the picture, right) and permeable pavements. By maintaining or restoring the hydrologic function of urban areas, green infrastructure treats precipitation as a resource rather than waste, and can play a critical role in achieving community development as well as water quality goals.



Low Impact Development and Green Infrastructure Benefit Jurisdictions Nationwide

In August 2013, the U.S. Environmental Protection Agency (EPA) released [Case Studies Analyzing the Economic Benefits of Low Impact Development and Green Infrastructure](#), a report designed to help utilities, state agencies, municipalities, and stormwater professionals understand the potential benefits of low impact development and green infrastructure (LID/GI) programs. The report highlights different evaluation methods that have been successfully applied and describes case studies where LID/GI projects and programs have been shown to be economically beneficial. This document promotes the use of LID/GI, where appropriate, to supplement grey stormwater infrastructure.

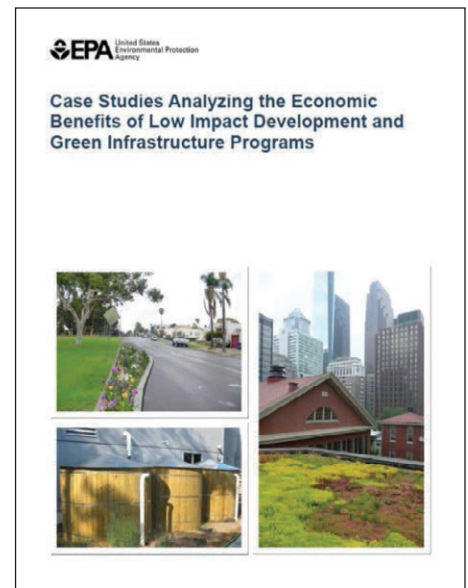
Although many jurisdictions have begun to implement LID/GI approaches for stormwater management, EPA’s research shows that a relatively small percentage of them have conducted economic analyses of their existing or proposed programs. This lack of program analysis is due to many factors, such as uncertainties surrounding costs, operation and maintenance requirements, budgetary constraints, and difficulties associated with quantifying the benefits provided by LID/GI.

To help alleviate these uncertainties, EPA developed 13 case studies from municipalities across the United States that have conducted economic evaluations of their LID/GI programs. EPA highlights a variety of analysis types in the case studies—looking beyond just one measure, such as capital cost—to show a more complete picture of the economic benefits and costs of LID/GI. The case studies were selected to represent a variety of analysis methods in different geographic areas of the United States, for different types of municipal programs. The case studies highlight locations where LID/GI applications, in combination with grey infrastructure, were found to be economically beneficial.

For example, the following summaries of three of the report's 13 case studies provide insight into the range of LID/GI program analyses and geographical areas covered by the report:

- **A Benefit-Cost Analysis Provides the Basis for Incentivizing Ecoroof Construction** (Bureau of Environmental Services, Portland (BES), Oregon).
BES developed a stormwater management program that recognizes the need for sustainable stormwater management systems throughout the city. The LID-based program helps the city comply with its MS4 discharge permit, reduce combined sewer overflow events, maintain water quality, and control flooding. Specific program components include green roofs, green streets, stormwater best management practice (BMP) monitoring, school BMPs, and a financing program. BES conducted a benefit-cost analysis (including social, financial, and environmental elements) of a hypothetical green roof, calculating the net present value of the practices to illustrate the long-term value of these investments to the public, developers, and building owners.
- **Long-Term Cost Savings Plus Environmental and Social Benefits Envisioned in Rural Green Streets Pilot Project** (West Union, Iowa).
In partnership with the Iowa Department of Economic Development, West Union developed an integrated approach to community sustainability and livability through the Iowa Green Streets Pilot Project, which includes incorporating LID/GI techniques into the renovation of six downtown blocks. Primary objectives of the project included improving citizen safety, replacing aging infrastructure, improving water quality and habitat in a nearby trout stream, and reducing flooding in the downtown area. As part of the project analysis, West Union compared the long-term ownership costs of a green street design with those of a conventional design.
- **Preserving Suburban Lands to Improve Water Quality Provides a Good Return on Investment for the Community** (Alachua County Environmental Protection Department and Public Works Department, Alachua County, Florida).
Alachua County is within the Gainesville, Florida, metropolitan area. The county developed its LID/GI-based program to help mitigate the impacts of historical land development and prepare for the expected population growth-related impacts on regional water resources. The county's program includes development standards that require LID/GI practices, and offers incentives for their use on private lands. The county acquires, protects, and manages environmentally significant lands to protect water resources, wildlife habitat, and natural areas suitable for resource-based recreation. Alachua County conducted a benefit-cost analysis that compared the benefit of increased property values resulting from increases in open space against the decreased tax revenues lost from public acquisition of private property.

Stormwater professionals can use the information and resources provided in this report when planning, implementing, and assessing their own LID/GI programs. The report provides a starting



A new EPA guide describes the economic benefits offered by LID/GI.

framework that both illustrates how others have evaluated the costs and benefits of their LID/GI projects and programs and suggests methods communities might want to investigate to get started on their own analyses.

The main body of the report provides summary information on the types of economic analyses conducted by the case study entities, as well as the key findings and lessons learned by each entity as a result of implementing their LID/GI programs. The 13 case studies, provided in the appendix, offer more detailed information about each entity's LID/GI program, the role and type of economic analyses conducted, the specific analytical methods used, the results of the analyses, and key challenges and lessons learned. The case studies also provide additional written and Web-based resources related to each case study program.

More information about LID/GI practices is available on EPA's [Low Impact Development website](#).

Software Spotlight

National Stormwater Calculator: Not Your Typical Calculator

Got stormwater? Developers, landowners, and others now have another tool to help them make informed land-use decisions and to reduce stormwater runoff. The U.S. Environmental Protection Agency (EPA) recently released phase II of its [National Stormwater Calculator](#) (SWC), a simple-to-use tool for computing hydrology of any site within the United States. Large sites should be broken up into smaller sections that can be analyzed separately. The SWC estimates the amount of stormwater runoff generated from a site under different development and stormwater control scenarios over a long-term period of historic rainfall. The analysis takes into account local soil conditions, slope, land cover, and meteorology. Different types of low impact development (LID) practices (often referred to as green infrastructure) can be employed in the site plan to capture and retain rainfall on-site. The newly released phase II of the SWC adds localized climate change scenarios to assess the future climate vulnerability of the site.

The SWC uses the EPA [Storm Water Management Model](#) (SWMM) as its computational engine. SWMM is a well-established, EPA-developed model that has seen continuous use and periodic updates for 40 years. Its hydrology component uses physically meaningful parameters, making it especially well-suited for application on a nationwide scale.

Assessing a Site's Stormwater Runoff

The SWC's primary focus is to show site developers and property owners the accuracy with which they can meet a desired stormwater retention target. The SWC provides information such as:

- What is the largest daily rainfall amount that can be captured by a site in its pre-development, current, or post-development condition?
- To what degree will storms of different magnitudes be captured on site?
- What mix of LID controls can be employed to meet a given stormwater retention target?
- How well will LID controls perform under future meteorological projections according to climate change scenarios validated by the Intergovernmental Panel on Climate Change?

The SWC seamlessly accesses several national databases that deliver local soil and meteorological data for a specific site. The user supplies land cover information that reflects the state of development they wish to analyze and selects a mix of LID controls to be applied. With this information, the SWC computes the site's hydrologic response to a long-term record of historical hourly precipitation; the information could also be modified by a future particular climate change scenario (i.e. hot/dry, median change, or warm/wet). The use of a long time period allows a full range of meteorological conditions to be analyzed, rather than just a single design storm event. The resulting time series of rainfall and runoff are aggregated into daily amounts that are then used to report various runoff and retention statistics. In addition, the site's response to extreme rainfall events of different return periods is also analyzed.

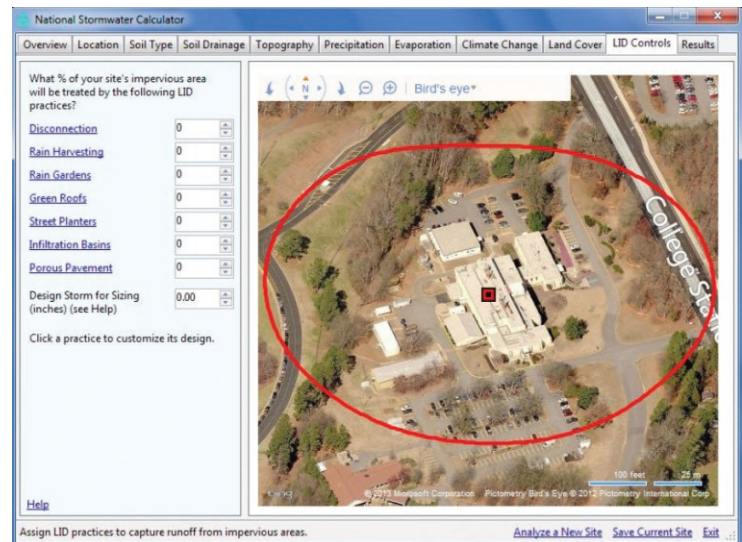
The SWC is most appropriate for performing screening-level analyses of small footprint sites that have uniform soil conditions. The footprint of the site is assessed by the length of the longest runoff path, which should be less than several hundred feet. The hydrological processes simulated by the SWC include evaporation of rainfall captured on vegetative surfaces or in surface depressions, infiltration losses into the soil, and overland surface flow. Certain processes such as transpiration or biological treatment are not accounted for in the model. Once rainfall infiltrates the soil of an LID unit, the SWC assumes that it won't become surface runoff. Any water that doesn't drain into deeper soil layers of the site will be evaporated during dry periods.

Applying LID Controls

The SWC allows users to apply a mix of seven different types of LID practices to a site:

- Disconnection
- Rain Harvesting
- Rain Gardens
- Green Roofs
- Street Planters
- Infiltration Basins
- Permeable Pavement

EPA chose these specific LID practices because they can all be sized on the basis of drainage area. Two other commonly used controls, vegetative swales and infiltration trenches, are not included because their sizing depends on their location and length within a specific site—information that is beyond the scope of the SWC. Each LID practice used in the SWC is assigned a set of default design and sizing parameters; however, these may be modified as needed.



Example LID Controls tab page of the SWC.

Installing and Running the SWC

The SWC is a desktop application that operates on any version of Microsoft Windows (version 4 or higher). Users must also have an Internet connection to run the SWC. Visit EPA's [SWC website](#) for instructions on installing the program. Once the SWC is installed, the main screen displays a series of tabbed pages (see figure, above) that are used to collect the site information, run the analysis, and provide the hydrologic results. Based on provided geographic location, the display shows the site's location, its topography, selected soil properties, and the locations of nearby rain gauges and weather stations projected onto a Bing Map. Most of the pages have a "Help" command that will provide additional information about a page, if needed.

The SWC has the ability to display the results of different scenarios side-by-side to compare alternatives or assess the differences between the baseline and post-development scenario. The results from the analysis can be saved as a PDF for presentation purposes. The calculator input file can be saved for future reference.

SWC in Action

The SWC can be used by local stormwater authorities or individuals to assess the performance of LID controls on specific sites to reach stormwater retention goals. For master planning studies, it is advisable to break down the area into parcels with uniform surface characteristics. The Low Impact Development Center used the SWC to prepare the Mount Rainier Urban Green Infrastructure Master Plan for the City of Mount Rainier in Maryland. Published in October 2013, the plan provides a framework to guide community greening activities to improve the water quality of the Anacostia River. Neil Weinstein, Executive Director of The Low Impact Development Center, noted that the SWC "helped us to quickly look at different scenarios and

convey that information to the public and staff about potential ways they could use green infrastructure.” For more information, you may download the [master plan](#).

For More Information

Several helpful resources are available at EPA’s [SWC website](#), including:

- National Stormwater Calculator User’s Guide Version 1.1
- The National Stormwater Calculator - Identifying Green Infrastructure Solutions (Fact Sheet)
- National Stormwater Calculator - A desktop tool that helps users control runoff to promote the natural movement of water (Fact Sheet)
- EPA’s National Stormwater Calculator (YouTube Video)

EPA’s Watershed Academy held a [Web-based seminar on the SWC](#) on October 23, 2013. The speakers explained the design and function of the SWC and walked participants through a demonstration. The slides, audio files, and transcript of this seminar are available for free download.

[For questions about using the SWC, contact the EPA National Stormwater Calculator Team at SWC@EPA.gov. For information about the model itself, contact Lewis Rossman, U.S. Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory; Phone: 513-569-7603; Email: rossman.lewis@epa.gov]

Others Resources

The Center for Neighborhood Technologies (CNT) offers a [National Green Values™ Calculator](#), a national stormwater management calculator that compares the performance, costs, and benefits of LID practices to conventional stormwater practices. The calculator follows a step-by-step process to educate and provide the user with a quantitative analysis of LID benefits and cost savings considered over the full life cycle of the specified site. The CNT calculator is more useful as a cost-comparison tool, while EPA’s SWC provides information on hydrologic performance.

New Watershed Tool Helps Managers Meet Watershed Goals

In late 2013 the U.S. Environmental Protection Agency (EPA) released a new software application designed to help water resource managers and planners meet watershed and/or water utilities management goals. The Watershed Management Optimization Support Tool (WMOST) is a public-domain software application designed to facilitate integrated water resources management related to stormwater, water supply, and wastewater. The tool allows users to screen a wide range of low impact development (LID) and land conservation practices to identify which ones would most cost-effectively achieve their management goals.

WMOST can be used to: (1) identify the most cost-effective mix of management practices to meet projected human demand and in-stream flow standards; (2) understand trade-offs between meeting management goals (e.g., human demand or in-stream flow) and total annual costs; and (3) characterize how sensitive the software’s selected mix of management practices is to the type of parameters and data used (e.g., how would the effects of climate change and resulting changes in runoff and recharge rates affect the mix of least-cost practices identified by WMOST). WMOST calculates the optimal solution based on user inputs of watershed characteristics, human water system characteristics, management practices, and management goals.

A WMOST User Guide, as well as model files, is available for download from the [WMOST website](#). The User Guide provides directions and screenshots explaining how to set up and run the model as well as steps for performing sensitivity and trade-off analyses. The guide provides two case studies: (1) the Upper Ipswich River Watershed in Connecticut and (2) Danvers and Middleton in Massachusetts (two towns that share one water utility). Users may download Excel files for these case studies from the WMOST website; the files include all scenarios and can be used as sources of default data, especially for similar watersheds and similar-sized drinking water utilities and wastewater systems.

WMOST Developed to Support GI and LID Efforts

In recent years, the EPA's state revolving fund (SRF) guidelines have been broadened to include support for LID at the local scale (e.g., best management practices to reduce runoff and increase infiltration in certain areas) and green infrastructure (GI) at the watershed scale (e.g., watershed-wide conservation planning for source water protection). Beginning with the American Recovery and Reinvestment Act, Congress has mandated a 20 percent set-aside of SRF funding for a Green Project Reserve (GPR). The GPR is intended to support GI, LID, and land conservation projects that help to meet water quality goals. EPA's Office of Research and Development, in partnership with EPA Region 1, supported the development of WMOST to help communities evaluate GI, LID, and land conservation practices as part of an integrated water resources management approach. The tool is intended to facilitate the evaluation of LID and GI as alternative or complementary management options in projects proposed for SRF.

How are States Using Clean Water State Revolving Funds for GI and LID Projects?

Issue 93 of EPA's *Nonpoint News-Notes* focused on states' use of Clean Water State Revolving Funds (CWSRF) to support nonpoint source pollution management projects. The CWSRF was established in 1987 to fund the construction of publicly owned treatment works (POTWs), nonpoint source pollution management, and estuary protection projects. Historically, the majority of CWSRF funding has been directed toward POTWs, with only 4.2 percent of cumulative funding provided to nonpoint source projects. Funding nonpoint source projects poses a number of unique challenges for CWSRF programs to overcome. The articles presented in Issue 93 discuss examples of successful programs that states have developed to facilitate the use of CWSRF to manage nonpoint source pollution.

BASINS 4.1 Offers Enhanced Data Tools

The U.S. Environmental Protection Agency (EPA) has released an enhanced version of BASINS (Better Assessment Science Integrating point and Nonpoint Sources). BASINS version 4.1 includes numerous enhancements over Version 4.0, including updates to its underlying geographic information system (GIS) software, updates to the watershed delineation utilities, and enhancements to several data management and analysis tools. The major changes in BASINS 4.1 include:

- The model is built upon the latest stable release of the non-proprietary, open-source MapWindow GIS. The new Map Window interface has changed in appearance, but the main functions remain the same.
- The model includes updated automatic watershed delineation tools that use TauDEM (Terrain analysis using Digital Elevation Models) version 5 from Utah State University. TauDEM is a software program that delineates watershed boundaries from topographic information such as elevation grids, slope, and stream flow direction.
- Two of the main utilities, GENeration and analysis of model simulation SCeNarios (GenScn) and Watershed Data Management Utility (WDMUtil), are available for download separately. The model includes most of the functionality of GenScn and WDMUtil in the core BASINS user interface, making the separate programs unnecessary for most users.
- Design Flow (DFLOW), a tool to estimate design stream flows for use in water quality studies, has been added.
- The Users' Manual has been refined to match the current software.
- The 64-bit compatibility with Windows 8 has been verified.

BASINS was developed by EPA to assist states, local governments, and watershed groups in their efforts to manage their watersheds and develop total maximum daily loads. BASINS is used to integrate environmental data, analysis tools, and watershed and water quality models. Directions for downloading the model and its associated documentation, as well as additional information, are available on EPA's [BASINS website](#).

Reviews and Announcements

Agricultural Nonpoint Source Pollution

Literature Review of Contaminants in Manure Released

The U.S. Environmental Protection Agency's (EPA's) [Literature Review of Contaminants in Livestock and Poultry Manure and Implications for Water Quality](#) is now available. The report was developed as part of ongoing efforts to better understand the environmental occurrence and potential effects related to contaminants of emerging concern. Past reviews of animal manure have focused primarily on nutrient issues. This report focuses on summarizing technical information on other components, particularly pathogens and contaminants of emerging concern such as antimicrobials and hormones that might affect water quality. The report makes no policy or regulatory recommendations; rather, it identifies information gaps that might help define research needs for federal, state, and local partners.

National Assessment Shows Distribution and Trends of Pesticides

The U.S. Geological Survey (USGS) has released [national maps and trend graphs](#) showing the distribution of the agricultural use of 459 pesticides for each year during 1992–2009 for the entire conterminous United States. The maps and supporting national database of county-level use estimates for each pesticide were developed by the USGS for use in national and regional water quality assessments.

Study Shows Groundwater Affects Water Quality Improvements

A study by the USGS, [Quantifying Groundwater's Role in Delaying Improvements to Chesapeake Bay Water Quality](#), finds that it might take several decades for water quality management practices aimed at reducing nitrogen input to achieve their full benefit because of the ongoing influence of nitrogen-containing groundwater. USGS researchers developed a nitrogen mass-balance regression model and applied it to seven watersheds on the Delmarva Peninsula (Eastern Shore of the Chesapeake Bay). The model included the distribution of groundwater return times obtained from a regional groundwater-flow model, the history of nitrogen application on the land surface over the last century, and parameters that account for denitrification. The model was able to reproduce nitrate concentrations in streams and wells over time, including a recent decline in the rate at which concentrations have been increasing. In addition, it was used to forecast future nitrogen delivery from the Delmarva Peninsula to the Bay given different scenarios of nitrogen load reduction to the water table. The relatively deep porous aquifers of the Delmarva yield longer groundwater return times than those reported earlier for western parts of the Bay watershed. Accordingly, several decades will be required to see the full effects of current and future water quality management practices.

Climate Change

Climate Change Literature Synthesis Report Released

The newly released third edition of [Literature Synthesis on Climate Change Implications for Water and Environmental Resources](#) from the U.S. Bureau of Reclamation offers a summary of recent literature on the current and projected effects of climate change on hydrology and water resources. It is organized around the five Bureau of Reclamation regions, which correspond roughly with the Columbia River basin, the Sacramento-San Joaquin River basin, the upper Colorado River basin, the lower Colorado River basin, and the Great Plains. The information in this report is meant for use in a range of planning studies including environmental impact statements, biological assessments, and feasibility studies. Previous versions were published in 2011 and 2009.

Monthly Webinars on Climate-Related Risks in Water Resources

The Sectoral Applications Research Program (SARP) in the National Oceanic and Atmospheric Administration's (NOAA's) Climate Program Office addresses the climate information needs

of stakeholders within key socioeconomic sectors. Working with collaborators such as the U.S. National Integrated Drought Information System, Water Research Foundation, Water Environment Federation, Water Environment Research Foundation, and American Water Works Association, SARP is hosting a [series of webinars](#) on the third Thursday of every month.

President Issues Executive Order on Climate Change Preparedness

President Obama has signed an Executive Order (EO), [Preparing the United States for the Impacts of Climate Change](#), which directs federal agencies to take a series of steps to make it easier for American communities to strengthen their resilience to extreme weather and prepare for other impacts of climate change. The EO addresses modernizing federal programs to support climate-resilient investments; managing lands and waters for climate preparedness and resilience; providing information, data, and tools; and planning for climate change-related risk. The EO also establishes a Task Force on Climate Preparedness and Resilience, comprised of state, local, and tribal leaders from across the country that will use their first-hand experiences in building climate preparedness and resilience in their communities to inform their recommendations to the Administration. The White House released a [fact sheet](#) providing more information about the Task Force, including a list of community representatives nationwide.

Report on Cost-Efficient Climate Adaptation Best Practices Available

NOAA's North Atlantic Regional Team and Sea Grant program released a new report, [Cost-Efficient Climate Change Adaptation in the North Atlantic](#). The report explores community-level coastal flood management and climate change adaptation from Virginia to Maine. The authors identify low-cost, innovative ways that coastal communities are addressing climate change and related coastal hazard management best practices at the local level by looking at studies, laws, policies, outreach tools, and infrastructure investments that were voluntarily adopted by 34 local municipalities.

Stormwater

Case Study Demonstrates How Restoring a Stream Can Help Communities

In May 2013 the USGS released [Restoring a Stream, Restoring a Community—Urban watershed restoration fosters community improvement](#), an analysis of the Watts Branch of the Anacostia River in Washington, D.C. and Maryland's Prince George's County. The report explains how restoration work on this urban tributary has had a substantial impact on the local economy, directly or indirectly accounting for 45 jobs, \$2.6 million in local labor income (salaries, wages, and benefits), and \$3.4 million in value added (the contribution of expenditures to Gross Domestic Product) to the local D.C. metropolitan area in 2011.

EPA Releases Guide for Stormwater Practices on Brownfield Sites

EPA has released a new guide to help communities, developers, and other stakeholders determine the appropriateness of infiltration at vacant parcels and brownfield sites. A brownfield is a property where redevelopment or reuse might be complicated by the presence (or likely presence) of contamination. Many cities are interested in revitalizing urban areas by redeveloping vacant parcels and brownfield sites. Integrating green infrastructure into these sites can provide many environmental and community benefits. EPA's new guide, [Implementing Stormwater Infiltration Practices at Vacant Parcels and Brownfield Sites](#), walks decision makers through six questions to determine whether infiltration or other stormwater management approaches are appropriate for a specific brownfield property.

Faster, Cheaper, Greener Webinar Series Launched

The U.S. Environmental Protection Agency–Region 3 and the Water Environment Federation are teaming up on a new webinar series entitled “Faster, Cheaper, Greener” which focuses on building successful community-based public private partnerships (P3) for affordable green infrastructure urban stormwater retrofits. The initial webinars focused on lessons learned from successful and innovative P3 military housing privatization initiatives. An upcoming webinar will focus on stormwater management incentives and P3 that drive affordable green stormwater retrofits

on private property in Philadelphia. The latest news on upcoming webinars is available on EPA's [Watersheds in the Mid-Atlantic website](#).

Green Infrastructure Webcast Series Launched

The U.S. Environmental Protection Agency's Green Infrastructure Program is pleased to announce its launch of the [2014 Webcast Series](#). This series is generally geared towards public officials and practitioners just beginning to implement green infrastructure, as well as those looking to enhance established programs. Leading academics and professionals from around the country will present a range of topics and applications, from best practices in operations and maintenance to the intersection of green infrastructure and climate change. An upcoming webinar in the series focuses on implementing green infrastructure practices under enforcement orders. To sign up for any webinar, see the website link above.

NEMO Rain Garden App Now Available for iPhone and Android

The Connecticut Nonpoint Education for Municipal Officials (NEMO) program offers a smart phone app for both iPhones and Android devices that is designed to help homeowners and contractors design, install, and maintain rain gardens. NEMO's "[Rain Garden App](#)" leads a user through the proper siting, sizing, construction, planting, and maintenance of a rain garden. It includes tools to help the user determine the proper size of the garden, find out about local soil conditions, estimate the price of construction, and customize a plant list that will delight the eye while soaking up stormwater. In addition, the app includes six short video segments explaining various aspects of rain garden care and feeding. The imagery and plants are currently specific to Connecticut, but the designers are developing a national version that will have extensive databases for each area of the country.

NRDC Reports Highlight Benefits of Green Infrastructure

The Natural Resources Defense Council (NRDC) recently released two green infrastructure reports. The first, [The Green Edge: How Commercial Property Investment in Green Infrastructure Creates Value](#), explores the wide range of benefits that green infrastructure can provide to the commercial real estate sector. Benefits include higher rents and property values; increased retail sales; energy savings; local financial incentives such as tax credits, rebates, and stormwater fee credits; reduced life-cycle and maintenance costs; reduced flood damage; reduced water bills; reduced crime; and improved health and job satisfaction for office employees. The report provides illustrative examples for retail buildings, office buildings, and multi-family residential buildings, showing that the cumulative value of these benefits can total in the millions of dollars over a long-term (40-year) planning horizon. A second report, [Rooftops to Rivers II: Green strategies for controlling stormwater and combined sewer overflows, UPDATE 2013](#), highlights progress made by 20 cities since they were featured by the NRDC in a 2011 report. These 20 cities use green infrastructure to better manage stormwater and achieve a host of non-water benefits, including beautifying neighborhoods, cooling and cleansing the air, reducing asthma and heat-related illnesses, lowering heating and cooling energy costs, boosting economies, and supporting American jobs.

Paper Describes Low Impact Design Competition

In October 2013 the Water Environment Federation (WEF) released [Hosting a Low Impact Development Design Competition](#), a white paper designed to help municipalities and other groups plan a low impact development (LID) competition with the intention of bringing LID practices to the attention of the engineering and landscape architecture design community. In May 2013 WEF hosted a 2-day LID design competition workshop, bringing together representatives from organizations with experience in hosting competitions and those with an interest in holding future LID competitions. WEF developed the white paper based on information generated during the workshop.

Rain Garden Handbook for Western Washington Available

In July 2013 the Washington Department of Ecology released its [Rain Garden Handbook for Western Washington](#) to help homeowners, landscapers, landscape architects, engineers, and other

individuals to plan, design, and build rain gardens. While developed for western Washington, the guide offers valuable information for anyone interested in learning more about rain garden installation.

Rain Garden Outreach and Communications Guide Released

Resource Media recently released *Beautiful, Hard Working Rain Gardens*, a rain garden communications guide designed to help communities develop effective outreach and messaging strategies for rain garden projects. The guide addresses best outreach practices, effective messaging, and troubleshooting.

Scotts Miracle-Gro Removes Phosphorus from its Turf Builder Fertilizer

On World Water Day in March 2011, Scotts Miracle-Gro committed to making its lawn fertilizer products phosphorus-free by the end of 2012, a move applauded by environmental groups across the country as a partial solution to nutrient runoff that affects water quality in waterways. In spring 2013 Scotts Miracle-Gro [announced](#) that it met its commitment and removed phosphorus from its popular Turf Builder brand lawn fertilizer. In addition, the company has also made progress on its 2011 commitment to new consumer communication and education initiatives targeting water quality and conservation. For example, the company has partnered with the National Association of Conservation Districts to educate homeowners on sustainable lawn care practices through a Backyard Conservation program; launched Texas Water Smart, a public/private partnership that has become the state's largest consumer water conservation and education project initiative in just over a year; and has added information about environmental stewardship to its Turf Builder brand product packaging.

Stormwater to Street Trees Guide Released

In 2013 EPA released *Stormwater to Street Trees: Engineering Urban Forests for Stormwater Management*. This guide focuses on the use of integrated siting and design elements, along with case studies, to provide education on enhanced tree management systems to improve stormwater management and retention. The guide illustrates proper tree planting and maintenance techniques and technologies. It also provides information on using engineered systems and offers guidance on a variety of issues such as maximizing root growth area, choosing growth media, considering permeable pavements and overall site drainage, managing right-of-ways, and accounting for utilities. The document will be of particular interest to municipal public works engineers, arborists, water utility planners, state and local water quality agencies, and nonprofit organizations focused on urban stormwater protection.

Washington, D.C. Establishes New Stormwater Standards for Big Box Developments

In July 2013 the District Department of the Environment (DDOE) finalized a new stormwater regulatory framework for large development sites in the District of Columbia. The new framework includes stormwater retention performance standards that will dramatically reduce stormwater runoff's harmful impacts to area waterways. It also includes an innovative Stormwater Retention Credit trading program, which is the first of its kind in the nation. More information is available on [DDOE's website](#).

Water Environment Federation Releases New Stormwater Magazine

In September 2013 the Water Environment Federation launched a new stormwater magazine, *World Water: Stormwater Management*. This quarterly publication will focus on successful efforts to manage runoff and stormwater flows on municipal, industrial, and commercial lands around the world. The magazine may be read online for free. Printed copies are available through the mail for a fee.

Wetrofit Service Offers New Approach to Flooding Prevention

The Center for Neighborhood Technology (CNT) is partnering with local and national experts to pinpoint the greatest opportunities to reduce flooding in neighborhoods and cities across the Great Lakes states. As part of this work, CNT is piloting [Wetrofit™](#), the nation's first wet weather

retrofit service, to help property owners in the Chicago region protect their homes from flood damage. The Wetrofit service will aggressively facilitate the retrofitting of commercial, industrial, public, and residential buildings and land. Work will include simple, low-cost tools such as building rain gardens, repairing private lateral sewage pipes, installing permeable paving, and using rain barrels to collect roof stormwater runoff, among other practices.

Wetlands

Landmark Study Reveals Low Rate of Frog Abnormalities on Wildlife Refuges

An unprecedented 10-year-study by the U.S. Fish and Wildlife Service shows encouraging results for frogs and toads on national wildlife refuges. The [study](#) finds that on average, fewer than 2 percent of frogs and toads sampled on 152 refuges had physical abnormalities involving the skeleton and eyes—a lower rate than many experts feared based on earlier reports. This indicates that the severe malformations, such as missing or extra limbs, repeatedly reported in the media during the mid-1990s were actually very rare on national wildlife refuges. Although this study was not designed to investigate the reasons behind amphibian abnormalities, the results strongly implicate localized causes. This is consistent with other research that has identified contamination, predators, parasites, or the interaction of these as potential factors. The complete dataset from the study is being made available online at the [Dryad Digital Repository](#) to facilitate future research to aid in the conservation of amphibians and their habitats.

Report Shows Connectivity Best for Created Wetlands

New [USGS research](#) found that many wetlands created for habitat do very little to improve water quality problems in streams and rivers. The report notes that these wetland design practices represent a missed opportunity to improve the general ecological health of watersheds and wetland ecosystems. Wetlands are often created for mitigating impacts to wetlands elsewhere. Created wetlands typically range from several acres to tens of acres in size and are usually built with berms to regulate water levels precisely. These wetland creation practices prevent the exchange of water with adjacent streams and rivers. This lack of hydrologic connectivity to streams limits inputs of pollutants (sediment, nitrogen, and phosphorus) to both created and natural wetlands where the detrimental effects of these pollutants could be mitigated. More information is available on the [USGS website](#).

Status and Trends of Wetlands Report Released

The United States is losing wetlands in coastal watersheds at a significant rate, according to a new report released by the U.S. Fish and Wildlife Service and NOAA. The report, [Status and Trends of Wetlands in the Coastal Watersheds of the Conterminous United States 2004 to 2009](#), tracked wetland loss on the Pacific, Atlantic, Gulf, and Great Lakes coasts. It concludes that more than 80,000 acres of coastal wetlands are being lost on average each year, an increase from a previous study that showed that an estimated 59,000 acres of wetlands were lost annually between 1998 and 2004. EPA initiated a federal Interagency Coastal Wetlands Workgroup in response to the losses in the previous report. Federal agencies are collaborating to better understand how wetland trends are affected by land use practices and other factors, and how federal, state, and local programs can better address threats to coastal wetlands.

Other

EPA Releases Report on Importance of Water to Economy

EPA has released the [Importance of Water Synthesis](#) report to help raise the awareness of water's importance to our national economic welfare and to summarize information that public and private decision makers can use to better manage the nation's water resources. It highlights EPA's review of the literature and practice on the importance of water to the U.S. economy, identifies key data gaps, and describes the implications of the study's findings for future research. EPA hopes this report will serve as a catalyst for a broader discussion about water's critical role in the U.S. economy.

EPA Report Details How Development Impacts Public Health, Environment

In June 2013 EPA released a report examining how the built environment—the way we build our cities and towns—directly affects our environment and public health. The publication, [Our Built and Natural Environments: A Technical Review of the Interactions among Land Use, Transportation, and Environmental Quality](#), provides evidence that certain kinds of land use and transportation strategies (i.e., where and how we build our communities) can reduce the environmental and human health impacts of development. The report, the second edition of a popular document published in 2001, summarizes trends in land use, buildings, travel behavior, population growth, and the expansion of developed land. It then discusses the environmental consequences of these trends, such as habitat loss, degradation of water resources and air quality, urban heat islands, greenhouse gas emissions and global climate change, and other health and safety effects. The report concludes by describing ways to reduce such effects using strategies such as safeguarding sensitive areas; focusing development in built-up areas and around existing transit stations; building compact, mixed-use developments; designing streets that are safe for all users, including walkers and bikers; and using green building techniques.

New Drinking Water and Wastewater Utility Resources Available

EPA has been working collaboratively with six national organizations that support drinking water and wastewater utilities to promote effective utility management. Building on the success of this effort, in 2013 EPA and the U.S. Department of Agriculture's (USDA's) Rural Utilities Service developed two important tools that target rural and small water and wastewater systems: the [Rural and Small Systems Guidebook to Sustainable Utility Management](#) and the [Workshop in a Box](#). Both draw heavily from the results of four pilot workshops held for managers of rural and small systems (co-sponsored by EPA and USDA). The Rural and Small Systems Guidebook describes a series of steps to help operators of rural and small systems assess their operations. The Workshop in a Box and supplemental materials help systems and service providers conduct workshops on their own, using the approaches presented in the pilot workshops.

USDA–EPA Partnership Supports Water Quality Trading

In December 2013 the USDA and EPA announced an [expanded partnership](#) to support water quality trading and other market-based approaches that provide benefits to the environment and economy. USDA and EPA are working together to implement and coordinate policies and programs that encourage water quality trading. The purpose of this effort is to support states, interstate agencies, and tribes as they develop and implement water quality trading programs for nutrients, sediments, and other pollutants where opportunities exist to achieve water quality improvements at reduced costs.

USGS Portal Provides Access to Sediment Data

USGS has developed an interactive, [sediment data portal](#) to improve the utility and accessibility of suspended sediment data for watershed managers, policy makers, researchers, and the public. This online database represents the best available compendium of suspended sediment data for streams in the United States. Ancillary information on streamflow condition, sediment grain size, sampling method, and landscape condition are also available within the portal. USGS has been collecting information on sediment transport in streams and rivers since 1889. As the amount and location of sediment monitoring has changed substantially over time, the sediment portal is designed to enable comparisons of historical and current sediment sampling locations and allow access to long-term data sets. For instance, the number of stations with at least 10 discrete suspended sediment samples per decade declined by approximately 40 percent between the 1970s and 2000s; whereas the number of daily record sediment sites declined by about 60 percent during this interval.

Recent and Relevant Periodical Articles

Atlanta's Green Investment

By Margaret Buranen, *Stormwater*, November–December 2013
(www.stormh2o.com/SW/articles/23751.aspx)

This article describes Atlanta's efforts to leverage grant money to manage stormwater, curb flooding, and reduce combined sewer overflows. Using EPA green infrastructure grant money, Atlanta completed six pilot green infrastructure projects in 2012. Projects initially took place in priority areas where heavy flooding led to frequent combined sewer overflows that contaminated people's basements and backyards. In February 2013 the Atlanta City Council approved changes to the city's stormwater ordinance that will affect stormwater management on both residential and commercial properties in the future and will spark more use of green infrastructure.

Colorado's "Taupe Infrastructure"

By the Water Environment Federation, *Stormwater Report*, February 5, 2014
(<http://stormwater.wef.org/2014/02/colorados-taupe-infrastructure/>)

This article discusses the challenges of trying to adopt low impact development (LID) in Colorado, a state that is subject to [western water law](#). These laws assign "rights" to water based on who was allocated rights first. Using LID becomes tricky because, technically, a water right is required to retain, reuse, or to store runoff. This article discusses what is being done in Colorado to work within the confines of the water law system and still promote the use of LID.

Phosphorus and Onsite Wastewater Systems

By the National Environmental Services Center, *Pipeline*, Summer 2013
(www.nesc.wvu.edu/pdf/WW/publications/pipline/PlL_SU13.pdf)

This issue of *Pipeline* focuses on water quality problems caused by phosphorus that is discharged from onsite wastewater treatment systems. The newsletter explains the source of the problem, offers real-world examples, and discusses options for controlling this discharge.

Websites Worth a Bookmark

Climate Change Impacts and Adapting to Change (www.epa.gov/climatechange/impacts-adaptation/)

EPA's climate change website provides relevant resources to those interested in learning more about expected climate change impacts and adaptation options. More specifically, the website lists impacts from climate change and adaptation efforts by region or sector (e.g., water resources, agriculture, forests). The website also provides a number of resources to assist public officials and others with climate change adaptation planning.

EPA's Water Research (www2.epa.gov/water-research)

This website provides links to examples of water research conducted at EPA. Key research areas include Water and Climate; Water and Energy; Watershed Protection; Sustainable Water Infrastructure; Chemical and Microbial Risk; Nutrients Management; Health and Water; Methods, Models, Tools, and Databases; and Grants and Funding for Water Research.

Free Water (<http://vimeo.com/groups/focusforwardfilms/videos/51886318>)

In this award-winning film by Focus Forward, Brad Lancaster explains how to sustainably harvest 100,000 gallons of rainwater per year in Tucson, Arizona, and use it to create a vegetated paradise while protecting water quality. The film is available for viewing online for free.

Urban Water Voices (www2.epa.gov/urbanwaters/urban-waters-voices)

The Urban Waters Voices website offers a series of video interviews featuring locally led efforts to restore urban waters in communities across the United States. These videos feature local efforts and strategies to improve urban water quality while advancing local community priorities.

Calendar

For an updated events calendar, see www.epa.gov/nps/calendar.

April 2014

- 4/7–10 [Evapotranspiration: Challenges in Measurement and Modeling from Leaf to the Landscape Scale and Beyond](#): American Society of Agricultural and Biological Engineers Conference, Raleigh, NC
- 4/22–23 [Raising the Bar: Green Stormwater Infrastructure Planning and Design Workshop](#), South Burlington, VT
- 4/28–5/2 [9th National Monitoring Conference: Working Together for Clean Water](#), Cincinnati, OH
- 4/29–30 [New England Interstate Water Pollution Control Commission's 25th Annual Northeastern Nonpoint Source Pollution Conference](#), Newport, RI

May 2014

- 5/4–7 [14th Biennial U.S. Agricultural Information Network \(USAIN\) Conference—Sustainable Agriculture: Stewardship of Our Information Ecosystem](#), Burlington, VT
- 5/4–7 [National Ground Water Association \(NGWA\) Groundwater Summit: 10 Years of Moving Research to Solutions](#), Denver, CO
- 5/6 [EPA Webcast: Integrating Green Infrastructure into Existing Public Works Projects](#)
- 5/6–9 [17th National Mitigation and Ecosystem Banking Conference](#), Denver, CO
- 5/8–9 [Michigan Green Infrastructure Conference](#), Lansing, MI
- 5/12–14 [GIS and Water Resources VIII: Data to Decisions](#), American Water Resources Association Spring Specialty Conference, Salt Lake City, UT
- 5/12–15 [Symposium on Forestry Best Management Practice Effectiveness in the Eastern U.S.](#), Blacksburg, VA
- 5/27–29 [2014 Headwaters to Ocean \(H2O\) Conference](#), San Diego, CA
- 5/28–30 [Southwest Stream Restoration Conference](#), San Antonio, TX

June 2014

- 6/1–5 [World Environmental & Water Resources Congress 2014](#), Portland, OR
- 6/4–6 [Ohio Stormwater Conference](#), Akron, OH
- 6/8–12 [American Water Works Association Conference and Exposition](#), Boston, MA
- 6/15–19 [8th International Congress on Environmental Modelling and Software](#), San Diego, CA
- 6/30–7/2 [Integrated Water Resources Management: Theory to Application](#), American Water Resources Association Summer Specialty Conference, Reno, NV

July 2014

- 7/1 [EPA Webcast: Green Infrastructure & Climate Change](#)
- 7/13–16 [American Society of Agricultural and Biological Engineers: 2014 Annual International Meeting](#), Montreal, Quebec, Canada
- 7/27–30 [69th Soil and Water Conservation Society International Annual Conference: Making Waves in Conservation: Our Life on Land and Its Impact on Water](#), Lombard, IL
- 7/27–8/1 [16th Annual EPA Region 6 Stormwater Conference](#), Fort Worth, TX

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