Nonpoint Source
News-Notes
January 2016, #99

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

EPA United States Environmental Protection Agency

Notes on the National Scene

GIWiz Helps You Find Needed Green Infrastructure Resources

Do you need assistance navigating the U.S. Environmental Protection Agency's (EPA's) myriad Web pages to find the right green infrastructure resources for your application or community? A new tool, recently developed by EPA, can help sort through the available information.

EPA's Green Infrastructure website is blessed with an abundance of tools and resources designed to help states, local officials and community stakeholders support and promote sustainable water management and planning using green infrastructure. Staff from many EPA offices—Office of Research and Development, Office of Policy, Office of Water, and EPA Regional staff—have worked both independently and in collaboration with external partners over the years to develop hundreds of green

New Hampshire program reduces chloride in runoff. See page 9.

Inside this Issue

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infrastructure tools, publications and other resources to help analyze problems, understand management options, calculate design parameters, analyze costs and benefits, evaluate tradeoffs, engage stakeholders, and develop education and outreach campaigns. And while they are all available to the public, the sheer number of resources can be overwhelming.

What is Green Infrastructure?

Green infrastructure uses vegetation, soils and natural processes to manage stormwater and create healthier urban environments. At the scale of a city or county, green infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water (e.g., rain gardens, planter boxes, bioswales, permeable pavements, green roofs). For more information, see EPA's Green Infrastructure website.

"EPA has heard from the public and communities we work with that the scale of our websites and large numbers of tools and resources can be difficult to navigate and locate," explains Bob Sachs, from EPA's Office of Policy. To help users sort through and find the types of green infrastructure tools they need for their given objec-tives (i.e., learning, researching, designing, or assessing), EPA recently developed and launched the beta version of a new, interactive Web-based search and reporting tool: the Green Infrastructure Wizard. Shortened to GIWiz, the tool is referred to as "gee-whiz."

Using GIWiz

To access tools offered through GIWiz, users may navigate through two primary search options:

(1) The "Quick Links" Wizard (Figure 1) is a simple two-click interface. It allows users to access green infrastructure tools and resources that are customized to a user's specific objective. By clicking the button that best matches their needs, users can select their corresponding objective and view a tailored list of tools and resources.

(2) The "Explore" Search Engine (Figure 2) is a guided, customizable search engine that generates reports based on a user's unique needs. The user answers any or all of the questions noted in the bubbles. At any point, the user may click a "Show Results" button to view a customized list of results or a "Clear Results" button to start over.

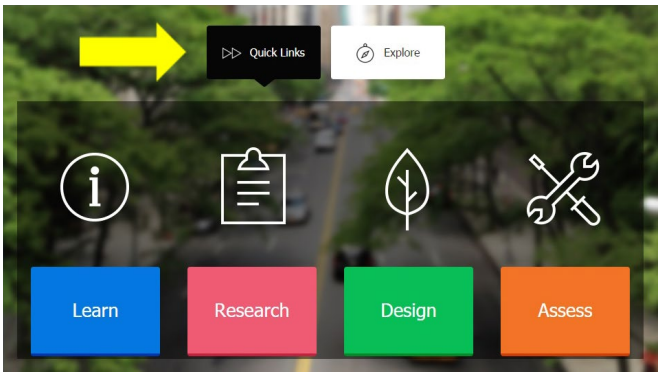


Figure 1. The GIWiz "Quick Links" interface.

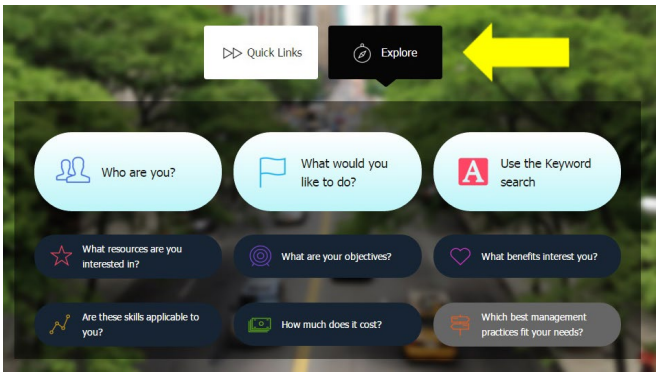


Figure 2. The GIWiz "Explore" interface.

Feedback Encouraged

EPA is actively soliciting feedback on GIWiz, and invites people to send comments through the feedback button available at the top right of the webpage, or via email to giwiz@epa.gov. In particular, EPA welcomes you, the user, to review the key questions under the "Explore" tab and comment on whether these are helpful as guides. Are they the right questions? Are there too many? Furthermore, under each question, do you agree with the character/types and numbers of attributes available for selection? What changes would you suggest?

EPA plans to further refine attributes, gap analysis of tools and resources against user-defined needs, and will continue to expand GIWiz content. A downloadable GIWiz poster is available for educational purposes from EPA.

[For more information, contact Bob Sachs, U.S. Environmental Protection Agency, Office of Policy, 1200 Pennsylvania Avenue, N.W. (Mail Code 1807T), Washington, DC 20460. Phone: 202-566-2884; Email: sachs.robert@epa.gov]

New National Network of Reference Watersheds Increases Access to Information

Do you need reference watershed information for your data analysis project? Check out the National Network of Reference Watersheds (NNRW), a new Web-based resource developed by the National Water Quality Monitoring Council (NWQMC), in cooperation with the U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (EPA). The NNRW provides quality-assured data and information for minimally disturbed watersheds (reference watersheds) and freshwater stream monitoring sites across the continental United States. The website allows users to search the NNRW database of reference watersheds, identify watersheds of interest, and download watershed information and water quality data.

What is a Reference Watershed?

The NNRW defines reference watersheds as those minimally disturbed by human activity, and preferably in an area protected from human-induced changes. The EPA refers to these as healthy watersheds. The database includes many types of reference watersheds; some are considered to be reference watersheds based on any number of characteristics, such as low hydrologic disturbance, limited land use disturbance, water quality, stream biology or some combination of criteria. Data from reference watersheds can be used to measure changes in soil chemistry, vegetation, water quality and biology through time, as well as to compare to disturbed watersheds. The NNRW currently contains information on almost 2,500 reference watersheds across the United States (Figure 1).

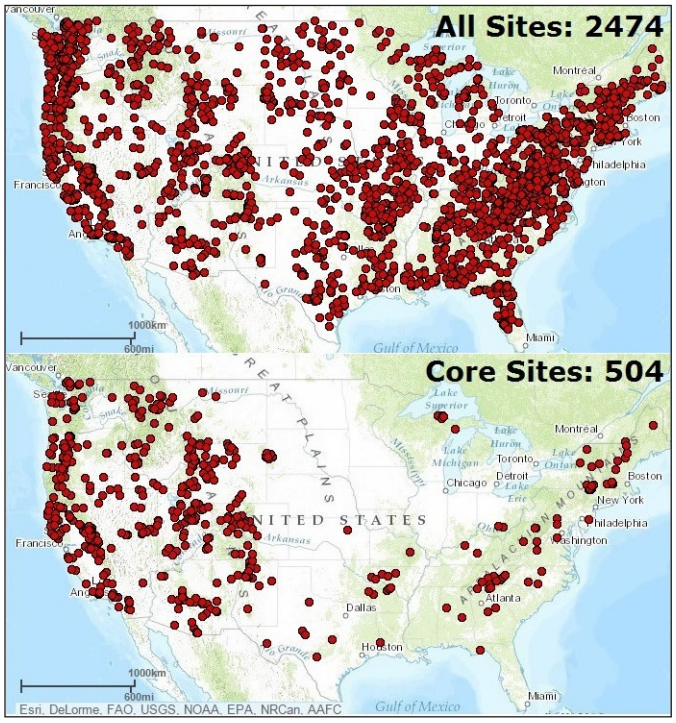


Figure 1. The National Network of Reference Watersheds currently includes 2,474 minimally disturbed reference watershed sites (top map) and 504 pristine core watershed sites (lower map). New sites will be added as the network expands.

A subset of the reference watersheds, referred to as the "core watersheds," includes those watersheds that have stream discharge data available and are considered the most pristine, based on specific land use criteria. The NNRW currently contains information for more than 500 core watersheds (see Figure 1). To be considered a core watershed, the drainage area must have:

- Low hydrologic disturbance (dams, water withdrawal, pollutant discharge, etc.).
- No row crops present.
- Less than 5 percent of land in pasture.
- No medium or high impact development (areas with a mixture of constructed materials and vegetation, where impervious surfaces account for 50–79 percent or 80–100 percent of total cover, respectively).
- Less than 10 percent total development.
- More than 75 percent of land covered by natural vegetation or is barren (bare rock or other earthen material).

Users may search the database of reference watersheds by defining watershed characteristics; data will be queried and accessed through the NWQMC's Water Quality Portal (see box, next page).

At present, the majority of the reference watersheds provided on the NNRW are from the USGS' GAGESII dataset. Several hundred EPA watersheds are also included; additional watersheds will be added as other federal, state, tribal, interstate, academic, local and private sector organizations choose to participate in the network.

"Anyone can submit a site to the network," explains Mike McHale, Research Hydrologist with the USGS. "We have a template of information that must be supplied for the site to be searchable, and a shapefile is necessary for us to calculate all of the watershed land use characteristics. The only requirement for the general NNRW database is that the person or agency submitting the watershed justify why they consider it a reference watershed. For the core watershed section of

New National Network of Reference Watersheds Increases Access to Information (continued)

the network, the watersheds must meet the criteria laid out on the website." For more information about submitting data to the NNRW, email Mike McHale.

How Do I Use the Database?

The NNRW offers self-explanatory tabs on the website that leads users through the process. If more help is needed, an online Users Guide provides details about each website area. Users may navigate to sites via national maps that show both reference and core watershed sites, and may also conduct detailed searches of the network database (based on areas of interest, agency or partner affiliation, water quality data criteria and other parameters). Once a search is performed, the system will report the number of results found, and will then prompt the user to allow the query to be transmitted to the Water Quality Portal for data retrieval.

Background information about the development and function of the NNRW is available in an online fact sheet, *Establishing a Collaborative and Multipurpose National Network of Reference Watersheds and Monitoring Sites for Freshwater Streams in the United States*.

[For more information, contact Michael McHale, Research Hydrologist, U.S. Geological Survey, Watersheds Research Section, 425 Jordan Road, Troy, NY 12180. Phone: 518-285-5675; Email: mmchale@usgs.gov]

The Water Quality Portal: Accessing Multiagency Data

The Water Quality Portal (WQP) provides an easy way to access data stored in various large water quality databases. A cooperative service sponsored by the USGS, EPA and the NWQMC, the WQP integrates publicly available water quality data from the USGS National Water Information System (NWIS), the EPA STOrage and RETrieval (STORET) Data Warehouse, and the U.S. Department of Agriculture's Agricultural Research Service's Sustaining The Earth's Watersheds–Agricultural Research Database System (STEWARDS). As of July 2015, over 265 million results from more than 2.2 million monitoring locations were accessible through the portal. The WQP provides various input parameters on its query form, including location, site, sampling and date parameters to filter and customize the returned results. The WQP can return site information (locations where samples were collected), or it can return sample results (analytical data of collected samples).

Notes from the States, Tribes and Localities

Dedicated Funding Source Allows Minnesota's Watershed Monitoring Program to Reap Rewards

Thanks to the support of its residents, Minnesota has become a national leader in watershed assessment and monitoring. In November 2008, Minnesota voters approved the Clean Water, Land and Legacy Amendment to the state constitution, which protects and restores water resources and wildlife habitat, preserves arts and cultural heritage, and supports parks and trails. The amendment increased the tax rate by three-eighths of one percent on taxable sales, starting July 1, 2009, and continuing through 2034. Of those funds, approximately 33 percent is dedicated to a Clean Water Fund (CWF) to protect, enhance and restore water quality in lakes, rivers, streams and groundwater.

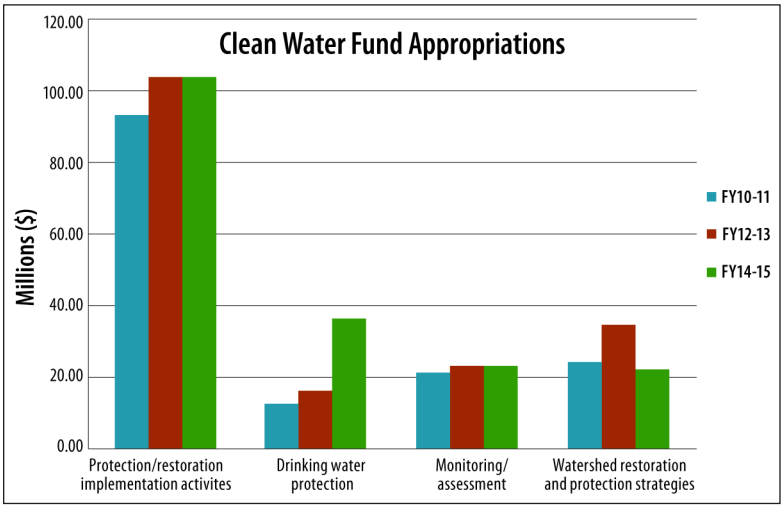


Figure 1. The sales tax receipts received since fiscal year (FY) 2009 have provided considerable funding for the Clean Water Fund. The Minnesota Legislature appropriated approximately $152.2 million for FY10–11, $179.4 million in FY12–13 and $194.9 million in FY14–15 in four key water-related focus areas.

CWF dollars are invested in various water management activities: water quality monitoring and assessment, watershed restoration and protection strategy development, implementation activities, and drinking water protection (Figure 1). Seven years after passage of the amendment, the increased funding for watersheds is paying off—state and local watershed partners know more about the quality of local water bodies, more landowners are implementing projects, the on-the-ground restoration efforts are better targeted, and pollution loads have been reduced.

Dedicated Funding Source Allows Minnesota's Watershed Monitoring Program to Reap Rewards (continued)

Statewide Assessment Produces Water Quality Information

The Minnesota Pollution Control Agency (MPCA) is using the CWF to support a comprehensive statewide assessment of its major watersheds. The funding available to support water quality monitoring has increased from about $1 million annually before the passage of the Clean Water, Land and Legacy Amendment, up to about $8 million annually today. In 2008, this funding allowed MPCA to launch a 10-year-cycle rotational water quality monitoring approach to ensure that all major watersheds are monitored by 2018 (Figure 2). Under this Intensive Watershed Monitoring approach, MPCA staff and local organizations (often supported by grants) work together to monitor an average of eight of Minnesota's 80 major watersheds each year for stream water chemistry, lake chemistry and biological health. The MPCA also maintains a 200-site Watershed Pollutant Load Monitoring Network with continuous flow and storm event and base flow grab sampling at all sites.

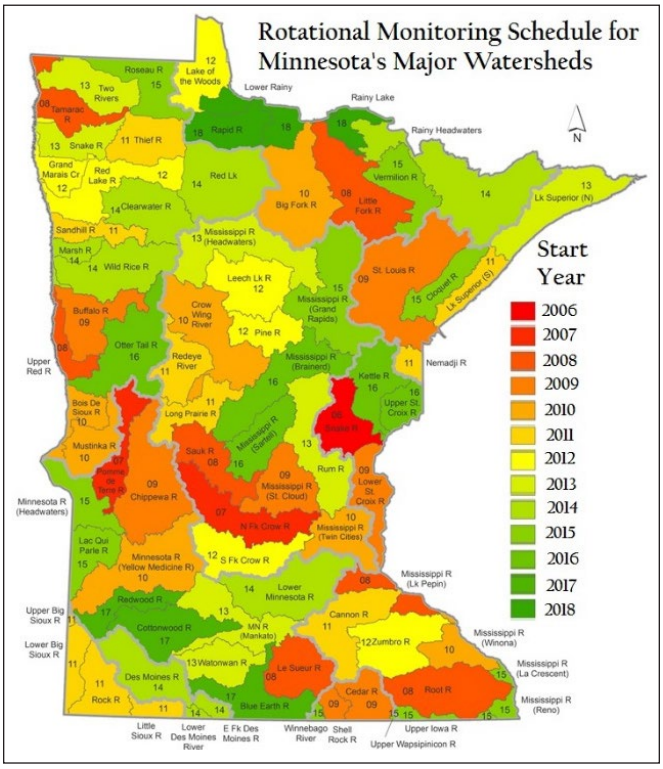


Figure 2. The Minnesota Pollution Control Agency established a schedule to ensure that intensive watershed monitoring is conducted in every major Minnesota watershed by 2018.

This is a massive undertaking. "I am constantly amazed at my staff's ability to get our monitoring work done," notes Glenn Skuta, the MPCA's Surface Water Monitoring Manager. "They constantly overcome challenges with weather, heavy workload, technology problems, and other issues. Plus, I've been very heartened by the level of participation we've gotten from local partners to do monitoring on our behalf."

Watersheds are sampled using the pour-point method, where a systematic sampling near the mouth of watersheds of different size scales is used to measure the condition of the upstream watershed in an unbiased way. Using these data, MPCA determines if the sampled waters meet the water quality standards necessary to protect public health, recreation and aquatic life. Once water quality assessments are made, the monitoring data serve as a starting point for determining the sources and magnitude of pollution for polluted waters, or as a baseline to set protection measures for unpolluted waters. For polluted waters, MPCA works to identify sources of impairment, conducts watershed modeling, and eventually develops watershed restoration and protection strategies (WRAPS).

Having more and better water quality information available is helpful, but it can be unwieldy. "What becomes harder is managing the ever-growing amount of data, doing more and more stressor identification work, working with more and more local partners, and developing more watershed restoration and protection strategies," explains Skuta.

Minnesota is managing the challenges well. In 2015 Minnesota became only the fourth state ever to receive the U.S. Environmental Protection Agency's highest designation as a "Level 4" bioassessment program. (This presentation from the 5th National Monitoring Conference in 2006 provides more information on what's required to earn this sought-after designation).

Targeting Pollution Problems

Once WRAPS are completed, local governments lead the cleanup efforts, working closely with organizations, landowners and citizens. With support from the CWF, these actions include upgrading wastewater treatment plants and septic systems, reducing polluted runoff from city streets and agricultural areas, and implementing other best management practices.

Between 2010 and 2013, the CWF funded more than 325 grants to protect and restore water resources, issued more than 425 loans to prevent nonpoint source water pollution or solve existing water quality problems, secured more than 375 easements to permanently protect approximately 4,264 acres along riparian corridors and within well-head protection areas, repaired 524 subsurface

sewage treatment systems that posed imminent health-threats, and removed the pollution threat posed by 133 feedlots located within riparian shoreland areas. In total, watershed partners have installed more than 2,400 best management and conservation practices, resulting in an estimated reduction of approximately 48,000 pounds of phosphorus and 119,000 tons of sediment across the state.

Monitoring Data is Key for Managing Minnesota's Many Lakes

By the end of the first statewide cycle of watershed monitoring and assessment, MPCA and its partners will have monitored every lake greater than 500 acres in size, and the majority of lakes 100–500 acres in size. MPCA also conducts the water chemistry monitoring for the state's ongoing Sentinel Lakes Program, which is designed to understand and predict the consequences of land use and climate change on lake habitats. This program, led by the Minnesota Department of Natural Resources, involves long-term monitoring of water chemistry, fisheries, habitat and other factors in these lakes as well as detailed assessment of watershed and related characteristics.

Monitoring Program Will Highlight Successes and Challenges Moving Forward

A new monitoring cycle begins in 2019, and new data will be gathered from the same watersheds initially monitored in 2008. These new data will show whether water quality has improved, declined or remained the same in these watersheds. MPCA will have a better sense for which conservation projects have had the most success, and will have a new baseline for performing future watershed restoration work.

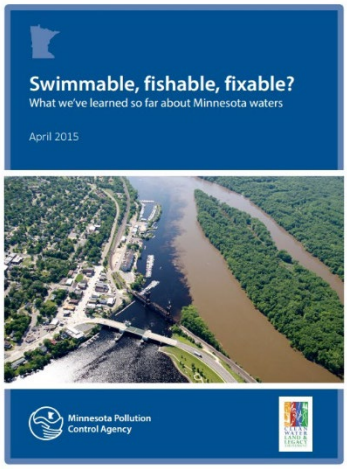


Figure 3. In April 2015 MPCA released this report, which reviews the results of the first half of the statewide 10-year monitoring effort.

Now more than halfway through the first 10-year cycle, certain water quality patterns have begun to emerge, as reported on the MPCA's "How's the Water" webpages, and in the MPCA's 2015 report, *Swimmable, fishable, fixable?* (Figure 3). Not surprisingly, better water quality is seen in watersheds with lower residential populations and less animal agriculture. In watersheds dominated by agricultural and urban land, such as those clustered in southern Minnesota, a mere 50 percent or less of the state's lakes fully support the water quality standard for swimming because of excess phosphorus, which is an important driver of harmful algae blooms in the state. Heavily farmed watersheds tend to have high levels of nitrogen, phosphorus and suspended solids in their waters, which damage aquatic life and recreational opportunities. Urban areas also suffer from elevated levels of water pollution caused by runoff.

"We have seen many of these patterns developing over the last 20 years," explains MPCA Commissioner John Linc Stine. "With the comprehensive watershed information we are gathering, we are much closer to a diagnosis that can point us toward the changes that need to happen."

More information about the watershed monitoring and restoration effort underway in Minnesota is available on the Clean Water Fund website and in the recent Clean Water Performance Report (2014).

[For more information, contact Glenn Skuta, Water Monitoring Section Manager, Minnesota Pollution Control Agency, 520 Lafayette Road, St. Paul, MN 55155. Phone: 651-757-2730; Email: glenn.skuta@state.mn.us.]

Sweeping Clean Water Bill Aims to Improve Vermont's Lakes and Waterways

In June 2015, Vermont Governor Peter Shumlin signed the state's new Clean Water Act (known as Act 64) into law. This significant and comprehensive legislation is creating new pathways to protect Vermont's environmental health by giving the state the authority and capacity to require that more pollution control practices are put into place to protect waterways. Act 64 enables the state to help towns implement modern stormwater management systems that capture and treat polluted runoff from roads, streets and parking lots, which will keep nutrients and sediment out

of Vermont's waterways. It will also direct significant new resources to help farmers and loggers reduce water pollution from their operations, keep livestock out of Vermont's streams, and seek more careful management of tilling practices and manure application.

"Vermont's Clean Water Act opens up a whole new approach to nonpoint source management in the state," explains Rick Hopkins, Environmental Analyst with the Vermont Department of Environmental Conservation's Watershed Management Division. "Along with implementing new regulations, we have a new funding source to manage and are responsible for tracking implementation and water quality improvements. People will want to know the program is making a difference."

On June 16, 2015, Vermont Governor Peter Shumlin signed the state's new Clean Water Act into law while next to Lake Champlain in Burlington, Vermont.

Act 64 provides statutory and funding support for Vermont's Clean Water Initiative, which was released in November 2014. The Initiative outlined priority actions needed to improve water quality statewide and recommended funding options to meet the first stage of funding needs for these improvement programs. To accomplish these priorities, Act 64 amends, enacts or establishes statutes, fees and programs that allow state government agencies to work with stakeholders to reduce polluted storm water runoff from farm fields, roads, parking lots and other developed areas. Specifically, Act 64:

- Amends or enacts multiple statutes related to water quality in the state.
- Establishes or amends certain agricultural fees and requirements, including mandating that small farms certify they are complying with required agricultural practices.
- Reorganizes and enhances the Agency of Agriculture, Food and Markets' (AAFM's) water quality enforcement authority.
- Amends or establishes water quality requirements to be implemented by the Agency of Natural Resources (ANR), including developing a schedule to update 15 river basin plans.
- Revises ANR's statutory authority to regulate stormwater discharges, including expanding requirements for general permits to additional properties.
- Establishes the Vermont Clean Water Fund, which provides funding for (1) state compliance with water quality requirements and implementation of water quality projects or programs; (2) water quality staff positions when needed to maintain compliance with water quality requirements and existing revenue sources are inadequate; and (3) organizations, associations and other entities for community-based water quality programs.
- Establishes 13 ANR water quality positions and funds them through increased fees on water-related ANR permits. Similarly, it establishes eight new AAFM water quality positions, which are funded, in part, from new or increased agricultural water quality fees.

"Act 64 is particularly significant because some nonpoint source pollution sources, such as roads, will now be managed like point sources," notes Hopkins. The state's general permit will be expanded by December 2017 to include runoff from all municipality-owned roads, both paved and gravel. Once the general permit is developed, it will allow the municipalities a certain amount of time to inventory their roads, prioritize problem areas and implement needed best management practices. "Funding will be available to help the municipalities implement projects to comply with the general permit," adds Hopkins.

Act 64 Funds Will Support Projects Through Vermont's Better Back Roads Program

Since 1997 Vermont's Better Back Roads Program (BBR) has provided grants to support projects on town or private roads that improve water quality and result in maintenance cost savings. The original BBR program focused mainly on gravel roads. Anticipated funding for the state's Municipal Mitigation Program per Act 64 will allow municipalities to make improvements on paved roads as well as replace undersized culverts.

Diverse Funding Sources Supports New Requirements

Vermont's Clean Water Initiative, as supported by Act 64, is funded with a combination of federal dollars, money from the state's capital budget, and a new dedicated state Clean Water Fund (CWF). Vermont's capital budget includes $6.75 million for technical assistance and direct investment in water quality projects around the state. This includes $1.6 million in state matching funds, which will leverage $8.2 million in federal U.S. Environmental Protection Agency grants, for a total of $9.8 million for low-interest loans to municipalities through the Clean Water State Revolving Fund. The FY2016 capital budget also increases to $3.75 million the funding for innovative storm water management projects (up from $2.57 million in FY2015), and $1.4 million in funding for the AAFM's cost sharing program for livestock fencing and other agricultural practices (up from $1 million in FY2015). The state transportation bill also includes $3.2 million for stormwater retrofits and other projects to reduce polluted runoff from roads. The new AAFM fees are expected to raise $620,000 in FY2016.

Unpaved roads, such as this one in the town of Plainfield, Vermont, will soon fall under a state general permit. The municipality will be required to ensure the road complies with performance standards or will need to retrofit it with best management practices to prevent erosion. *Photo by the Central Vermont Regional Planning Commission.*

Vermont's new CWF will assist communities and partners in restoring and protecting Vermont's waterways. For its first three years (2016–2018), it will be financed with a 0.2 percent surcharge on property transfer taxes. The surcharge is expected to generate $5.3 million in FY2016. After 2018, the state hopes to have a more sustainable funding resource in place for the CWF.

A CWF Board, which directs the funding, is comprised of the secretaries of AAFM, ANR, the Agency of Commerce and Community Development, and the Agency of Transportation. In November 2015 the board recommended distribution of $10.4 million authorized for the CWF's first two years, including:

- $2,140,000 for municipal stormwater support.
- $1,465,000 for municipal road inventories and improvements.
- $985,000 for grassroots partner support to aid municipalities and farmers.
- $1,750,000 for direct grants to farmers.
- $900,000 for compliance and enforcement of water quality standards on farms by the AAFM.
- $1,150,000 for river channel and floodplain restoration activities to reduce soil erosion and enhance flood resiliency.

The Vermont Department of Environmental Conservation (DEC), which is part of ANR, offers grants for nonpoint source pollution-related projects through its Ecosystem Restoration Program. Some funding from the CWF will be channeled through this existing program to support new projects implemented to comply with Act 64.

The new law will have far-reaching effects, both in the Lake Champlain watershed, which drains 55 percent of Vermont, and the rest of the state, much of which drains into the Connecticut River. "The Vermont Clean Water Act is a big deal for all of the waters of Vermont," said Representative David Deen, Chair of the House Committee on Fish, Wildlife, and Water Resources. "The same water quality protection techniques that will reduce phosphorous discharges in the Lake Champlain watershed and reduce blue green algae blooms will reduce nitrogen discharges in the Connecticut River watershed and reduce the Long Island Sound dead zone."

[For more information contact Rick Hopkins, Vermont Department of Environmental Conservation, Watershed Management Division, 1 National Life Drive (Main 2), Montpelier, VT 05620-3522. Phone: 802-490-6115; Email: rick.hopkins@state.vt.us]

Want More Act 64 Details?

Check out the following resources:

- Act 64 legislative summary
- Clean Water Initiative and Act 64 slide presentation
- Clean Water Fund fact sheets and reports

New Hampshire Road Salt Reduction Program Protects Personal Safety and the Environment

Protecting public safety in icy conditions is a common concern, especially in northern states with long winters. This often leads businesses and snow removal contractors to liberally apply salt products to ice-covered sidewalks and parking lots. The hidden costs of over-application is often borne by the environment—much of the salt is carried into streams and groundwater with meltwater, sometimes making the water unpalatable for drinking and uninhabitable for aquatic life. The state of New Hampshire's successful Voluntary Certified Salt Applicator Program is designed to meet twin goals—protecting public safety and water quality.

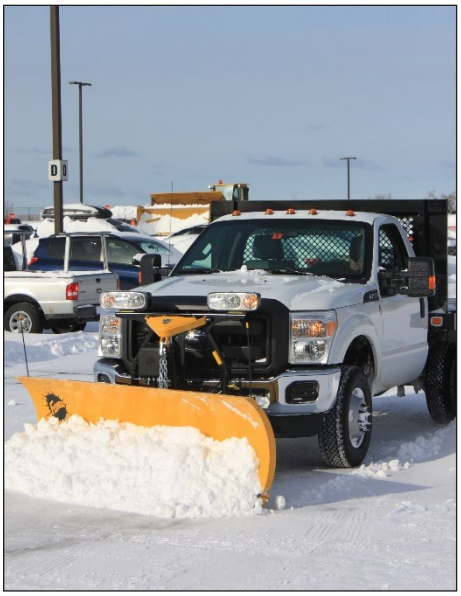
What's the Problem?

When road salt dissolves in water, the chloride molecule easily moves with water flow and is not retained by the soil. Chemical reactions, evaporation or vegetation do not remove chloride in significant quantities. Therefore, nearly all of the chloride applied as road salt will eventually end up in the nearby surface waters or groundwater. New Hampshire's aquatic life water quality standard for chronic chloride requires that chloride not exceed a four-day average of 230 milligrams per liter (mg/L). And although chloride is not toxic to human health at low levels, a human health water quality standard has been established at 250 mg/L (instantaneous maximum) to address the taste and odor issues associated with chloride concentrations above that benchmark.

In the mid-2000s a total maximum daily load (TMDL) study of four small watersheds along the Interstate 93 expansion corridor found that road salt accounted for approximately 90 percent of chloride imported to the watersheds: 10–15 percent from state roads, 30–35 percent from municipal roads and 45–50 percent from private roads and parking lots. Chloride concentrations in some watersheds remained above water quality standards almost 25 percent of the year, with most of the water quality violations occurring during low flow periods in both summer and the winter. The TMDL study found that salt imports in these four watersheds need to be decreased by 24 to 40 percent of 2007 levels to meet water quality standards.

In response to increased monitoring and growing awareness of the issue, New Hampshire Department of Environmental Services (DES) added 19 chloride-impaired waters to the state's 2008 Clean Water Act section 303(d) list. More have been added since then. A total of 47 waterbodies were listed as chloride-impaired in the state's 2014 water quality assessment report.

New Program Aims to Reduce Chloride in New Hampshire Waters



A snow removal contractor scrapes a New Hampshire parking lot.

To address the growing chloride nonpoint source pollution problem, New Hampshire developed a Green SnowPro training course designed to educate commercial salt applicators and municipal staff responsible for snow and ice removal. The course, offered through the University of New Hampshire's Technology Transfer Center, discusses efficient and environmentally friendly winter maintenance practices such as equipment calibration, pre-wetting with brine and other liquids, and changing application rates according to pavement temperature. The goal of the program is to maintain safe parking lot and driveway conditions using as little salt as possible. The course includes 4 hours of classroom instruction, 1 hour of hands-on equipment calibration and brine-making technique demonstrations in the field, and successful completion of a 30-minute exam following the demonstration and classroom time.

Students receiving a passing score on the Green SnowPro exam qualify to apply for the state's Voluntary Salt Applicator Certification and Liability Protection Program, established by state law in 2013 (RSA 489-C and Code of Administrative Rules Env-Wq 2200). The certification program establishes a voluntary system for commercial salt applicators to track their salt use and provide information to the salt accounting system on an annual basis. Under the new law, certified commercial salt applicators and property owners who hire certified

applicators are not liable for damages arising from snow or ice (e.g., slip-and-fall incidents), provided the commercial salt applicator uses best management practices and keeps proper records.

"Interest in the program continues to grow," says Patrick Woodbrey, Salt Reduction Coordinator with the DES Watershed Assistance Section. "Contractors embrace the program as a way to set themselves apart and promote their company." Certified contractors are welcome to use the Green SnowPro logo on company websites and Facebook pages as a way to inform potential clients about their participation in the program.

Clients also benefit from using certified contractors because they save money through the use of efficient winter maintenance practices, and because they are covered under the certified contractor's liability protection. "Just the other day I received a call from a contractor seeking information about the program because one of his clients requested that he become certified," explains Woodbrey. "The client had discovered that his insurance company would give him a discount if he hired a DES-certified snow removal contractor."

The law is fairly new, and no incidents have occurred that have tested its liability protection aspect. However, the law was developed in close coordination with legal experts and the insurance companies, so DES expects it to withstand legal battles.

About 500 individuals have successfully completed the Green SnowPro training and achieved certification.

About 500 individuals have successfully completed the Green SnowPro training and achieved certification. "The program continues to be popular. We expect to issue another fifty to seventy certifications in the upcoming year," says Woodbrey. DES maintains a current list of certified applicators on its certification information webpage.

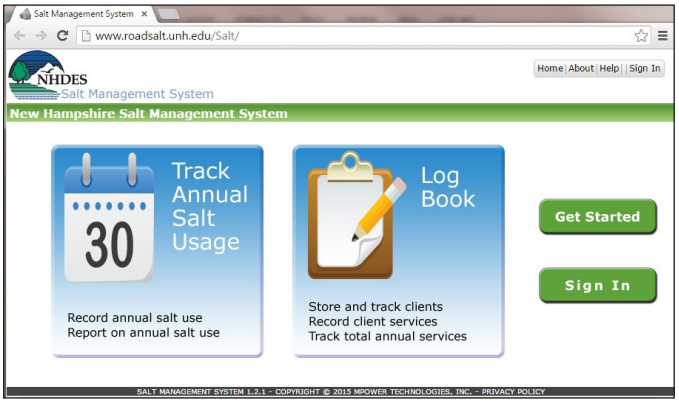
Program Offer Multiple Certification Options

The type of certification sought depends on the company's needs. An individual who performs snow removal services but does not hire employees earns an Individual Certification. Snow removal business owners with one or more employees earn a Master Certification, which serves as an umbrella for the company. Employees applying salt can also earn a Subordinate Certification.

Certification expires every June; to maintain their certification, contractors must apply annually to the DES. There is no fee to apply, but each certified individual must attend at least 2 hours of professional development every 2 years to remain eligible. The University of New Hampshire's Technology Transfer Center offers a 2-hour refresher course for $25. A DES slideshow is available that describes the certification purpose and process.

Program Will Track Salt Usage Over Time

The certification program includes a requirement that each certified applicator must track his or her total annual salt usage in the DES' free online salt accounting system. To ensure maximum liability protection, the certified applicator must also keep track of activities for each storm event, including each site visit, target application rates, weather conditions and use of recommended best practices.



The New Hampshire Department of Environmental Services online road salt accounting system was designed to help snow removal contractors log and track their salt usage and site services.

Unfortunately, the tracking aspect of the program has been slow to start, as some contractors experienced technical issues with the online forms. To address this, DES developed alternative paper forms. DES then enters this information into the tracking system by hand.

Because contractors were not required to track their use before the certification program was established, DES does not have "before" data on contractors' salt use. "At this point we only have anecdotal information pointing to reductions in the amount of salt applied," adds Woodbrey. "Many contractors have told us they've been able to use less."

New Hampshire Road Salt Reduction Program Protects Personal Safety and the Environment (continued)

Woodbrey is hopeful that the combined efforts of municipalities and private snow removal contractors will reduce the number of chloride-impaired waters in New Hampshire. DES has been collecting data in the four small TMDL-study watersheds along the Interstate 93 expansion corridor. Over the past several years the data have begun showing a downward trend in chloride levels, likely due to the efforts by local municipalities to use their salt more efficiently. "It's made a difference," explains Woodbrey. "The SnowPro program is a way to pull the private sector into the salt reduction effort and keep that trend rolling." For more information, see New Hampshire's Road Salt Reduction website, view a short video, or visit the program's Facebook page.

[For more information, contact Patrick Woodbrey, Salt Reduction Coordinator, Watershed Assistance Section, New Hampshire Department of Environmental Services, P.O. Box 95, Concord, NH 03302-0095. Phone: 603-271-5329; Email: Patrick.Woodbrey@des.nh.gov.]

Efforts to Restore Hempstead Harbor Shellfish Beds Provide Insight into Economic Benefits of Large-Scale Restoration Efforts

A successful shellfish restoration effort in New York's Hempstead Harbor is paying off—and that's just the tip of the potential iceberg, according to a new U.S. Environmental Protection Agency (EPA) study. More than a century ago, the harbor struggled with overharvesting, habitat destruction and industrial pollution, problems that led to the decline of shellfishing in the late 1800s and complete closure of the shellfishing waters in 1966. Now, after nearly 50 years of effort, Hempstead Harbor is once again producing healthy shellfish for human consumption. The journey has been arduous, but it's providing insights into the economic returns of environmental restoration, both in Hempstead Harbor and beyond.

Decline Driven By Industry Expansion

Hempstead Harbor is approximately 25 miles from downtown Manhattan on the southern shore of Long Island Sound. Once the most productive oystering bay in New York State, the closure of Hempstead Harbor's shellfishing beds in 1966 was rooted in industrialization. As early as the mid-1800s, the invention of steam-powered dredging and other low-cost and high-yield harvesting technologies of the time led to increases in shellfish harvest volume. By 1880, the threat of overharvesting was so great that New York State imposed restrictions on shellfishing harvesting technology to curb overexploitation. At the same time, the spread of industrialization across the landscape generated greater levels of pollution. The connection between shellfish consumption and illness resulted in the closure of all the shellfish beds in close proximity to New York City in the early 1900s. In 1934, thousands of acres of wetlands near Hempstead harbor were converted to landfills, compounding pollution impacts. The resulting pollution-driven hypoxic (low oxygen) conditions decimated shellfish populations in Hempstead Harbor, leading to the loss of natural water filtration as well as the bottom sediment-stabilizing function the shellfish beds once provided. The harbor was completely closed to shellfishing in 1966.

By the 1970s, Hempstead Harbor was polluted by spills from five oil depots, leachate from landfills and two unfiltered incinerators, industrial hazardous waste, runoff from a quarry, and sewage and oil from storm sewers and thousands of boats populating the harbor's four marinas. Compounding these environmental challenges, jurisdictional responsibility for harbors management and water quality was fragmented among eight local municipalities, Nassau County, and several federal and state environmental agencies.

Journey to Restoration Has Been a Long One

The 1970s brought a growing recognition of environmental problems, formalized at the national level in 1972 through the passage of the Clean Water Act. In 1986, a group of Hempstead citizens formed the Coalition to Save Hempstead Harbor, and one year later, New York State Department of Environmental Conservation (DEC) designated Hempstead Harbor as a "Significant Coastal Fish and Wildlife Area." In 1995, the eight municipalities and various county, state and federal agencies with jurisdiction over the harbor formed the Hempstead Harbor Protection Committee (HHPC).

In 1998 the HHPC created a Water Quality Improvement Plan, describing an extensive set of planned remedial actions. In the following years, the HHPC worked to implement these activities. One wastewater treatment facility was closed and another was upgraded. Superfund sites and landfills were cleaned up. Local wetlands were restored, and steps were taken to better manage stormwater.

Figure 1. Fishermen pull up a rake full of oysters from Hempstead Harbor on June 1, 2011—the first day the harbor had been open to shellfishing in 45 years.

In 2007, in response to persistent bacterial pollution, DEC established a fecal coliform total maximum daily load (TMDL) that called for an ambitious 95 percent reduction in pollution from nonpoint sources. To implement the TMDL, the HHPC upgraded stormwater and point source controls, reduced waterfowl contamination and designated the harbor as a "Vessel Waste No Discharge Zone."

To complement the ongoing efforts to improve water quality in the harbor, the Long Island Sound Study and the National Fish and Wildlife Foundation provided funding for Nassau County to seed two million juvenile shellfish in Hempstead Harbor in 2007 and 1.1 million additional juvenile oysters and clams in 2009.

Restoration Efforts Pay Off Big

Thanks to multifaceted and multijurisdictional efforts, the Hempstead Harbor restoration effort achieved a significant milestone in 2011. Shellfish and water samples from the northern part of Hempstead Harbor finally met human health standards for fecal coliform, heavy metals, chemicals and radionuclides. As a result, in 2011 about one-third of Hempstead Harbor (approximately 2,500 acres) was reopened to shellfishing (Figures 1 and 2).

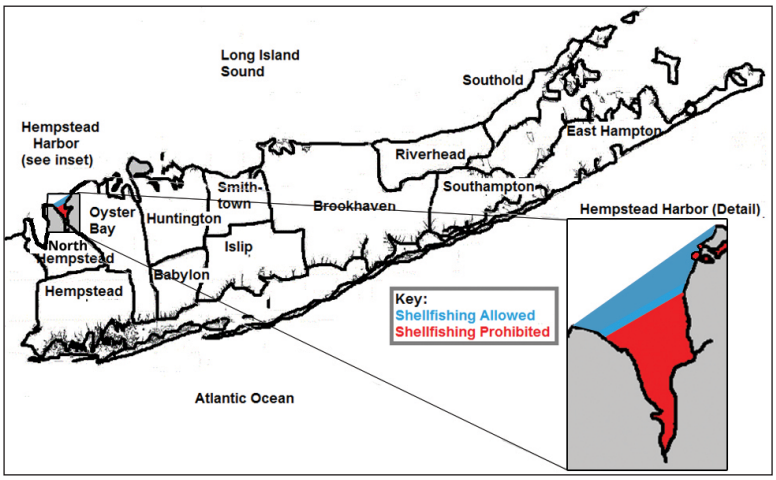


Figure 2. A map of Hempstead Harbor shows the shellfishing area re-opened in 2011 (in blue).

Ongoing monitoring activities in the northern segment of Hempstead Harbor include sanitary surveys, water quality monitoring and shellfish tissue testing. DEC will continue to monitor the water quality of these reclassified areas as part of its participation in the National Shellfish Sanitation Program.

Looking Behind to See Ahead: Economic Valuation of Shellfish Restoration

Because Hempstead Harbor was recently opened after so many years of closure, it presents a valuable opportunity to learn about the economic benefits of shellfish restoration. To that end, EPA conducted an economic valuation study on Hempstead Harbor and developed a simple, replicable, transparent methodology that can be used to estimate the economic value of shellfish restoration projects in Hempstead Harbor and other locations. Although a few existing studies estimate commercial or recreational benefits from shellfish harvests in specific locations, these studies typically rely on location-specific data. EPA's study methodology is designed to be flexible and easy to apply more broadly.

The primarily economic approach EPA used to estimate these benefits is "value transfer," the common practice of using economic values estimated in one location to predict economic values in a different, but sufficiently similar, location. Because a value transfer approach draws on economic estimates from a variety of geographic areas and types of shellfish markets, it does not calculate a locally tailored result. However, by using a variety of best-available existing economic and ecological studies, it has the advantage of being easily applied without requiring the use of proprietary economic models. Overall, the emphasis is on providing rough estimates of each category of benefits.

Figure 3. The EPA study estimated the economic benefits of three different shellfish harvesting scenarios in Hempstead Harbor: post-restoration conditions, medium-term recovery and long-term recovery.

The study evaluated the benefits associated with three different harvest scenarios: post-restoration conditions in the harbor in 2011 and 2012, medium-term recovery that achieves conditions typical of other shellfishing areas in Long Island Sound, and long-term recovery of Hempstead Harbor's full historical shellfish populations (Figure 3). For each scenario, the study quantified a variety of benefit categories, including commercial benefits, recreational benefits, finfish habitat expansion, carbon dioxide sequestration and denitrification (Table 1). The study drew two main conclusions:

1. **The near-term economic benefits of the Hempstead Harbor restoration effort to date have been modest.** Average commercial harvests in 2011 and 2012 were about 2,000 bushels per year of all shellfish species combined, with a dockside value of $139,000. This commercial harvest generated $325,000 in total direct and indirect economic impacts per year and supported 4.9 jobs with $180,000 in annual labor payments. After taking into account economic issues such as harvesting costs and declining demand, the net social welfare benefits from the increased commercial harvest are about $70,000 per year. In addition to these commercial benefits, the near-term effects of the Hempstead Harbor shellfish clean-up could include $40,000 in annual recreational benefits, and $14,000 in annual finfishing benefits (from improved habitat provided by shellfish). Thus, the total near-term social benefits of the Hempstead Harbor restoration could be upwards of $120,000 per year.
2. **The medium-term and long-term economic benefits from eventual full restoration of shellfish populations in Hempstead Harbor could be much more significant.** For example, under the long-term recovery scenario, commercial shellfish harvests are predicted to be 97,000 bushels per year for all species combined, with a dockside value of $6.4 million. This harvest would generate $15.3 million in annual direct and indirect economic impacts, provide $8.4 million in annual labor income, and support 233 jobs. The net social benefits of this increased harvest would be $3.1 million per year. Restoration in shallower waters could support recreational harvests in excess of 10,000 bushels per year and provide $1.0 million in annual recreational benefits, as well as generating $600,000 per year in finfishing benefits and $100,000 per year in carbon sequestration benefits. Many other endpoints would also be affected—ranging from nitrogen sequestration to cultural and historic values. Overall, the monetizable net social benefits of long-term restoration of Hempstead Harbor would likely be approximately $5.0 million per year.

Efforts to Restore Hempstead Harbor Shellfish Beds Provide Insight into Economic Benefits of Large-Scale Restoration Efforts (continued)

Table 1. Total Annual Benefits of Shellfish Bed Restoration, by Recovery Scenario

Benefit Category	Pre-Restoration Baseline (1970–2010)	Recovery Scenarios: Post-Restoration (2011–2012)	Recovery Scenarios: Medium-Term Recovery	Recovery Scenarios: Long-Term Recovery
Monetized Benefits				
Commercial Harvest	$0	$69,730	$1,110,136	$3,179,645
Recreational Harvest	$0	$41,324	$440,937	$1,042,262
Effects on Finfish Harvest	$0	$13,941	$221,964	$635,769
CO_2 Sequestration	$0	$2,428	$37,145	$106,558
Total Monetized Benefits	$0	$127,423	$1,810,183	$4,964,233
Non-Monetized Benefits				
Nitrogen Removal (tons)	0	2	23	66
Other Water Quality Improvements	0	+	+	+
Sediment Stabilization	0	+	+	+
Positive Biofeedback	0	+	+	+
Non-Use Benefits	0	+	+	+
Cultural and Historical Values	0	+	+	+

Data developed by Abt Associates, Inc., under contract with EPA

Other Regions Could Benefit from Study Results

Because the history of environmental problems in Hempstead Harbor are typical of the problems faced in shellfish waters near many coastal urban areas, EPA hopes the results from the Hempstead Harbor shellfish economic valuation study could benefit other areas as well. Although the local details might be different, the broad conclusions about the economic benefits of shellfish bed restoration in Hempstead Harbor could inform other communities considering restoration efforts of their historical shellfish beds.

[For more information, contact Jamal Kadri, U.S. Environmental Protection Agency, Coastal Management Branch, 1200 Pennsylvania Ave., NW, Mail Code 4504T, Washington, DC 20460. Phone: 202-566-1248; Email: kadri.jamal@epa.gov]

Nonpoint Source Success in Story, Wyoming: Fixing Failing Septic Systems Restores Creek

When bacteria from failing septic systems in the unincorporated community of Story, Wyoming, threatened the health of a shallow drinking water aquifer and a local creek, stakeholders jumped into action. A community-level effort, involving voluntary inspections, data collection and septic repair, eliminated the bacterial threat and prompted the county to develop area-specific septic regulations governing future development.

Figure 1. Northern Wyoming's North Piney Creek was impaired by bacteria from leaking septic systems.

In 2005, allegations of surfacing sewage within a Story subdivision prompted the Wyoming Department of Environmental Quality (WDEQ) to conduct a study to evaluate *E. coli* contamination on several surface waters in the area, including North Piney Creek (Figure 1). Originating in the Big Horn Mountains, North Piney Creek is a perennial stream protected by WDEQ for multiple uses, including drinking water, cold-water game and nongame fisheries, fish consumption, aquatic life (other than fish), recreation, wildlife, industry, agriculture and scenic value uses.

WDEQ collected water samples from two sites on North Piney Creek—one above Story and one below. Samples collected in 2005 indicated that North Piney Creek above Story met the *E. coli* criterion protective of primary contact recreation (geometric mean of 126 colony-forming units (cfu) per 100 milliliters (mL). However, samples showed that the site below Story had a bacteria geometric mean of 329 cfu/100 mL, which

exceeded the *E. coli* criterion. This led WDEQ to add a 6.4-mile segment of North Piney Creek (segment WYPR100902060303_01) to Wyoming's 2006 Clean Water Act section 303(d) list of impaired waters for nonsupport of primary contact recreation use.

The 303(d) listing of North Piney Creek, along with concerns that the septic system effluent could be contaminating the shallow alluvial aquifers used for Story's domestic water supply, prompted Sheridan County to identify and address the sources of the bacteria impairment. Work included the county's sponsorship of a CWA section 205(j) project ($39,236 grant funds, plus $19,986 of nonfederal match), one of the goals of which was to educate the public on water quality issues and the need for proper design and installation of septic systems.

To gather information, the county asked residents on a voluntary basis to allow county personnel access to private properties to perform a conditions assessment on existing septic systems. The county also mapped groundwater depths, which helped to improve understanding of the area's hydrogeology and identified areas most prone to bacteria contamination problems.

As part of the data gathering process, the county completed a review of septic system permitting records within Story, finding that roughly half of the 700 housing units did not have septic system permits and that some of the permitted systems were out of date or inadequate. After reviewing data and identifying problem areas, Sheridan County approached Story residents and partnered with them to replace or rehabilitate multiple failing septic systems.

Fixing Failing Septic Systems Solved Problem

At the request of Sheridan County, WDEQ completed follow up sampling on North Piney Creek from 2008 to 2010 to determine if the bacterial impairments had been mitigated. WDEQ collected samples from North Piney Creek during the primary contact recreation season (May through September) in months corresponding to when samples were collected in 2005. Five samples were collected in a 30-day period (each sample separated by at least 24 hours) to calculate a geometric mean in accordance with Wyoming's water quality criterion for *E. coli*. The geometric mean *E. coli* concentrations obtained in 2008–2010 indicated that *E. coli* concentrations at both North Piney Creek sites (above and below Story) attained the criterion protective of primary contact recreation (Figure 2). Geometric mean concentrations at the North Piney Creek site above Story attained the water quality criterion in all years it was sampled. Therefore, the WDEQ is planning to remove North Piney Creek from its 2014 CWA section 303(d) list of impaired waters. This successful restoration project was featured on EPA's website in the *North Fork Piney Creek Nonpoint Source Success Story*.

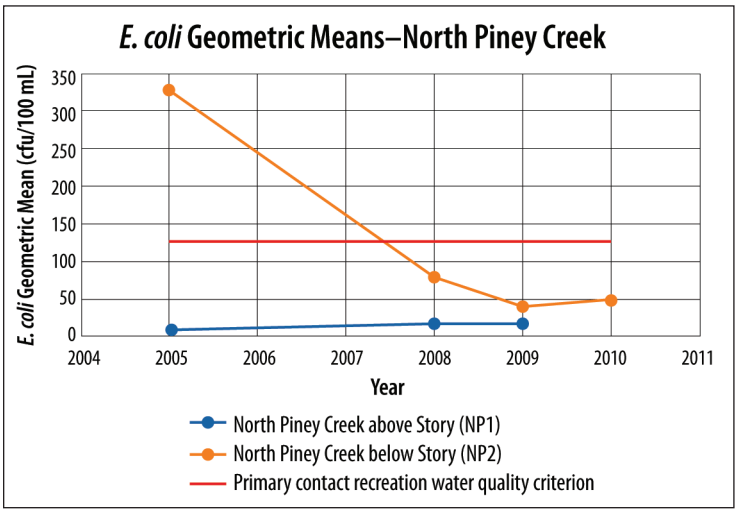


Figure 2. Data show that the North Piney Creek *E. coli* geometric means dropped between 2005 and 2010, thanks to the area's septic system improvement project.

To protect local waters moving forward, the county developed the Story Area Septic System Supplemental Regulations. The new regulations require additional design and construction requirements for septic systems placed in the alluvial material in the Story area, and take into account the location of neighboring wells, the lot size and elevation, the presence of alluvial materials, and other criteria.

Because Story does not have a central water supply or wastewater collection system, each property typically contains a private water supply well and septic system. The new septic rules, approved by the county commissioners in 2012, help to ensure that public and environmental health are protected.

[For more information, contact Ken Muller, Sheridan County, 224 South Main Street, Suite 428, Sheridan, WY 82801. *Phone: 307-674-2920; Email: kmuller@sheridancounty.com]*

Notes on Education

2015 StormTV Project Winners Wow Audiences

The Water Environment Federation (WEF) recently announced the winners of its fourth annual stormwater video competition, the StormTV Project, which highlights innovative stormwater programs, practices, products and public outreach efforts led by stormwater professionals around the world. The competition also serves as a way to collect and share ideas on what's working in the world of stormwater.

"The competition aims to achieve a few objectives," explains WEF's Kristina Twigg. "The primary objective is to build a library of videos that can serve as a resource for the stormwater sector—whether that is sharing interesting projects or public outreach ideas. We also want to recognize organizations for their work on innovative programs, practices, products and public outreach. Lastly, we want to encourage social media sharing of these ideas."

The 2015 StormTV Project received almost 150 submissions. "About half of the organizations submitting to the StormTV Project are local governments and utilities," says Twigg. "In many cases the public outreach videos are intended as public service announcements to generate public understanding or change behavior, and in some cases to help meet the goals of an MS4 permit." Regulated MS4 [municipal separate storm sewer systems] communities are required to conduct public education and outreach to increase awareness of the direct links between land activities, rainfall-runoff, storm drains and local water resources. Videos such as those developed for the competition can help fulfill the public education requirements of permits.

Figure 1. The winning public education video, "Stormwater Pollution – The Dirty Truth: Home Car Washing," highlights the pollution danger posed if you wash your car on an impervious surface that directs flow into a storm drain.

Figure 2. The winning training video, North Carolina's "Keep Restaurant Pollution and Profits From Going Down the Stormwater Drain," highlights how improperly disposing of restaurant washwater in storm drains can negatively impact the health of local streams and lakes.

Winning Entries Rose to the Top of a Highly Competitive Pool

More than 35 expert judges reviewed the 2015 StormTV submissions for message communication and quality as well as content matter and relevance. Judges selected winners in four categories: public education, training, commercial, and programs and projects. "I was truly inspired by the innovation demonstrated by the videos featuring programs and projects," says Elizabeth Krousel, a judge and program manager with Michael Baker International. The following winning videos were shown and received their awards during a ceremony at WEFTEC® 2015 in Chicago in September 2015.

Public Education Video Winner

The Australian Car Wash Association won the public education category award for the video, "Stormwater Pollution – The Dirty Truth: Home Car Washing," which was developed as part of the nonprofit Australian Car Wash Association's public awareness campaign to encourage car owners to visit commercial car washes and keep stormwater pollution out of local waterways (Figure 1).

Training Video Winner

The University of North Carolina Institute for the Environment (UNC-IE) and the town of Chapel Hill, North Carolina, won the training category award for the video, "Keep Restaurant Pollution and Profits From Going Down the Stormwater Drain" (Figure 2).

In 2009, Chapel Hill's Stormwater Management Division responded to many reports of restaurants illegally discharging wash water and organic wastes into storm drains. To stop these discharges, the town and UNC-IE collaborated to produce educational posters, handouts and videos, including the award-winning one. These materials are now being used nationwide to train restaurant workers about preventing pollution. The winning video shows viewers how to properly store and dispose of wastes to protect businesses and water quality. Since the training program began, restaurant employees in Chapel Hill have reduced the number of dumping violations, and several businesses have invested in constructing or improving washout areas to avoid sending wash water and organic matter into storm drains.

Figure 3. The winning commercial category video, "Gilardi's Segment," highlights how the use of a rainwater harvesting system has enabled a local restaurant to use rainwater instead of city water for the garden vegetables grown on-site.

Figure 4. The winning programs and projects category video, "Bishan-Ang Mo Kio Park," reports on a project that replaced a concrete channel with a vibrant, sinuous urban river.

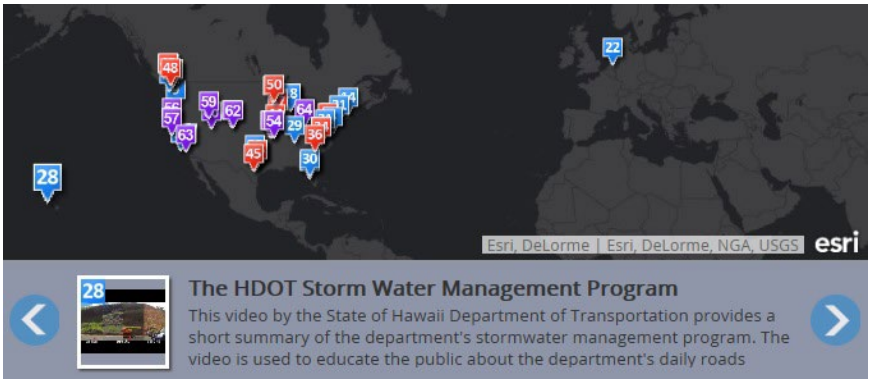


Figure 5. The 2015 StormTVProject map offers a quick look at the distribution of videos describing programs and projects (noted in blue), videos produced commercially (noted in purple), and videos developed for training purposes (noted in red). Users can click on each tab to view a short summary of the video under the map, as seen here for video #28 from Hawaii. To view an entire selected video, the user would navigate to the YouTube StormTV Project playlist.

Commercial Video Winner

Enginuity, LLC, the makers of RainReserve (rainwater harvesting products) won the commercial category award for the video, "Gilardi's Segment" (Figure 3). Enginuity's video features a rainwater harvesting system installed in the urban community garden of Gilardi's Italian Restaurant in Springfield, Missouri. Using the RainReserve system, Gilardi's owner James Martin has reduced his water bill. He uses stored rainwater to grow food, both to serve in his restaurant and to donate to local charity organizations.

Programs and Projects Video Winner

Atelier Dreiseitl, a Ramboll-Environ Company, won the programs and projects category award for the video, "Bishan-Ang Mo Kio Park" (Figure 4). Atelier Dreiseitl redesigned a 1.7-mile-long straight concrete drainage channel (the Kallang channel) into a sinuous, natural river that is now 2 miles long and meanders through Singapore's Bishan-Ang Mo Kio Park. The project redesigned 153 acres of the park to accommodate dynamic river processes, including fluctuating water levels, and to benefit park-goers. This project is part of a long-term initiative to transform Singapore's water bodies beyond their drainage and water supply functions into dynamic spaces for community bonding and recreation.

Competition Has Wider Goals

In addition to being a competition, the StormTV Project is also helping to build a library of videos that describe inventive stormwater programs, practices, products and public outreach efforts. Since the competition launched in 2012, WEF has collected links to 366 videos, which are displayed on the StormTV Project playlist on WEF's YouTube channel.

WEF promotes the videos in a variety of ways, including through press releases to the media; social media channels; the WEF e-newsletters *Highlights*, *WaterLog* and *The Stormwater Report* (with a combined distribution of more than 100,000); and WEF's international stormwater magazine, *World Water: Stormwater Management*. The outreach is generating interest, notes Twigg. "The playlist has been viewed nearly 16,000 times since February 1, 2014."

2015 StormTV Project Winners Wow Audiences (continued)

To help visitors find videos for particular regions, this year's submissions also are displayed by location through two interactive maps: the first online map notes locations of public education videos, and the second online map (Figure 5, previous page) shows locations of videos describing programs and projects and manufactured treatment devices as well as videos developed for training purposes. "Users can embed the maps on their website or share them via social media," says Twigg. As the project continues to grow, WEF hopes to acquire a project sponsor and develop a database that enables users to find particular videos through category and keyword searches.

More details about each project are available on WEF's 2015 StormTV Project winners announcement. For general information about the contest, including news about the upcoming 2016 contest, visit WEF's StormTV Project website.

[For more information, contact Kristina Twigg, Associate Editor, World Water: Stormwater Management, Water Environment Federation, 601 Wythe Street, Alexandria, Virginia 22314. Phone 703-684-2400 Ext. 7739; Email: ktwigg@wef.org]

Reviews and Announcements

Agricultural Nonpoint Source Pollution

Concentrated Animal Feeding Operations Affect North Carolina Stream Water Quality

Concentrated animal feeding operations (CAFOs) have measurable effects on stream water quality in many agricultural watersheds in the North Carolina coastal plain, according to a report released June 23, 2015, by the U.S. Geological Survey. The report, *Surface Water Quality in Agricultural Watersheds of the North Carolina Coastal Plain Associated with Concentrated Animal Feeding Operations*, explores the findings of a study conducted in cooperation with the North Carolina Department of Environment and Natural Resources, Division of Water Resources. Most of the water quality properties and constituents varied significantly among the six sampling periods studied, changing both seasonally and in response to hydrologic conditions. The differences noted among the sampling periods indicate that the interactions between seasonal climatic differences, streamflow conditions, and instream biotic and abiotic processes are complex and their integrated effects can have varying degrees of influence on individual nutrients. Land applications of waste manure at swine CAFOs influenced ion and nutrient chemistry in many of the North Carolina Coastal Plain streams that were studied.

Minnesota Brewery Rewards Farmers for Protecting its Source Water

Because water is a critical part of the beer-production process, Minnesota's Third Street Brewhouse recognizes the farmers working to protect its water sources as part of the Minnesota Agricultural Water Quality Certification Program. In coordination with the Stearns County Soil and Water Conservation District (SWCD), each farmer who becomes certified in the Middle Sauk River pilot area receives a six-pack of the brewery's Rise to the Top Cream Ale. The Stearns County SWCD is piloting the certification program, working in partnership with the Minnesota Department of Agriculture.

Minnesota Passes Law Requiring 50-Foot Stream Buffers

In June 2015, Minnesota Governor Mark Dayton signed into law legislation requiring new perennial vegetation buffers of up to 50 feet along certain rivers, streams, and ditches. Known as the Buffer Initiative, this effort will protect Minnesota's water resources from erosion and runoff pollution by establishing 110,000 acres of perennial vegetative cover adjacent to Minnesota's waters. Crafted with input from stakeholder groups, legislators from both parties, and landowners, the Buffer Initiative will be led by the Minnesota Department of Agriculture, Minnesota Board of Water and Soil Resources, Minnesota Department of Natural Resources (DNR), and the Minnesota Pollution Control Agency. Landowners retain use of the buffer, as long as perennial vegetation is maintained. By July 2016, the DNR will establish a map of each county that shows the waters that are subject to the buffer requirements. Landowners may install buffers on their own

at any time, or can wait until the buffer protection maps are complete. Buffers must be in place on all designated public waters by November 1, 2017, and on all public drainage systems by November 1, 2018. More information is available on the Minnesota Board of Water and Soil Resources 2015 Buffer Legislation webpage and the Minnesota DNR Buffer Mapping Project webpage.

Ohio Law Limits Manure and Fertilizer Application

In July 2015 a new Ohio law took effect restricting the application of manure and fertilizer (i.e., nitrogen and phosphorus) on frozen, snow-covered or saturated ground in the 24 counties making up the western Lake Erie basin. Application is also restricted if the local weather forecast calls for a greater than 50 percent chance of precipitation exceeding one inch in a 12-hour period for fertilizer and one-half inch in a 24-hour period for manure. A producer may apply fertilizer or manure if it can be injected into the ground, incorporated within 24 hours or applied to a growing crop. The Ohio law is intended to help control algae growth in Lake Erie and its western basin. More information is available at the Ohio State University Extension Agricultural Law and Taxation website.

Online Portal Offers Farmers Expanded Conservation Management Options

Farmers, ranchers and private forest landowners have the opportunity to track their conservation program activities with U.S. Department of Agriculture's (USDA's) Natural Resources Conservation Service (NRCS) through a new online portal, the Conservation Client Gateway (CWG). Producers across the country can work with conservation planners online to access Farm Bill programs, request conservation assistance and track payments for their conservation activities. CWG is entirely voluntary, giving producers a choice between conducting business online or traveling to a service center. It enables farmers, ranchers and private landowners to securely:

- Request NRCS technical and financial assistance
- Review and sign conservation plans and practice schedules
- Complete and sign an application for a conservation program
- Review, sign and submit contracts and appendices for conservation programs
- Document completed practices and request certification of completed practices
- Request and track payments for conservation programs
- Store and retrieve technical and financial files, including documents and photographs

More information is available on the CWG fact sheet and the CWG Frequently Asked Questions page.

Webinars Portal for Conservation of Natural Resources

USDA's Webinar Portal for Conservation of Natural Resources provides links to webinars that focus on natural resources topics. The portal serves as a launching point for current and on-demand webinars, and provides a platform where natural resource professionals, landowners and others can find up-to-date information for the fields of forestry, conservation, bioenergy, climate change and other topics related to natural resources. Webinar portal partners include the Southern Regional Extension Forestry Office, North Carolina State University's Extension Forest Resources, Texas AgriLife Extension Service, land-grant universities, and the U.S. Department of Agriculture (i.e., Natural Resources Conservation Service, Forest Service and the Northeast Climate Hub).

Climate Change

Adaptation Strategies Guide for Water Utilities Updated

EPA recently updated its *Adaptation Strategies Guide for Water Utilities*. The guide provides adaptation strategies for impacts to water sector utilities associated with climate change, such as drought, water quality degradation, ecosystem changes, and changes in service demand and use. The guide features information based on updated models data from the *U.S. Global Change Research Program 2014 Report*. Additional features of the 2015 edition include sustainability briefs addressing green

infrastructure, energy management and water demand management. It also contains updated water utility climate adaptation case studies.

EPA National Water Program Releases Climate Change Reports

EPA's National Water Program has released the *2015 Workplan for Climate Change*. This plan outlines the actions that the EPA National Water Program plans to take in 2015 to implement the *EPA National Water Program 2012 Strategy: Response to Climate Change* (2012 Strategy). The 2012 Strategy describes long-term goals for the management of sustainable water resources in light of climate change. It is intended to be a roadmap to guide program planning and inform decision-makers during the Agency's planning and budgeting process. The 2015 Workplan builds on work conducted in 2012–2014 and is structured around five long-term programmatic areas: water infrastructure, watersheds and wetlands, coastal and ocean waters, water quality, and working with tribes. EPA's National Water Program also released the *2014 Highlights of Progress Report*, which summarizes the major accomplishments addressing climate change and water by the EPA National Water Program, EPA Office of Research and Development, and EPA regional water programs during 2014.

New Academic Consortium Formed to Tackle Urban Water Crises

A new Urban Water Innovation Network, a consortium of 14 academic institutions and key partners across the United States, has been formed to collaborate on addressing challenges that threaten urban water systems. Researchers hope to develop solutions to help communities increase the resilience of their water systems and enhance preparedness for responding to climate change-related water crises. The National Science Foundation has awarded the consortium a $12 million grant through its Sustainability Research Networks program to support the initiative.

Resilience AmeriCorps Pilot Program Announced

The Rockefeller Foundation and the nonprofit Cities of Service are teaming up with federal agencies to launch Resilience AmeriCorps, a pilot program designed to help communities plan and implement efforts necessary to become more resilient to extreme weather and other impacts of climate change. Through the pilot program, AmeriCorps VISTA members will serve in up to 12 communities in 2015–2016, where they will build volunteer networks to carry out program initiatives, and create education and outreach materials to strengthen awareness and citizen engagement in low-income communities.

Workbook Helps Communities Develop Risk-Based Climate Change Adaptation Plans

EPA's Climate Ready Estuaries Program developed a workbook, *Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans*, which provides climate change adaptation guidance for communities and organizations. The workbook explores how to conduct risk-based climate change vulnerability assessments and develop adaptation action plans. Other resources and tools are available on EPA's Climate Ready Estuaries Program's risk-based adaptation webpage.

Data Resources

NOAA Releases Green Infrastructure Mapping Guide

NOAA's new Green Infrastructure Mapping Guide teaches geographic information system (GIS) specialists how to incorporate green infrastructure strategies directly into their mapping projects to help plan for flood-related hazards. This online guide offers a GIS work plan and easy access to examples, case studies and templates.

Series of Smart Phone Apps Will Maximize Land's Productivity and Protect Resources

As part of a 5-year, multi-organization project called the Land Potential Knowledge System, USDA and its partners are developing a suite of mobile phone applications ("apps") to connect agricultural producers around the world. The first two apps, dubbed "LandInfo" and "LandCover," were released in May 2015. These apps allow anyone using the mobile phone technology to collect

and share soil and land cover information as well as gain access to global climate data. LandInfo's primary objective is to make collecting soil data easier for non-soil scientists. It also provides useful feedback, including how much water the soil can store for plants to use, average monthly temperature and precipitation, and the length of the growing season based on the user's location. A yard or meter stick with five notches is all that's needed to document tree, grass, bare ground and crop-residue cover. The app automatically generates basic indicators of these cover types on the phone. Once a connection is established, the app sends the data to servers, where it will be stored and accessible to users worldwide. LandInfo and LandCover are currently available on Android. Availability on other platforms, including iPhones, is planned by early 2016. A future app (LandPotential) will use the LandInfo information together with Internet cloud-based models and additional knowledge bases to help users identify and select management systems that increase production while reducing soil erosion.

Education

Do-It-Yourself Lake Science App Available

Investigate freshwater ecosystems where you live with the DIY Lake Science App from the University of California–Berkeley's Lawrence Hall of Science, funded by the National Science Foundation. This free app (for the iPhone and iPad) allows families and educators to investigate lakes and other freshwater ecosystems wherever they go. The app allows users to explore how lakes change (in the "Under the Lake" simulation), conduct 12 hands-on activities using everyday items, and view videos on lake science. Each activity includes material lists, step-by-step instructions and detailed explanations.

EPA Water Quality Modeling Workgroup Webinars Available Online

EPA formed the Water Quality Modeling Workgroup in 2013 to facilitate collaboration among EPA and state employees who use water quality models for Clean Water Act (CWA) regulatory purposes, primarily in the total maximum daily load (TMDL) and water quality standards programs. The workgroup steering committee consists of water quality professionals from EPA's regional offices and headquarters. The group hosted a series of six 2-hour webinars in 2015 to help other water quality professionals better understand how models can help solve problems facing water quality regulators. The first three webinars addressed modeling basics, such as selecting, developing, and running hydrology and water quality models. The last three webinars focused on modeling specific pollutants (e.g., nutrients, sediment, metals) and other emerging issues. Archived versions of the webinars are available.

Student Contests Promote Nonpoint Source Pollution Awareness

As part of its efforts to educate the community about water topics, the Metropolitan North Georgia Water Planning District (Metro Water District) holds an annual high school video contest and middle school essay contest. The 2015 high school video topic was "Here's the Scoop on Pet Waste," and more than 200 students participated. The contest includes cash prizes ($1,500 first place, $1,000 second place, and $500 third place). The winning entries are featured on the video contest website and will air throughout the region on local television access stations. The applicants used creative approaches such as writing and singing original music to deliver messages centered around the threats pet waste can pose to people's health and the environment. For the 2015 middle school essay contest (300 to 500 words), students were asked to address the following question: "Why is stormwater pollution a problem and what can you do to prevent it?" More than 1,900 students participated. The district-wide winner received $500 and 15 county winners received $100 each.

Toolkit Aims to Reduce Marine Debris

To help reduce marine debris and coastal pollution, the Product Stewardship Institute, EPA, and the University of California released a new Marine Debris Campus Toolkit designed to help college campuses and other institutions cut the amount of plastic waste generated. The toolkit offers users a plastic footprint calculator, source reduction plans, ideas for alternate purchasing practices, successful examples from other institutions, and more.

Green Stormwater Infrastructure

Benefits of Community Based Public-Private Partnerships Highlighted in Report

EPA Region 3 has released *Community Based Public-Private Partnerships (CBP3) and Alternative Market-Based Tools for Integrated Green Stormwater Infrastructure: A Guide for Local Governments*. The guide comes out of a multi-year effort by the EPA Region 3 office and its partners to identify tools to help Mid-Atlantic communities address their water quality challenges through faster, cheaper and greener methods. The report introduces the CBP3 approach as a flexible, performance-based platform for developing affordable, integrated green stormwater infrastructure to meet a variety of regulatory and community needs. It also gives background information on traditional public-private partnerships (P3s) and how CBP3 model differs. Furthermore, the guide contains descriptions of financing alternatives and market-based tools. Although the guide was developed for Mid-Atlantic states, it offers information applicable nationwide.

Report Reviews Green Infrastructure Practice Performance

A new report, *Green Infrastructure: Lessons from Science and Practice*, demonstrates the importance, as well as the limits, to green infrastructure. Scientists from Syracuse University, the Cary Institute, and Harvard University, in partnership with the Science Policy Exchange, gathered data on the performance of eight green infrastructure technologies, including green roofs, grassed swales, constructed wetlands and porous pavement. They analyzed the technologies' effectiveness at reducing storm water volume during summer and winter seasons, and also assessed how well these practices reduced loads of six common pollutants (e.g., suspended sediment, nitrogen, phosphorus, chloride, lead and cadmium). They found that green infrastructure holds great promise, but that performance varies by technology, season and site.

Gulf of Mexico

Deepwater Horizon Draft Comprehensive Restoration Plan Issued

On October 5, 2015, the Deepwater Horizon (DWH) oil spill Natural Resource Damage Assessment Trustees (including EPA) proposed a comprehensive, integrated, ecosystem plan for the Gulf of Mexico. The draft plan is based on an assessment following the impacts of the spill on the Gulf's natural resources and the services those resources provide. The draft plan includes a detailed framework for how the trustees will use the natural damage recoveries from the settlement with BP to restore the Gulf environment. The public comment period for the proposed comprehensive restoration plan (DWH Oil Spill Draft Programmatic Damage Assessment and Restoration Plan (PDARP)) and Draft Programmatic Environmental Impact Statement (PEIS) ended December 4. The PDARP and PEIS, as well as additional information, are available at NOAA's Comprehensive Restoration Plan for the Gulf of Mexico website.

Deepwater Horizon Draft Settlement Reached

The United States and the five Gulf of Mexico states also announced a historic settlement with BP to resolve civil claims against BP arising from the April 20, 2010, well blowout and oil spill. The settlement resolves the governments' civil claims under the CWA and natural resources damage claims under the Oil Pollution Act, as well as economic damage claims of the five Gulf states and local governments. Altogether this settlement is worth $20.8 billion. The settlement includes $5.5 billion for federal CWA penalties, the largest civil penalty in the history of environmental law, 80 percent of which will go to restoration efforts in the Gulf region pursuant to the RESTORE Act. The settlement also includes $8.1 billion in natural resource damages, including $1 billion that BP already committed to pay for early restoration, for joint use by the federal and state trustees to restore injured resources. The natural resource damages money will fund Gulf restoration projects that will be selected by the federal and state trustees to meet five restoration goals and 13 restoration project categories (e.g., restoring water quality, reducing nutrients, restoring and conserving habitat).

Gulf of Mexico Hypoxic Zone Grew by 28 Percent in 2015

The 2015 zone of depressed oxygen levels in the Gulf of Mexico, commonly known as the 'Dead Zone,' spanned 16,760 square kilometers (approximately 6,474 square miles)—about the size of Connecticut and Rhode Island combined—making it the largest since 2002, when the Gulf dead zone stretched over 22,000 square kilometers. The 2015 dead zone was 28 percent larger than in 2014. The average size for the last five years, including 2015, is 14,024 square kilometers (5,543 square miles), which is three times larger than the environmental target (5,000 square kilometers; 1,991 square miles) approved by a federal/state task force in 2001 and re-ratified by the same task force in 2008 and again in 2015. "Heavy June rains contributed to the larger-than-average size," said Nancy Rabalais, executive director of the Louisiana Universities Marine Consortium, who leads an annual survey cruise that measures the size and severity of the dead zone. More information is available in this Louisiana Universities Marine Consortium press release.

Other

RAND Report Reviews Robust Decision Making Methods for TMDLs

Researchers from the nonprofit RAND Corporation released a paper, *Managing Water Quality in the Face of Uncertainty: A Robust Decision Making Demonstration for EPA's National Water Program*, exploring how Robust Decision Making (RDM) methods could help EPA and its partners develop TMDL implementation plans that are more robust to deal with the impacts of climate change and other uncertainties.

Recent and Relevant Periodical Articles

Floating Treatment Wetlands Show Promise as Pond Retrofit (in the Water Environment Federation's Stormwater Report*, September 3, 2015 issue).*

As discussed in this article, floating treatment wetlands (FTWs) are an emerging innovation in green technology that has significant potential for stormwater management. Research efforts and pilot installations in the United States and elsewhere have shown strong potential for the use of FTWs to remove nutrients and other contaminants from stormwater retention ponds. Floating treatment wetlands have been credited with contributing to the water quality improvement of Harveys Lake in Pennsylvania, as explained in this 2015 EPA *Nonpoint Source Success Story*.

*The Streetscapes of San Francisco (*Stormwater*, July/August 2015)*

This article contains information about San Francisco's use of green stormwater infrastructure and how the city is using green infrastructure to address combined sewer overflows, aging infrastructure and seismic vulnerability. Through its 20-year Sewer System Improvement Program, San Francisco has committed to investing $400 million in green stormwater infrastructure projects.

Websites Worth a Bookmark

Addressing Climate Change in the Water Sector (http://www.epa.gov/climate-change-water-sector)

EPA's National Water Program has redesigned and launched this website, which directs users quickly and easily to a variety of resources including climate change adaptation tools, organizations, training and research. The popular "Calendar of Climate Change and Water Events" link shows upcoming webinars, conferences and training. "EPA Climate Change and Water News" is easy to subscribe to and keeps stakeholders informed about EPA and partner activities, publications, events and funding opportunities. The site also profiles actions that EPA is taking on climate change in the water sector.

nowCOAST (https://nowcoast.noaa.gov/)

NOAA has upgraded its nowCOAST website, which offers a GIS-based online map service providing updated ocean observations, river conditions, and coastal and marine weather forecasts. The new version offers a visual point-and-click access to 60 NOAA data products and services, ranging from 1-hour precipitation data and salinity levels to river stage/discharge forecasts and harmful algae blooms forecasts.

Calendar

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

January 2016

1/19–21	The Food-Energy-Water Nexus: 16th National Conference and Global Forum on Science, Policy and the Environment, Washington, DC.

February 2016

2/11–13	New Partners for Smart Growth Conference, Portland, OR
2/16–19	International Erosion Control Association (IECA) Annual Conference, San Antonio, TX
2/23–24	National Ground Water Association's Conference on Hydrology and Water Quality in the Southwest, Albuquerque, NM
2/24–25	49th International Conference on Water Management Modeling, Toronto, Ontario, Canada
2/25–26	Land & Water Summit: Creating a New Paradigm for Living in Arid Lands, Albuquerque, NM

March 2016

3/7–10	Sustainable Water Management Conference, Providence, RI
3/21–24	Association for Environmental Health and Sciences Foundation's Annual International Conference on Soil, Water, Energy, and Air: U.S. West Coast Conference, San Diego, CA

April 2016

4/25–27	American Water Resources Association Conference: Water - Energy - Environment, Anchorage, AK

May 2016

5/2–6	10th National Monitoring Conference: Working Together for Clean Water, Tampa, FL
5/4–6	2016 Ohio Stormwater Conference, Sharonville, OH
5/10–13	National Mitigation and Ecosystem Banking Conference, Fort Worth, TX
5/20–23	River Rally, Mobile, AL
5/30–6/1	Society of Wetland Scientists Annual Meeting: Protecting Wetland Ecosystem Services, Promoting Stronger Economies, Corpus Christi, TX

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