



Nonpoint Source News-Notes

May 2017, #101

*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

Report Highlights Role and Achievements of Nonpoint Source Program

The U.S. Environmental Protection Agency's (EPA's) October 2016 report, *National Nonpoint Source Program—a catalyst for water quality improvements*, offers the first-ever overview of nonpoint source (NPS) pollution control work occurring nationwide and highlights some of the dedicated people behind it. The report introduces the [Section 319 Nonpoint Source Management Program](#) and grant program established through section 319 of the Clean Water Act (CWA). The authors compiled data from more than 300 Success Stories and more than 2,000 projects from CWA section 319 grants issued in 2008–2013 (Figure 1). Using these data, along with other information including impaired waters lists, U.S. and agricultural census data, and the National Land Cover Database, EPA developed helpful statistics and graphics for reference and use by anyone interested in NPS issues. The report,



Persistence pays off for Tennessee's Crab Orchard Creek, [page 12](#).

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sometimes referred to as the NPS Highlights Report, examines the strategies that state agencies, territories and tribes are using to tackle the spectrum of water quality challenges they're facing. By learning from others and sharing information about what's working in the world of NPS control, watershed practitioners around the country can benefit.

What's the Scope of the NPS Pollution Problem?

The NPS Highlights Report examines the impact of NPS pollution on waters across the country, and addresses the success of NPS control efforts. As of 2016, 31.3 percent of the nation's rivers and streams and 44.4 percent of the nation's lakes, reservoirs and ponds have been assessed for water quality and with a possible source of impairment identified. Of those, 85 percent of rivers

and streams and 80 percent of lakes and reservoirs are impaired by NPS pollution. Specifically, states have identified more than 614,000 miles of rivers and streams, more than 13 million acres of lakes, and more than 500,000 acres of wetlands that do not meet state water quality goals as a result of NPS pollution (Table 1). A 2015 analysis conducted for the report showed that more than 70 percent of Americans live within 2 miles of a polluted lake, river, stream or coastal area.

Table 1. The amount of assessed U.S. watershed that are classified as good, threatened, or impaired (as of July 2016).

Total Assessed Waters of the United States	Rivers and Streams (Miles)	Lakes, Reservoirs, and Ponds (Acres)
Good Waters	487,299	5,470,004
Threatened Waters	5,550	34,621
Impaired Waters	614,153	13,009,273

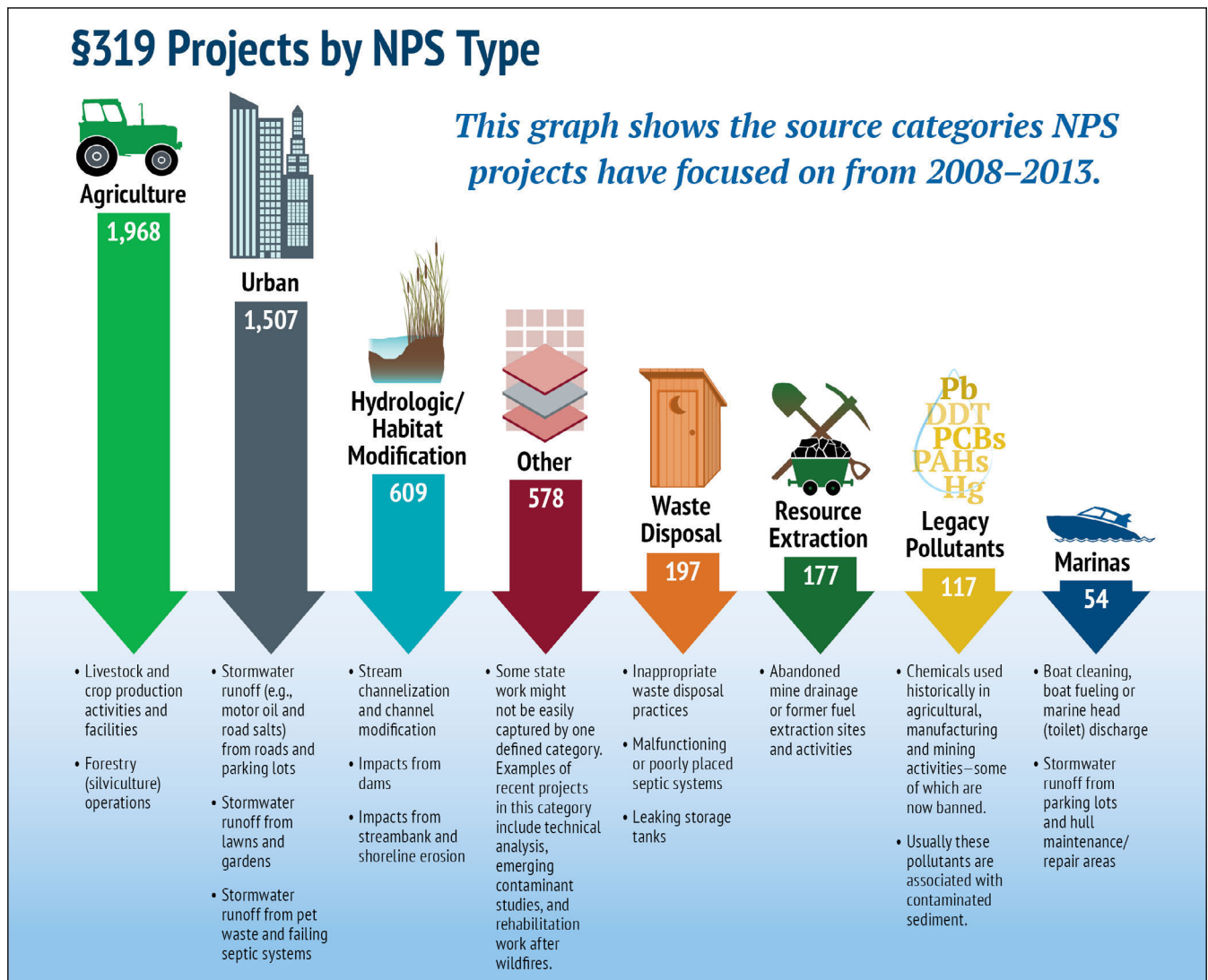


Figure 1. Between 2008 and 2013, the top two NPS pollution source categories receiving the most CWA section 319 grants funding were agriculture and urban sources. Note: many projects are listed in EPA's Grants Reporting and Tracking System as addressing multiple categories of pollution.

How are We Addressing NPS-Impaired Waters?

As noted throughout the 24-page report, environmental agency staff and local stakeholders, such as soil and water conservation district staff and watershed group leaders, are the key to improving water quality at the local level. EPA's CWA section 319 NPS grants support their efforts and assist in leveraging additional project funding. Between 2008 and 2013, the top two NPS categories receiving the most section 319 grant funding were agriculture and urban sources, followed by hydrologic/habitat modification, other sources, waste disposal, resource extraction, legacy pollutants and marinas (see Figures 1 and 2). Many section 319 grant projects target multiple categories of NPS pollution within a watershed (e.g., agriculture, hydromodification, waste disposal).

EPA's NPS Highlights Report shows the results of stakeholders' hard work addressing the spectrum of nonpoint sources across the country. Their efforts—and that of others doing similar work nationwide—are paying off. Between 2005 and 2016, states removed 674 waterbodies from the impaired waters list (restoring more than 6,000 miles of stream and 164,000 acres of lakes) and reported them as NPS Success Stories under EPA's [National Water Program Guidance Measure WQ-10](#). These NPS Success Stories are waters in which one or more impairments (e.g., bacteria, sediment) had been removed and/or a designated use for that water (e.g., swimming, drinking water) had been restored due to on-the-ground NPS pollution-reduction efforts such as implementing best management practices or removing leaking septic systems. Details about specific waterbodies that have been improved are detailed on EPA's [NPS Success Stories website](#).

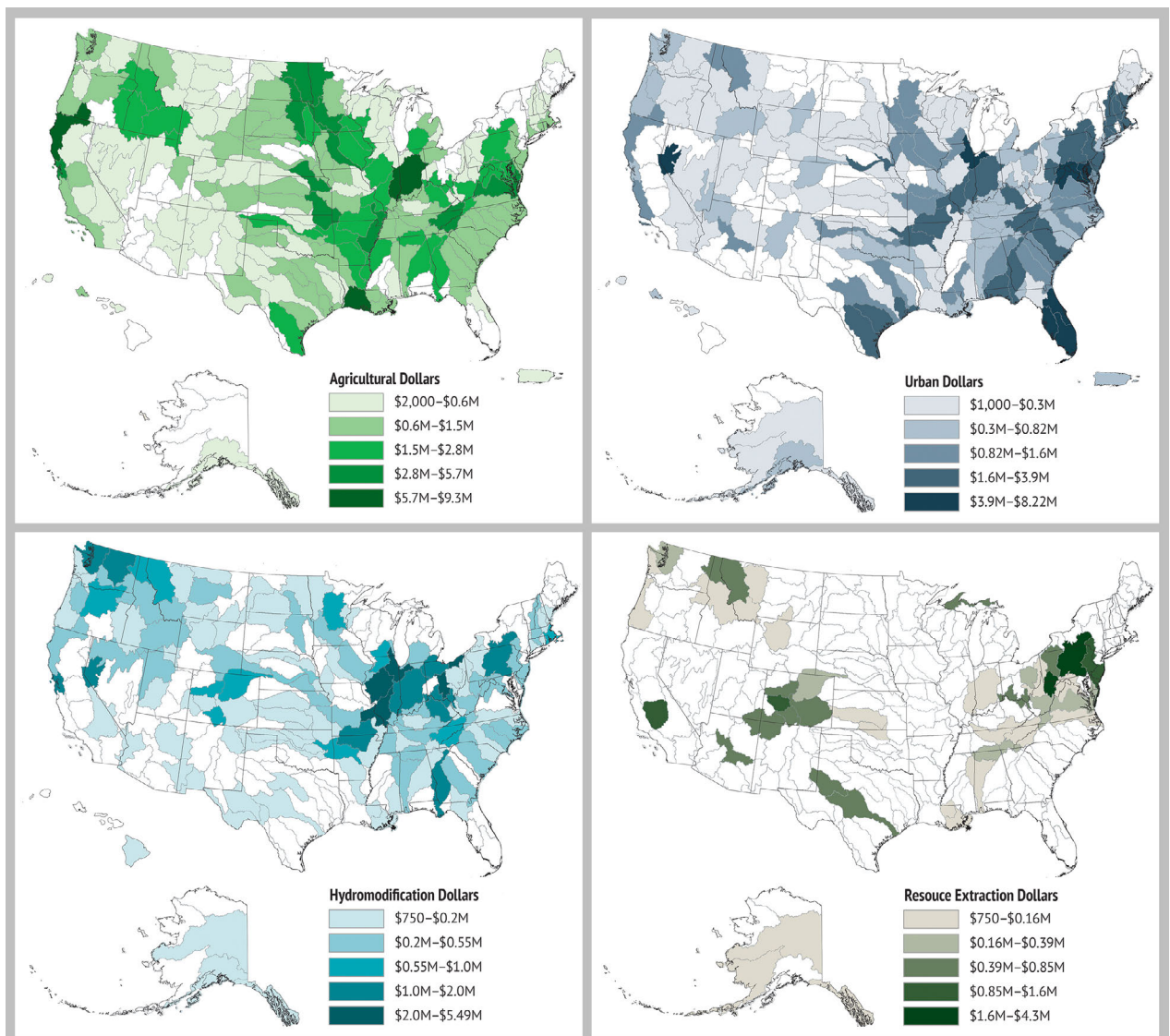


Figure 2. States' 2008–2013 application of CWA section 319 funds across NPS categories: agriculture (top left), urban runoff (top right), hydromodification (bottom left), and resource extraction (bottom right).

Land Use Drives NPS Work

Pages 10 through 17 of the report provide a more detailed look at where and how CWA section 319 grant funds have been applied across the country in four diverse NPS pollution categories: agriculture, hydromodification, urban runoff and resource extraction. States' application of section 319 funds across NPS categories is not uniform; instead, states target NPS sources according to land use and their state-driven priorities (see Figure 2). Short snapshots within each section of the report introduce people working to address diverse NPS-related challenges at the local watershed level.

States Leverage Section 319 Dollars to Improve Water Quality

National Nonpoint Source Program

The 1987 CWA amendments established the national Section 319 Nonpoint Source Management Program, which helps focus state and local NPS management efforts. Through CWA section 319, EPA provides states, territories and tribes with guidance and grant funding to implement their individual NPS pollution programs, supporting a wide variety of activities such as implementing regulatory or nonregulatory programs, offering technical and financial assistance, conducting education and training, supporting watershed projects, and monitoring to assess the success of specific NPS implementation projects.

EPA section 319 grants serve as a catalyst to bring partners together. To illustrate this, EPA analyzed the funds, as reported to EPA by the states, that supported restoration of 538 NPS-impaired waters across the nation. Although the restorations relied on support from the section 319 program, those funds accounted for only about 13 percent (\$238 million) of \$1.79 billion in overall restoration funding, as reported by states. The remaining 87 percent came from a wide variety of other sources, and included project funds that state agencies and local stakeholders raised by leveraging the available section 319 grant funds (Figure 3). Note that these numbers reflect only the projects affecting the 538 analyzed waterbodies where states reported the removal of one or more impairments through the NPS Success Stories website. Many more section 319 projects are currently in progress around the country, achieving improvements and engaging community support. (To view information about active and past section 319 projects across the country, visit EPA's [Public Grants Reporting and Tracking System](#).)

Section 319 Funds Enable Targeted Water Quality Improvement Efforts

Since 1990, NPS programs at the federal, state, tribal and local levels have evolved with refinement of NPS management program plans, a better understanding of suites of best management practices, and new monitoring and modeling approaches that increase the likelihood of water quality restoration. The program continues to improve partnerships with federal, state and local entities by improving communication, sharing information with the public, and measuring and reporting water quality improvements.

Using a [watershed approach](#) (Figure 4) is the key to success because NPS pollution is diffuse, requiring watershed partners to identify and target key sources scattered across the landscape. Pages 6 and 7 in the NPS Highlights Report feature a step-by-step map outlining how to achieve water quality improvement in a dynamic environment. As emphasized in the map, people are the foundation that sets everything else into motion. Once you have a plan in place, fully achieving success requires diverse partnerships, money, work and time.

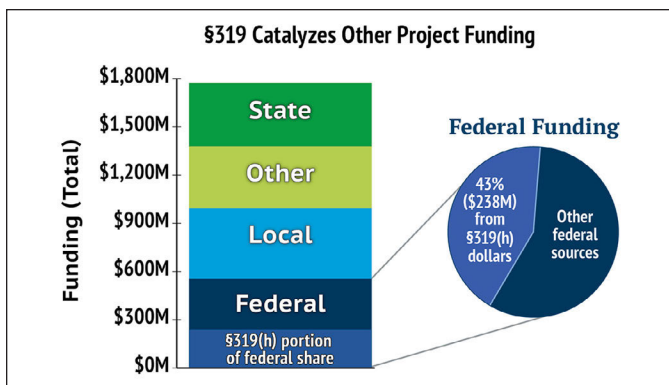


Figure 3. States and local stakeholders use CWA section 319 grant funding to leverage additional funding for projects.



Figure 4. The report presents the key benefits to using a watershed approach when addressing NPS pollution.

The scope of the NPS pollution problem is large, and addressing it is a formidable challenge. Fortunately, states, local organizations and tribes are up to the task, as is clear from the EPA's NPS Highlights Report. The national NPS program will continue to provide enhanced tools and information, and it is vital to support the program's ongoing efforts by highlighting its successes.

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Opportunities Increase for Using Clean Water State Revolving Funds for Nonpoint Source Projects

Over the years, a number of states have taken advantage of their authority to apply Clean Water State Revolving Funds (CWSRF) to help implement their nonpoint source (NPS) management programs. And opportunities to leverage these funds to address NPS needs are growing in several important ways, thanks to an increased focus on these funds, as well as changes to the CWSRF ushered in by a 2014 law.

By way of background, about four percent of CWSRF funds have been invested in NPS water quality projects nationally since the inception of the CWSRF in 1987. This works out to \$4.7 billion of the \$118.7 billion of the federal funds used to date. As significant as that has been, according to information in the U.S. Environmental Protection Agency's (EPA's) water quality assessment database ([ATTAINS](#)), where sources of impairments are known, approximately three-quarters of impaired waters are polluted primarily by NPS nationally. Given the potential for CWSRF to help address NPS problems in even greater ways, it's important to understand that a central characteristic of the CWSRF program is that each of the 50 states and Puerto Rico have latitude to tailor their

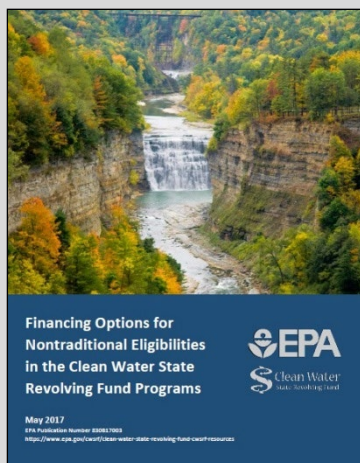
specific programs to suit their own priorities. And this customization has translated into great diversity in the way states have applied these funds to address their NPS needs. This means that a number of states have dedicated considerably more than the four percent national average CWSRF toward NPS projects over the years, each with lessons worth learning about. But first, it's useful to know how these funds have been applied traditionally over the years, and why.

Since Congress established the CWSRF in the 1987 Clean Water Act amendments, NPS projects have been eligible for funding. However, as the loan program replaced the construction grants program that came with the original 1972 Clean Water Act, it has been a favored choice of capital for point source utilities. Municipal sewage authorities that rely on CWSRF loans to upgrade or expand their infrastructure typically pass on the repayments for those loans to large populations of rate-paying consumers. By contrast, funding NPS projects through such a loan program comes with a couple of unique challenges. First, NPS projects rarely have rate-paying constituencies, and there is typically no obvious source of loan repayment. Second, nonpoint source projects typically come with significantly smaller price tags than traditional wastewater infrastructure projects, although they still require similar administrative efforts to manage the loan process. This means that it's easier for states to distribute a few large loans to municipal

EPA Releases Guide to Financing Nontraditional CWSRF Projects

In May 2017 EPA released [Financing Options for Nontraditional Eligibilities in the Clean Water State Revolving Fund Program](#), a technical document prepared primarily as a reference for the 51 CWSRF programs and EPA's regional offices. The paper focuses on how varied types of financial assistance available to the CWSRF program can be deployed to fund eligibilities that do not fall within the mainstream of traditional grey infrastructure. It is intended to complement the May 2016

[Overview of Clean Water State Revolving Fund Eligibilities](#) paper, which includes the expansion of eligibilities in the program stemming from enactment of the Water Resources Reform and Development Act, particularly in regard to nontraditional eligibilities. Prominent examples include privately owned green infrastructure, privately and publicly owned projects for reusing or recycling municipal and industrial wastewater and stormwater, and a wide range of watershed projects. Eligibilities and financing options in the program continue to evolve as greater experience is gained with WRRDA provisions, implementation of the Water Infrastructure Finance and Innovation Act program, and other developments; therefore, both of these CWSRF resource documents should be viewed as reference-works-in-progress that will be updated periodically.



wastewater utilities than to manage a large number of smaller loans, particularly when they would go to nonconventional loan recipients.

The good news is that a number of state CWSRF program managers recognize these challenges and have been striving to overcome them. The states that have directed the most CWSRF dollars toward NPS projects have all proactively sought ways to prioritize NPS and level the playing field with point source projects, often by creating innovative funding approaches. For instance, several of these states have established sponsorship programs to incentivize investments in NPS projects by allowing traditional loan recipients such as municipal sewer authorities to qualify for lower interest loans in return for sponsoring NPS projects with partner organizations as part of a bundled loan package. An important feature of such sponsorship programs is that the partner responsible for implementing the NPS project is not required to make any loan repayments, which makes the NPS project financing more akin to a grant from this partner's perspective. Ohio, Iowa, Idaho and Oregon have all had NPS sponsorship programs for many years, and Delaware has recently joined their ranks. Sponsorship programs are explained in greater detail in an April 13, 2017, webcast by EPA's CWSRF Branch titled *Sponsorship: A Unique Tool for Funding Land Conservation with the CWSRF*, as well as in *Issue 93 of Nonpoint Source News-Notes* (January 2013). Both of these resources also provide helpful examples.

Ohio: Solving the CWSRF Revenue Stream Dilemma

Problem:

Utility ratepayers provide a ready source of loan repayment (A) whereas typical land conservation projects do not (B).

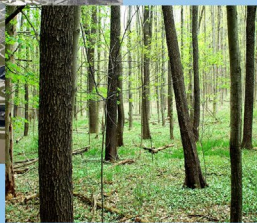


OR



Solution:

Allow traditional applicants such as utilities to sponsor stream or wetland restoration/protection projects in exchange for lower interest rates.



Combine both projects into a sponsorship loan package

In Ohio, the Clean Water State Revolving Fund is administered through Ohio's Water Pollution Control Loan Fund (WPCLF). Typically, Ohio communities with publicly owned treatment works (POTWs) apply for loans to improve their treatment systems using WPCLF. The community pays back the loan with POTW system user fees. To reduce the interest rates on their loan—and improve local water resources at the same time—these communities can apply for the WPCLF's Water Resource Restoration Sponsor Program, which allows communities to sponsor nonpoint source projects using the interest savings generated when the WPCLF offers loans for the POTWs at below-market rates. Funds for WRRSP projects are made available by advancing a portion of the estimated amount of interest to be repaid by the sponsor over the life of the loan. The amount of available funding is based upon the initial principal amount, the term of the loan and the interest rate. Sponsors benefit because they receive up to an extra 0.1 percent interest rate discount on the POTW financing, which will reduce the total loan repayments. (Photos by Ohio Environmental Protection Agency)

2014 Law Emphasizes Innovation and Funding of Nontraditional Projects

Opportunities for funding NPS projects through CWSRF were given a boost when Congress passed the Water Resources Reform and Development Act (WRRDA) in 2014. Title V of the WRRDA ushered in some fundamental changes to the way the CWSRF is run, including by significantly expanding the types of projects that could be funded under the CWSRF. In this expansion, Congress re-affirmed that these funds may be applied toward implementing state section 319 NPS management programs. Toward this end, EPA continues to encourage state CWSRF agencies to work with their NPS program offices to ensure that projects funded under this eligibility criterion are consistent with current approved state NPS management program plans. Additionally, WRRDA allows CWSRF to be used for addressing decentralized wastewater treatment systems (e.g., septic systems and their alternatives), regardless of their inclusion in a state's NPS management program. WRRDA also specifically allows CWSRF to be applied toward addressing stormwater issues without the need to distinguish between point and NPS classifications. Moreover, WRRDA has significantly expanded the use of CWSRF for so-called watershed pilot

projects, a funding category that was previously limited to wet weather discharge permit projects, but which now explicitly allows for watershed partnerships that “include efforts... to demonstrate cooperative ways to address nonpoint sources of pollution to reduce adverse impacts on water quality.” In May 2016, EPA published an [Overview of Clean Water State Revolving Fund Eligibilities](#) explaining all the eligibility changes ushered in by WRRDA.

WRRDA brought other important changes to CWSRF, as well. For example, the repayment period for CWSRF loans has been extended from 20 to 30 years (or the useful life of the project, if less than 30 years). Also, principal forgiveness is allowed based on state-defined affordability criteria or for energy/water conservation, stormwater, or sustainable project planning, design and construction.

Between lessons learned from states on the front lines of financing NPS projects through CWSRF and the expanded opportunities brought about by recent changes to CWSRF, there has never been a better time for local practitioners to work with their state CWSRF programs.

[For more information contact Kelly Tucker, EPA Office of Wastewater Management, Clean Water State Revolving Fund; Phone: 202 564-0608; Email: tucker.kelly@epa.gov; Web: www.epa.gov/cwsrf]

Salt Levels in North American Lakes Are Rising

North America’s freshwater lakes are growing saltier as a consequence of development and exposure to road salt. The results of a study of 371 lakes ([Salting Our Freshwater Lakes](#)) published in the April 4, 2017, edition of *Proceedings of the National Academy of Sciences* indicate that many Midwestern and Northeastern lakes are experiencing increasing chloride trends, with approximately 44 percent of lakes sampled in these regions undergoing long-term salinization.

The study, funded in part by the National Science Foundation, is the first large-scale analysis of chloride trends in freshwater lakes. It was conducted by a team of 15 researchers as part of the [Global Lake Ecological Observatory Network \(GLEON\) Fellowship Program](#), an initiative that seeks to train the next generation of freshwater scientists and practitioners.

Lead author Hilary Dugan, a limnologist at the University of Wisconsin-Madison and former Cary Institute of Ecosystem Studies Postdoctoral Fellow, explains, “We compiled long-term data, and compared chloride concentrations in North American lakes and reservoirs to climate and land use patterns, with the goal of revealing whether, how, and why salinization is changing across broad geographic scales. The picture is sobering. For lakes, small amounts of shoreline development translate into big salinization risks.”

Study Compared Salinity of Freshwater Lakes to Proximity of Roads

The research team analyzed chloride trends in 371 freshwater lakes, each of which was larger than 10 acres in size and had at least 10 years of recorded chloride data. The majority of the lakes (284) were located in an area referred to as the North American Lakes Region, which includes Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Ontario, Rhode Island, Vermont, and Wisconsin. To gauge road salt exposure, the research team assessed road density and land cover within a 100- to 1,500-meter buffer around each of the 371 study lakes. Roadways and impervious surfaces such as parking lots and sidewalks are reliable proxies for road salt application because they are susceptible to high levels of salting and runoff.

Results were clear: roads and other impervious surfaces within 500 meters of a lake’s shoreline were a strong predictor of elevated chloride concentrations. In the North American Lakes Region, 70 percent (94 out of 134) of lakes with more than 1 percent impervious land cover in their 500-meter buffer zone had increasing chloride trends. When results are extrapolated to all lakes in the North American Lakes Region, about 7,770 lakes could be at risk of rising salinity. If current salinization trends continue, many North American lakes will surpass EPA-recommended chloride levels in 50 years. Within this study, 14 lakes in the North American Lakes Region are expected to exceed the EPA’s aquatic life criterion concentration of 230 milligrams per liter (mg/L) by 2050, and 47 more are on track to reach chloride concentrations of 100 mg/L during the same time period.

The study's authors recommend that best lake management practices recognize that shoreline management extends well beyond a lake's perimeter. The authors note that although many states and municipalities acknowledge the importance of shoreline management, zoning regulations are often enforced only within 300 meters. Plus, many lakes lack the monitoring programs needed to adequately track lake health.

States Offer Training Programs to Help Reduce Salt Use

Many northern states are offering training programs in the off-season to help people better manage the application of salt in winter weather. For example, Minnesota offers its [Smart Salting training program](#) in spring and fall as part of its web-based [Winter Maintenance Assessment tool](#). Similarly, New Hampshire's statewide [Voluntary Certified Salt Applicator Certification and Liability Protection Program](#) is designed to educate commercial salt applicators and municipal staff responsible for snow and ice removal by offering voluntary training and certification. A detailed article about the New Hampshire program was included in [NPS News-Notes issue #99](#).



A snow-removal contractor plows a New Hampshire parking lot.

Coauthor and Fellowship advisor Kathleen Weathers, an ecosystem scientist at the Cary Institute of Ecosystem Studies and co-chair of GLEON, comments, "In the North American Lakes Region — where road salt is a reality — roads and other impervious surfaces within 500 meters of a lake's shoreline are a recipe for salinization. We need to manage and monitor lakes to ensure they are kept 'fresh' and protect the myriad of services they provide, from fisheries and recreation to drinking water supplies."

[For more information contact Hilary Dugan, University of Wisconsin-Madison. Email: hdugan@wisc.edu. Note: Article excerpted from Cary Institute of Ecosystem Studies April 10, 2017, press release: "North America's freshwater lakes are getting saltier"]

Federal Partners' Strategy Supports Mississippi Basin States

Partnerships working to improve water quality in the Gulf of Mexico remain strong. In December 2016, the federal members of the [Mississippi River/Gulf of Mexico Watershed Nutrient Task Force](#), known more informally as the Hypoxia Task Force (HTF), released [Looking Forward: The Strategy of the Federal Members of the Hypoxia Task Force](#), an update to their federal strategy from 2013. This updated strategy shows that the states and federal agencies that comprise the HTF continue to work collaboratively to implement the [Gulf Hypoxia Action Plan 2008](#). Since the release of the 2008 plan, each HTF state (i.e., Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin) has developed a [nutrient reduction strategy](#) through stakeholder participation that serves as a road map for implementing nutrient reductions in its state. These state strategies serve as the cornerstone for reaching the HTF goals to reduce nutrient loads delivered to the northern Gulf of Mexico.



The federal agency members of the HTF include the U.S. Army Corps of Engineers, U.S. Department of Agriculture, U.S. Department of the Interior, U.S. Environmental Protection Agency, and National Oceanic and Atmospheric Administration. The federal strategy highlights technical, financial and other assistance that the federal members provide to the HTF states for developing and implementing their individual strategies, and outlines goals for the future.

The [December 2016 update](#) highlights the progress the federal partners have made since 2013 on their seven priority areas of support to the HTF states as the states implement their nutrient reduction strategies:

- (1) **Monitoring** - The federal members of the HTF are involved in numerous monitoring programs and projects that help track water quality changes instream, at the edge of fields,

and in the Gulf hypoxic zone. Through the Mississippi/Atchafalaya River Basin Monitoring Collaborative, the HTF seeks to formalize a long-term monitoring network.

- (2) **Decision support tools** - The federal agencies provide access to many of their databases through public online portals, and have created tools that states, farmers and others can use in identifying, prioritizing and implementing nutrient-reduction opportunities.
- (3) **Modeling** - Basin- and region-scale models supported by the federal partners, including SWAT and SPARROW, provide a scientific basis for decision making and nutrient-reduction tracking.
- (4) **Permitting and regulatory programs support** - EPA will continue working with water quality agencies in HTF states to reduce point source loads through Clean Water Act and related state programs, and will continue to track the status of nutrient monitoring requirements and nutrient permit limits.
- (5) **Outreach, education and partnerships** - The HTF is focused on developing partnerships with key stakeholders such as the HTF state land-grant universities.
- (6) **Financial and technical assistance** - The federal agencies provide funds and tools that assist the states and their partners as they implement their state nutrient reduction strategies.
- (7) **Other initiatives** - Over the past few years, the HTF has started working more closely with the U.S. Fish and Wildlife Service and its Landscape Conservation Cooperative programs.

Looking Ahead

In the near future, the HTF federal agencies will continue to support the HTF in all seven priority areas, and will place additional focus on three key issues: (1) supporting states as they implement their nutrient reduction strategies, (2) working towards the HTF's adoption of quantitative measures to track progress, and (3) developing partnerships with organizations aligned with its goals (e.g., nongovernment organizations, industry, universities, communities and cities). For more information on the work of federal and state HTF members and partners, see the Mississippi River/Gulf of Mexico HTF [website](#). For a more comprehensive description of the HTF and its work, please see the [2015 Report to Congress on the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force](#).

Notes from the States, Tribes and Localities

Farm and Forest Easement Fund Expands Protections for New York City's Drinking Water

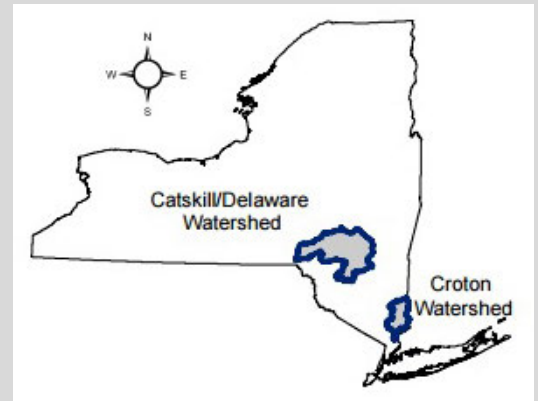
Protecting source water pays off. New York City's (NYC's) program designed to safeguard the health of watersheds that provide its drinking water is nationally known, both for its wide-reaching efforts to prevent pollution and for saving urban ratepayers billions of dollars in water treatment costs. After all, it's cheaper to keep clean water clean than it is to treat water once it's contaminated. Now, the partnership between NYC's nine million drinking water customers and rural farmers and landowners is expanding. A recently announced stewardship endowment fund financed by the city through its drinking water utility is providing \$43 million to safeguard agricultural and forestry easements through ongoing inspection and monitoring activities.

NYC partners with the farm community in the Croton and Catskill/Delaware watersheds (i.e., the NYC drinking water source watersheds collectively referred to as the NYC Watershed) to reduce agricultural pollution through its voluntary, incentive-based [Watershed Agricultural Program](#). This program has been funded since 1992 by the city, with additional support from federal, state and private matching funds. It's administered locally by the nonprofit Watershed Agricultural Council (WAC) through a contract with the NYC Department of Environmental Protection (DEP). The WAC helps farmers develop and implement voluntary pollution prevention and conservation plans (known as [Whole Farm Plans](#)), and currently manages conservation easement interests across approximately 26,000 acres of farms and forests. The WAC's [Virtual Farm Tour](#) offers more details about ways agricultural and forestry landowners are working to protect their watersheds.

Farm and Forest Easement Fund Expands Protections for New York City's Drinking Water (continued)

NYC Drinking Water: Did You Know?

The NYC drinking water supply system is one of the largest unfiltered water supplies in the United States. It provides approximately 1.2 billion gallons of high quality drinking water to nearly one-half the population of New York State every day (including eight million residents of NYC and one million consumers located in surrounding counties). The drinking water system is made up of a network of 19 reservoirs within a 2,000-square-mile area that stretches 125 miles north and west of NYC and includes two separate watershed areas: (1) the Catskill/Delaware Watershed, which in 2016 provided about 91 percent of daily consumption (and remains unfiltered) and (2) the more heavily populated Croton Watershed, which in 2016 provided about 9 percent of the daily consumption (and had a filtration system installed in 2015). Water is transferred to NYC through a series of tunnels and aqueducts. For more information, see the New York Department of Environmental Conservation's [Facts about the NYC Watershed webpage](#) and the NYC DEP's [2016 Drinking Water Supply and Quality Report](#).



Stewardship Funds Support Inspection of Working Land Easements

Landowners can use WAC's conservation easement program to preserve working lands, which would help prevent large farms from being split into smaller parcels and removed from the farming community. "The easements complement commercial farm and forest activities already occurring, while promoting economic viability and protecting water quality," said WAC Executive Director Craig Cashman. "Activities such as commercial farming, timber harvests and bluestone mining are permitted with an approved conservation plan."

The conservation plans are developed based on land resources, land uses, farm and forest practices, and watershed protection objectives. "The plans factor in various conservation concerns, including animal health, soil health and profitability," added Cashman. "This ensures that the farm is striving to maintain a strong conservation ethic while remaining economically viable in its practices."



Money from the new stewardship endowment fund will be used by WAC technical staff and contractors to perform aerial and ground inspections of existing easements on agricultural and forestry lands and to safeguard the easement boundaries against encroachment. The stewardship fund will also be used to protect water quality by overseeing any farm, timber or other projects on these working lands to ensure all work is performed responsibly and maintains local economic viability.

DEP Welcomes New Easements

Through the Watershed Agricultural Program, WAC is continuing to enroll farm and forest lands into the conservation easement program. A WAC Conservation Easement Committee scores and ranks easement applicants based on several criteria. For example, greater weight is given to those properties located within "priority areas" in the targeted NYC Watershed. Priority depends on the physical location (e.g., adjacency to waterbodies)

The WAC's virtual farm tour provides example photos of practices watershed farmers have installed in the NYC watershed.

NYC's Conservation Easement Program

A conservation easement is a legal agreement through which a landowner agrees to permanently limit the type and amount of development on his or her property while retaining ownership and certain other rights to use the land. Under the city's [Conservation Easement Program](#), which began in 1998, the NYC DEP buys easements at fair market value from willing landowners who then receive perpetual property tax benefits that are proportional to the easement's value relative to the overall property. Landowners who sell an easement to NYC receive the cash and property tax relief in return for relinquishing their development rights in perpetuity. The easement program currently is protecting 22 percent (approximately 26,000 acres) of land surrounding NYC's reservoirs in the Catskill Mountains.



Conservation easements can help farmers protect and preserve their working lands (photo by Kristen Artz).

as well as the amount of protected lands in the watershed subbasin and the time it takes for source waters to be conveyed through the aqueduct system and ultimately reach NYC residents.

Cashman said the entire watershed protection program continues to evolve, and his staff actively reaches out to producers and landowners to expand easement enrollment, as well as WAC's educational program and other programs. "The forest land easement program is fairly new," he said, "and we continue to acquire easements for those lands and for traditional agricultural land.

The process can be a bit slow at times, but we've made steady, consistent progress over the years. We have great partners and they've been extremely valuable to the process. With a little education, people start seeing the value of the easements, and how they allow farm and forest activities to continue. Helping producers maintain the economic viability of their land has been a key to our success."

Thanks to the watershed partners' efforts, reservoir phosphorus loads from agriculture have declined by nearly 60 percent since the mid-1990s, and the Catskill/Delaware Watershed NYC water supply continues to meet federal water quality requirements of unfiltered water supply systems (see DEP's [Filtration Avoidance Determination website](#)). The new stewardship endowment fund, which will support ongoing inspection and monitoring activities on easements, will help ensure the long-term integrity of the program and continued protection of the NYC Watershed.

Recent Legislation Expands Drinking Water Protection Statewide

An April 10, 2017, article posted by New York Riverkeeper ("[New York expands drinking water protections for millions](#)") describes recently passed legislation designed to increase protections to New York State's waters and drinking water consumers. Governor Andrew M. Cuomo and the New York State Legislature recently completed a multi-year plan known as the Water Infrastructure Act of 2017 that invests \$2.5 billion in water infrastructure, addressing everything from aging water treatment plants and leaking septic systems to overburdened stormwater systems and the dairy farm industry. To better protect consumers, companion legislation requires that almost all public drinking water supplies in New York State be tested for a broad suite of "emerging" chemical pollutants.

[For more information, contact Craig Cashman, Executive Director, Watershed Agricultural Council, 33195 State Highway 10, Walton, NY 13856. Phone: 607-865-7790; Email: ccashman@nycwatershed.org]

Reclamation Activities Boost Expanding Improvements in Tennessee Watershed

Restoring a watershed is rarely a quick endeavor—it requires long-term planning, dedicated stakeholder participation, widespread best management practice (BMP) implementation, and integration of multiple pollution control programs. Even then, anticipated water quality and ecosystem improvements might be delayed by weather events, the introduction of new pollution sources, and a host of other factors. Fortunately, persistence has paid off for Tennessee. Every year the U.S. Environmental Protection Agency's (EPA's) [Nonpoint Source Success stories website](#) features approximately 50 new stories about waters across the nation where water quality has been restored, thanks to the efforts of local, state and federal partners. In Tennessee's Crab Orchard Creek watershed, long-term water quality improvement efforts are being rewarded with a steadily expanding area of restored waters, beginning at the mouth of the watershed and moving upward.



Figure 1. One of eight acid mine drainage treatment ponds installed in the Crab Orchard Creek watershed.

Eastern Tennessee's Crab Orchard Creek watershed is mostly forested but includes pockets of agricultural and abandoned mine lands. Because of the ongoing impacts from historical mining activities, in 1998 the Tennessee Department of Conservation (TDEC) performed a biological reconnaissance (biorecon) study that assessed the total number of macroinvertebrate families found in the stream. Unfortunately, Crab Orchard Creek scored poorly and was placed on Tennessee's 1998 Clean Water Act (CWA) section 303(d) list of impaired waters for pH and siltation. TDEC collected additional field data in 1999 and 2000 that indicated Crab Orchard Creek was impaired specifically for pH, metals and manganese, while Laurel Creek, a tributary of Crab Orchard Creek, was identified as impaired for pH. The pH levels for both creeks were too acidic—well below Tennessee's fish and aquatic life criteria, which requires a pH within the range of 6.5 to 9.0. In 2001 TDEC developed a pH total maximum daily load for the Crab Orchard Creek watershed.

Partners Quickly Join Forces to Address Pollution Sources

Beginning in 2002, with the support of \$80,878 from Tennessee's Agricultural Resources Conservation Fund (ARCF), farmers installed 37 BMPs, including alternative watering facilities, exclusion fencing, livestock heavy use areas and cropland conversion. The U.S. Fish and Wildlife Service and U.S. Department of Agriculture–Natural Resources Conservation Service (NRCS)

have been active in the watershed, supplying cost-share opportunities and technical assistance.

Between 2006 and 2011, TDEC's Division of Water Resources teamed up with the Tennessee Department of Agriculture (TDA) on a CWA section 319 grant project (\$409,200, plus another \$209,800 in TDEC matching funds) to restore portions of the watershed adversely impacted by legacy mining pollutants. The partners installed eight acid mine drainage (AMD) treatment systems/ponds and reclaimed 57 acres of previously mined lands (Figures 1 and 2).

Technical assistance, community outreach and education, and water quality monitoring support for watershed projects were also provided by the Crab Orchard Creek Restoration Partnership, a group of organizations and nongovernmental agencies dedicated to restoring Crab Orchard Creek and its tributaries.



Figure 2. Partners reclaimed abandoned mine lands as part of a watershed restoration project.

Reclamation
Activities Boost
Expanding
Improvements
in Tennessee
Watershed
(continued)

Partners' Investment of Time and Dollars Yields Results

In 2006 TDEC assessed the habitat using a standardized technique at mile 3.1 of Crab Orchard Creek, which is within the same segment where the 1998 data were collected. The habitat score indicated that this segment complied with water quality standards, and that the stream supported its fish and aquatic life beneficial use. In 2007 a bioecon survey at this same station yielded a perfect score of 15. Water quality sampling in 2006 also indicated that the stream met pH criteria. As a result, TDEC removed the 2.3-mile-long lowermost impaired segment of Crab Orchard Creek from the 2010 list of impaired waters. At that time, upstream areas of the Crab Orchard Creek watershed remained listed as impaired for manganese and pH.

Fortunately, work to reclaim mining lands and install agricultural BMPs has continued, further controlling existing sources while also keeping new pollution sources in check. In early 2012 TDEC sampled benthic invertebrates and calculated a Tennessee Macroinvertebrate Index (TMI) for Crab Orchard Creek and Laurel Creek. The TMI yielded scores of 36 and 32; a score of 32

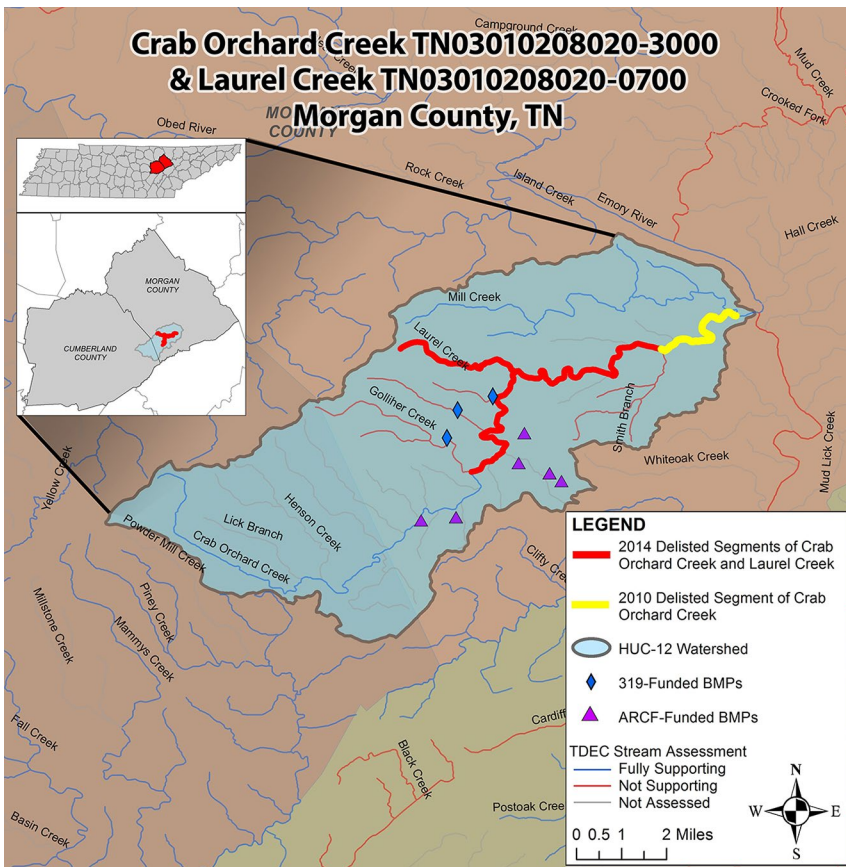


Figure 3. Ongoing watershed restoration and water quality protection efforts in the Crab Orchard Creek watershed have paid off, as multiple water body segments have been removed from the state's impaired waters list in 2010 (yellow segment) and 2014 (red segments).

or higher is considered passing for biocriteria guidelines.

In spring 2014 TDEC collected water quality samples that showed pH levels ranging from 6.10 to 7.2—meeting the applicable criteria. Additionally, manganese concentrations, which had been as high as 7,480 micrograms per liter ($\mu\text{g/L}$) in 1999–2000, had been significantly reduced to, and now varied from, 48 to 600 $\mu\text{g/L}$, with four of the six observations being less than 200 $\mu\text{g/L}$.

As a result of these data showing improvements, TDEC removed two additional segments from the impaired waters list in 2014: a 7.9-mile segment of Crab Orchard Creek (immediately upstream from the segment delisted in 2010) and a 3.7-mile segment of Laurel Creek. The delisting of these two additional watershed segments illustrates that persistent efforts to control watershed pollution sources can yield expanding benefits over time (Figure 3). “It is very rewarding to see streams like Crab Orchard Creek, once plagued by acid mine drainage from former coal mining operations, come off our state list of impaired waters as a direct result of section 319 funding and matching sources,” notes Sam Marshall with the Tennessee Department of Agriculture.

Partnerships Pay Dividends

Thanks to the ongoing dedication by multiple stakeholders, pollution control efforts continue to reap benefits throughout the Crab Orchard Creek watershed. In the coming years, TDEC hopes that the three remaining upstream impaired segments (Golliher Creek/Becky Branch, Fagan Mill Creek and Little Laurel Creek) will also be restored, and all segments within the Crab Orchard Creek watershed will fully support all designated uses. Thanks to Tennessee's steadfast watershed approach, full restoration draws closer every year.

[For more information, contact Sam Marshall, Tennessee Department of Agriculture, Phone: 615-837-5306; Email: sam.marshall@tn.gov]

Notes on Agriculture

Booklet Shares Strategies to Reduce Nitrogen Loads from Drained Cropland

Farmers care about water quality. And now a coalition of six major university extension offices from America's heartland have teamed up with an agricultural association to produce a new booklet to highlight best practices to curb nitrogen from croplands with tile drainfields. The new booklet, *Ten Ways to Reduce Nitrogen Loads from Drained Cropland in the Midwest*, provides information to help these farmers choose how to best protect their local and regional waterways from nitrate pollution (Figure 1). The 44-page booklet, published by University of Illinois Extension in collaboration with Purdue University Extension, South Dakota State University Extension, Iowa State University Extension and Outreach, University of Minnesota Extension, and Iowa Soybean Association-Environmental Programs and Services, focuses on 10 key ways that farms with drainage systems can be managed to reduce nitrogen loads while maintaining high agricultural productivity. Although developed for Midwest farms, the booklet includes valuable information applicable to any tile-drained farmland.

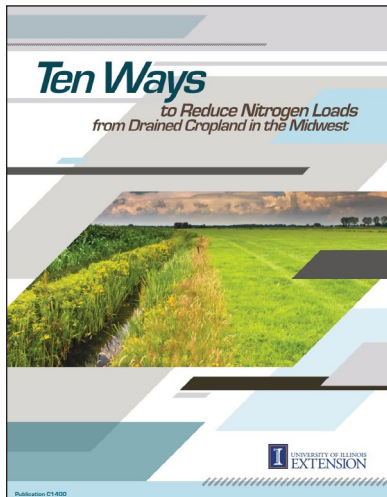


Figure 1. Ten Ways to Reduce Nitrogen Loads from Drained Cropland in the Midwest is available for download.

The Midwest, with its rich soils and abundant precipitation, is a global leader in corn and soybean production. Unfortunately, excess nitrogen in fertilizer applied to farm fields and nitrogen naturally present in the rich native soils can migrate as nitrate into local waters. To combat this problem, farmers can implement practices that trap the nitrogen on the fields so it remains available for the next growing season rather than migrating into surface water and groundwater where it can damage aquatic ecosystems. The booklet, which has been under development for the past decade, is designed to give farmers the information they need to select the nitrogen-control practices best suited for their land and operation.

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Why Target Nitrogen?

Elevated nitrogen levels in agricultural drainage water can lead to overgrowth of algae in surface and downstream waters, which negatively affects recreation and aquatic life/fisheries uses, and can taint surface water and groundwater-based drinking water supplies. In addition, nutrients from Midwestern states that drain into the Mississippi River basin contribute to the Gulf of Mexico's hypoxic zone (where oxygen levels are too low to support marine life). In 2015 the Gulf's hypoxic zone stretched 6,474 square miles along the coast of Louisiana, an area larger than the state of Connecticut.

For more than a decade, the 10 states along the Mississippi River as well as Ohio and Indiana on the Ohio River have worked to decrease nutrient loads that leave their watersheds, both for the health of local waters and for the Gulf. In response to the *Gulf Hypoxia Action Plan 2008*, each of these states has developed and released comprehensive [nutrient reduction strategies](#). For this reason, "it's the perfect time for this booklet to have finally come together," notes Dr. Laura Christianson, University of Illinois assistant professor of water quality. "Upper Midwestern states have more tile drainage than anywhere else in the country, so reducing nitrate loss through tile drains is an important part of the recently released strategies."

Booklet Outlines Available Nitrate Control Options

To help readers understand why certain practices work in specific situations, the booklet opens with an explanation of how nitrogen in the environment easily changes from one form to another through the processes such as fixation, mineralization, nitrification, denitrification, plant uptake/immobilization, and leaching. These processes are influenced by conditions in the soil, vegetation, and atmosphere, and affect nitrogen loads that ultimately enter drainage water from fields.

The 10 practices highlighted in the booklet are presented individually, and each includes a detailed description explaining what the practice is, how it improves water quality, how effective it is, where it will work, whether it has any additional benefits, and its level of acceptance. The booklet also

contains a chapter on economic considerations for each practice. “We wanted to present a variety of options that are practical for farmers and provide some comparison between the practices. Where does each practice work? How much will it cost? How well does the practice work? People can get a good idea of what’s going to work for them,” explains Christianson.

The 10 practices described in the booklet are broken down into three main categories based on how the practice targets nitrate: (1) by reducing nitrate in the plant root zone, (2) by reducing delivery of nitrate to the field’s edge, and (3) by removing nitrate at the edge of the field or downstream (Figure 2).

(1) Practices that reduce nitrate in the plant root zone. To reduce nitrate in the plant root zone, farmers can improve nitrogen management (i.e., modifying fertilizer application and adding nitrogen inhibitors), plant winter cover crops to uptake nitrate from the soil and reduce erosion, or increase use of perennials in the cropping system. These practices minimize the amount of nitrogen that directly enters drainage tile pipes. Christianson explains that many farmers in Illinois are already applying nitrogen fertilizers at the university-recommended rate. “For them to reduce their rate wouldn’t make any sense and wouldn’t provide water quality benefits. The timing of nitrogen application and use of nitrification inhibitors are probably the management changes I’d focus on more,” she says.

(2) Practices that reduce delivery of nitrate to the field’s edge. Farmers can also choose to change the physical drainage system in their fields to prevent the drainage water from reaching local streams. The practices recommended in the booklet include adding controlled drainage structures to retain drainage water in the soil, recycling drainage water, and reducing drainage intensity by increasing spacing between drains and decreasing drain depth (Figure 3). “The new practice of drainage water recycling is especially exciting because there is a significant potential to increase crop yields by storing drainage water and reapplying it when it’s needed by the crop,” notes Christianson. “This practice doesn’t come cheaply, but could be good for yields and downstream waters.”

(3) Practices that remove nitrate at the edge of the field or downstream. The final category consists of edge-of-field practices that emphasize denitrification by anaerobic bacteria and uptake of nitrogen by microbes and plants before the water is released into local streams. Practices described in the booklet include adding bioreactors (see box below) or constructed wetlands,

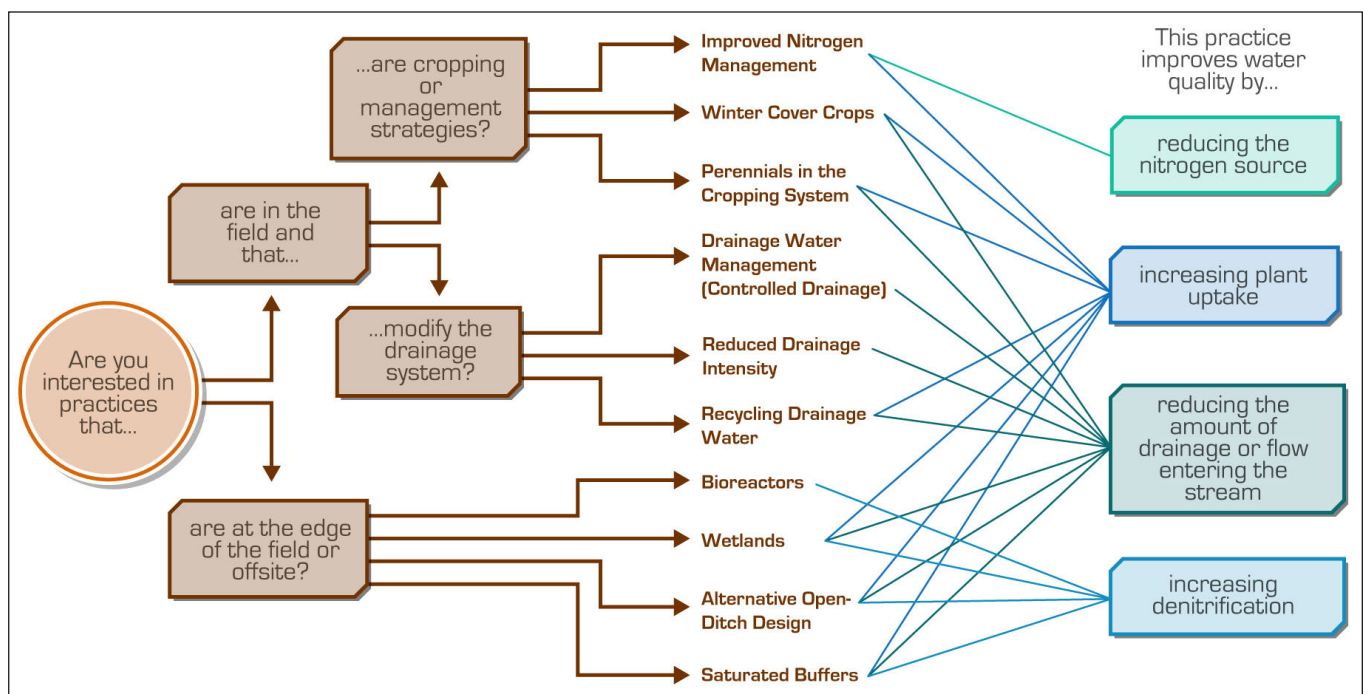


Figure 2. The Ten Ways booklet outlines 10 options for reducing the nitrate load leaving farm land. (Image credit: Christianson, L.E., J. Frankenberger, C. Hay, M.J. Helmers, and G. Sands. 2016. *Ten Ways to Reduce Nitrogen Loads from Drained Cropland in the Midwest*. Pub. C1400, University of Illinois Extension.)

converting drainage ditches to two-stage ditches (i.e., drainage ditches modified by adding flood-plain-like vegetated benches within the overall channel), or using saturated buffers (i.e., vegetated riparian buffer in which the water table is artificially raised by diverting water from a subsurface drainage system).

Christianson is a vocal advocate of bioreactors but she knows other practices might hold more appeal, such as cover crops. “The important thing is just trying something new—getting a new practice on the landscape to improve water quality,” Christianson says. “In fact, cover crops might have the biggest chance of adoption. And if everyone started planting cover crops, especially grass-based cover crops that overwinter like cereal rye, that would be our best chance of having a positive water quality impact.”

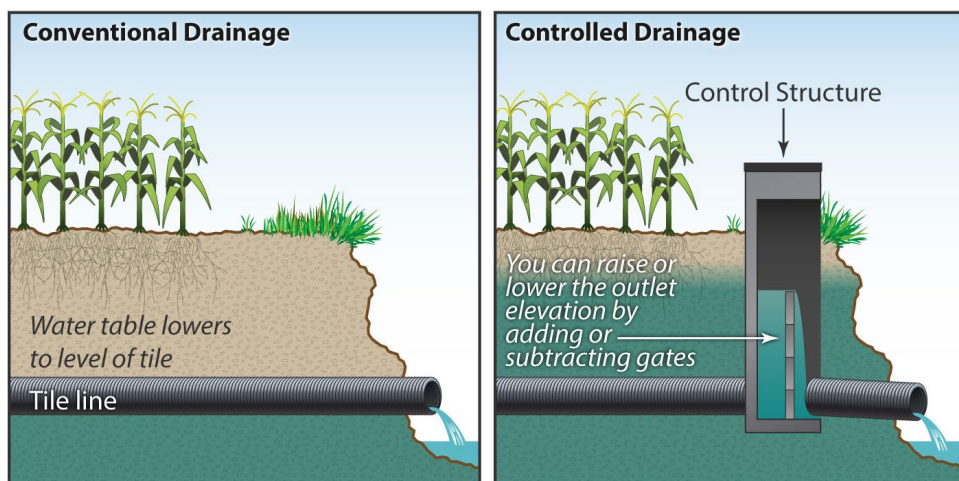


Figure 3. By adding control structures to tile-drained fields to retain drainage water in the soil during periods of the year when drainage is less critical, farmers can reduce the amount of nitrate-containing water leaving the field. (Image credit: Christianson, et al. 2016. *Ten Ways to Reduce Nitrogen Loads from Drained Cropland in the Midwest.*)

Reaching the Target Audience

The booklet’s coauthors are taking advantage of many avenues to distribute the valuable resource to watershed stakeholders. “We have a lot of great partners who are distributing the booklets and doing outreach presentations that pair with the booklet,” notes Christianson, “including extension specialists and educators across the upper Midwest, the North Central Region Water Network, and industry partners including agribusiness groups and the drainage industry.” The coauthors have also shared information about the booklet in press articles and radio and TV interviews. An online

What is a Denitrifying Bioreactor?

A bioreactor is a structure containing a carbon source (e.g., wood chips) that is installed to reduce the concentration of nitrate-nitrogen in subsurface agricultural drainage flow via enhanced denitrification. Typically, the bioreactor is installed at the end of a tile system, just before the drainage water enters a drainage ditch or stream. A water control structure is installed on the tile line, and this structure allows the operator to divert some of the drainage flow to the bioreactor chamber. At the other end of the chamber, a collector pipe gathers up the treated water and sends it out to a drainage ditch or stream.

The bioreactor chamber is a pit excavated into the ground. The pit is lined with plastic and filled with wood chips, and is then covered with a layer of soil at least 2 feet deep. The plastic prevents the soil from migrating into the wood chips, and ensures that the tile water stays in the wood chip chamber long enough to adequately remove the nitrates. Bacteria colonize the wood chips, using the carbon in the wood as an energy source and changing nitrates in the water to nitrogen gas (through the natural process of denitrification). The woodchips are expected to have a useful lifespan of 7 to 15 years before they lose their ability to remove nitrates, at which point they can be replaced to rejuvenate the system.

Bioreactors can be added to the edges of existing tile drain systems to reduce nitrogen in drainage water, which increases their appeal. In New Jersey, Rutgers Cooperative Extension is partnering with the New Jersey Natural Resources Conservation Service to help farmers statewide retrofit tile drains with wood chip bioreactors (see [Reducing Fertilizer Runoff from New Jersey Farmlands](#)). An article featured in the *Journal of Environmental Quality*, [Controls Influencing the Treatment of Excess Agricultural Nitrate with Denitrifying Bioreactors](#), explored the use of denitrifying bioreactors in New York’s Seneca River watershed. For more information, see the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service’s (NRCS’) [denitrifying bioreactor information sheet](#) (conservation practice standard number 605), or view [Nabbing Nitrates Before Water Leaves the Farm: Bioreactors](#), a video produced by the Missouri and Mississippi Divide Resource Conservation and Development, with support from USDA.



Installing a denitrifying bioreactor in a Midwest field. Photo by J. Johnson, USDA NRCS.

course specifically for certified crop advisors is being developed to accompany the booklet, and is expected to be available in summer 2017. The Ten Ways booklet is available for [free download](#), and printed copies (Publication C1400) are available from the University of Illinois' [PubsPlus website](#) for \$4.

[For more information contact Laura E. Christianson, Ph. D., P.E., Assistant Professor of Water Quality, Department of Crop Sciences, University of Illinois, S322 Turner Hall, 1102 S. Goodwin Ave., Urbana, IL, 61801. Phone: 217-244-6173, Email: LECbris@illinois.edu, Web: <http://draindrop.cropsci.illinois.edu>. Article was expanded from a University of Illinois Extension [News Release](#) by Lauren Quinn.]

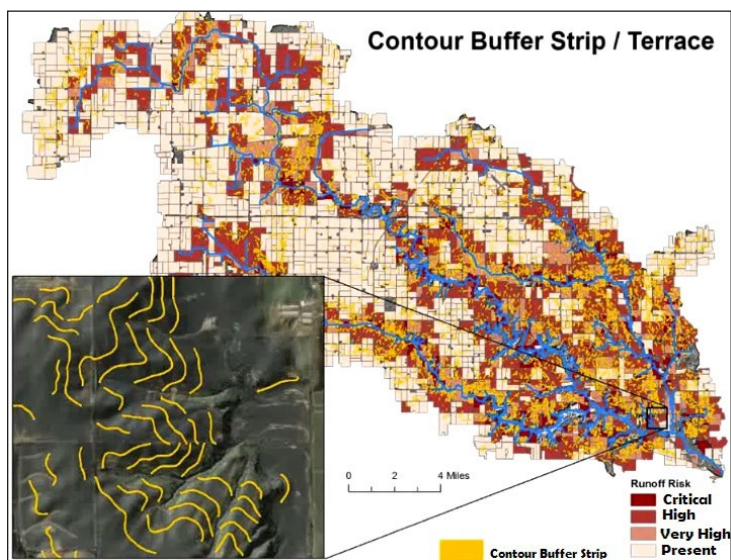
Agricultural Conservation Planning Framework Helps Target Conservation Practices

Using a new set of geographic information system (GIS)-based software tools, farmers and watershed managers in the Midwest are applying precision conservation concepts on agricultural lands. Developed by the U.S. Department of Agriculture's—Agricultural Research Service (USDA—ARS), the [Agricultural Conservation Planning Framework \(ACPF\) Toolbox](#) is designed to help farmers identify where different types of conservation practices could be placed to reduce, trap and treat water flows, thereby improving water quality.

The free ACPF software toolset includes GIS tools that manage and analyze different types of mapped information within a flexible framework. The tools can process [LiDAR](#)-based digital elevation models to analyze the terrain (slope) and hydrology, which helps to identify agricultural fields most prone to delivering runoff directly to streams. Another tool maps and classifies riparian zones to inform whole-watershed riparian corridor management. Finally, the software generates maps indicating where field-scale and edge-of-field conservation practices could be installed to reduce the amount of pollution carried away with drainage water. The maps show landowners where they could install conservation practices such as controlled drainage, grassed waterways, contour buffer strips, water and sediment control basins, and nutrient

removal wetlands (see figure). The toolset does not identify particular practices that must be installed in specific places; instead, it identifies multiple conservation placement opportunities across a watershed. Local watershed planners then consult with landowners to help them decide which practices to implement and where.

The ACPF's data-centered planning process and non-prescriptive approach to implementing conservation practices appeals to watershed managers and farmers alike. "Conservationists like the consistency of the ACPF approach and scientific basis that is brought into the process," explains Dr. Mark Tomer, Research Soil Scientist with the USDA—ARS' National Laboratory for Agriculture and the Environment. "This approach also empowers farmers to participate in watershed planning because they can choose the practices they want to use to solve their local water quality issues. Often, the choice is determined not only by what's most effective but also by which practices best fit with local farming systems and community preferences."



Using available data, the ACPF software generates maps with opportunities for contour buffer strips on a particular parcel in the lower part of this watershed—one of a suite of conservation practice implementation choices provided. The tool automatically varies the distance between the proposed contour strips based on slope steepness.

Expanding ACPF Applicability

Where ACPF data are available, a local GIS analyst with modest expertise, 2 days of training, and knowledge of the watershed can conduct the ACPF analyses. As of March 2017, USDA—ARS had developed ACPF databases featuring the necessary information on agricultural field boundaries, land use, soils, and detailed elevation data for Iowa, Illinois, southern Minnesota, eastern Kansas

and parts of northern Indiana. Dr. Tomer envisions wider ACPF applicability in the future, to include rain-fed agriculture areas where surface runoff and tile drainage contribute to local water quality problems and flooding issues. “This suggests potential use in parts of the eastern Great Plains, across the Midwest to the eastern United States, parts of the coastal and mid-south, and perhaps some agricultural areas near the U.S. west coast as well.”

Developing the necessary data sets to expand ACPF over a wider area will require time, dedication and research. The ACPF project team has worked for more than 5 years developing ACPF data sets covering nearly 7,000 subwatersheds across the Upper Mississippi River Basin. In addition to the time required to compile the necessary landscape-related input data, applying ACPF in new places will require research on conservation practice effectiveness. “We’d need to determine if we can optimize the output by learning how to adjust criteria for different landscape and soil conditions,” Dr. Tomer explains. He wants to ensure the ACPF’s siting criteria can be fine-tuned to continue providing realistic, accurate, and applicable sets of suggested practices and locations in each subwatershed, as it does now.

ACPF Emphasizes Landowner Control

The key to ACPF’s success with landowners and watershed managers has been its emphasis on local participation and choice. “We hear very little negative feedback,” notes Dr. Tomer. The criticism received to date has been from farmers not initially understanding that the ACPF creates a menu of possible conservation options rather than one conservation prescription they must implement. “When training new ACPF users, we emphasize that identifying a watershed’s conservation opportunities cannot be an automated process, and that local evaluation and feedback is critical when making conservation choices.”

You may download the most recent version of the ACPF Toolbox and the user manual from the North Central Region Water Network’s [ACPF Toolbox website](#), and learn about training opportunities, view a map of ACPF watersheds, access information on data availability, and read copies of scientific papers describing the toolbox. A 2016 [ACPF webinar](#) is available that walks viewers step-by-step through the ACPF process.

[For more information, contact Mark D. Tomer, Ph.D., Research Soil Scientist, USDA–ARS, National Laboratory for Agriculture and the Environment, 1015 N. University Blvd., Ames, IA 50011. Phone: 515-294-0213; Email: Mark.Tomer@ars.usda.gov]

ACPF in Action: Feedback from Farmers

ACPF analyses are paying off dividends for both producers and conservation planners, according to preliminary findings of an ongoing Purdue University study. Pranay Ranjan, a postdoctoral research associate in Purdue University’s Department of Forestry and Natural Resources, is studying the opinions of people in six watersheds (three in Minnesota and three in Iowa) who’ve worked with the ACPF. To date, he’s conducted interviews with 28 individuals who have been involved with the ACPF process—six GIS personnel, 14 conservation planners, and eight farmers. Ultimately he hopes to interview about 60 people total, or about 10 in each watershed.

Ranjan’s preliminary results indicate that people are pleased with the ACPF and what it offers. “Farmers recognize the value of the ACPF as a starting place for conversations with conservation planners,” he notes. Farmers indicated they found the ACPF-generated maps to be easy to understand, interesting and helpful. Conservation staff noted that ACPF-generated maps raised farmers’ curiosity about possibly using new types of practices on their land. Plus, both farmers and producers mentioned that they appreciate the amount of time saved by the ACPF effort. “Having the ACPF maps available minimizes the time needed to wander around the watershed trying to assess where to place practices,” he adds.

Ranjan is also receiving constructive feedback that he will relay to the ACPF design team. For example, some farmers would like ACPF analyses to offer additional information, such as nutrient level reductions that would be realized from implementing particular practices. Ranjan hopes to complete the study and report on his findings later this year. “Our goal is to help strengthen the ACPF toolbox, find out how the results are being used, and identify recommendations for future training efforts that will help conservation professionals as they take ACPF into new watersheds,” notes Ranjan.

The study is being completed through Purdue’s Natural Resources Social Science Lab, which is directed by Dr. Linda Prokopy. For more information, contact Pranay Ranjan, Ph.D., Postdoctoral Research Associate, at 765-494-1785 or ranjan@purdue.edu.

New Apps Provide Soil, Land and Climate Data

Knowledge of their local soils and climate is critical for farmers to match best farming practices to specific soil types—a harsh lesson learned in the last century from the “U.S. Dust Bowl” experience. During the 1930s, farmers in the U.S. Southern Plains applied farming methods that were mismatched with the region’s dryland conditions. The practices loosened the region’s drought-ridden dryland, exposing soil to severe wind erosion. The dust storms that resulted wreaked havoc for more than a decade.



U.S. Department of Agriculture–Natural Resources Conservation Service rangeland scientist Emilio Carrillo tests the new LandPKS mobile app on his smartphone. Photo by Jeffrey Herrick, USDA-ARS

Today, feeding the world’s seven billion people while also protecting land and water resources remains a challenge for land managers. Food production based on well-matched farming techniques that protect the environment, public health, and animal welfare is the cornerstone of sustainable agriculture.

A team led by the U.S. Department of Agriculture–[Agricultural Research Service](#) (USDA–ARS) soil scientist [Jeffrey Herrick](#) has developed an innovative cloud computing platform and suite of mobile apps to give farmers and land managers information they need. The Land-Potential Knowledge System (LandPKS) “identifies—and in the near future will deliver—knowledge relevant to specific soils to anyone with a mobile phone,” says Herrick, who is based at the USDA–ARS [Range Management Research Unit](#) in Las Cruces, New Mexico.

The LandPKS mobile app, which includes the LandInfo and LandCover modules, taps cloud computing, digital and traditional soil-mapping, and Global Positioning System (GPS) data to provide information on the sustainable potential of land under current and future climate conditions.

The current version of the LandInfo module allows the user to collect soil and site topographic data, while the LandCover module is used to document ground cover, vegetation height, plant density and spatial patterns of vegetation affecting soil erosion. Domestic and international development organizations and land-management agencies are already using the app to crowd-source the local information needed to inform management decisions.

For articles offering more details about LandPKS and its use of multiple data sources, including user-generated content, refer to the [LandPKS Publications webpage](#).

“The current apps can already help U.S. urban and small-tract land managers describe their soils without soil science training,” says Herrick. Other potential users include land managers, farmers, extension service agents, and people interested in knowing more about their land. Travelers may also use the app to get local climate data anywhere in the world.

The LandPKS app is geared to collect and store data derived from users at a specific given site. The collected information is housed in a centralized, open-access database and becomes part of a data system that will in the future identify management options for sites having similar topography, soils, and climatic conditions. The app is available for free download at [LandPotential.org](#), [Google Playstore](#), and the [iTunes App Store](#) (by searching “LandPKS.”)

*[For more information contact Jeffrey Herrick, U.S. Department of Agriculture, Agricultural Research Service, 2995 Knox St., Las Cruces, NM 88003. Phone: 575-646-4842; Email: Jeffrey.Herrick@ars.usda.gov. This article originally appeared in the January 2017 issue of *AgResearch*.]*

Notes on Education

Environmental Film Festivals: Sharing Messages, Offering Insight

Film festivals are fun—they showcase new movies by talented filmmakers and bring communities together. These days, more film festivals are popping up that are dedicated solely to environmental films made by independent producers. Viewers can attend screenings of short and feature-length

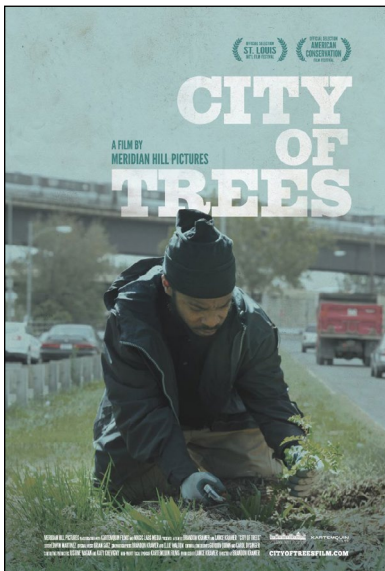
films about nature, adventure, wildlife, environmental justice, ecology, and conservation. Many of these touch on nonpoint source pollution and water quality protection issues.

The 2008 film, “Dirt! The Movie,” for example, explores the importance of soil to our lives, explains how soil erosion can threaten sustainability, and highlights examples of people across the globe solving soil-related problems. Narrated by actress Jamie Lee Curtis, the film was initially screened at the 2009 Sundance Film Festival, and was featured by PBS for Earth Day 2010. Since then, it has been shown at film festivals across the globe and is available online and for community screenings.

Not every environmental documentary has that much star power, but each one has an important story to tell. The 76-minute-long 2015 documentary “City of Trees,” for example, highlights the experiences of three trainees and the director of a job training program who work with unemployed people by helping them gain skills and knowledge planting trees and caring for parks in the District of Columbia (under the premise that these skills could provide future employment opportunities). The film, which was financially supported with grant funds and a Kickstarter campaign, offers insight into the challenges of retraining the U.S. workforce and restoring natural landscaping in urban areas. The film has appeared at numerous film festivals, including the American Conservation Film Festival (Shepherdstown, West Virginia), the Environment Film

Festival at Yale (New Haven, Connecticut), and the Eckerd College Environmental Film Festival (St. Petersburg, Florida), and is frequently screened at university and community venues around the country.

Film festivals provide filmmakers with a venue to experiment with new ways to convey their messages. The 2016 music-based eco-documentary “The Colorado” is designed as an immersive and sensorial experience in which music and images play a central role. The film relies on both narration and song as it explores the history, people, ecology and water of the Colorado River Basin. Funded in part by a Kickstarter campaign, the 90-minute movie is being featured in a number of film festivals in 2017, including the Wisconsin Film Festival (Madison, Wisconsin) and the Environmental Film Festival in the Nation’s Capital (DCEFF) (Washington, DC). The DCEFF is also hosting a virtual reality film, “Under the



City of Trees has been featured at numerous film festivals and is often shown for free at schools and other public venues.



Dirt! The Movie, is available for online streaming, and may be available for free at your local library.

Hometown Habitat: Developing a Documentary

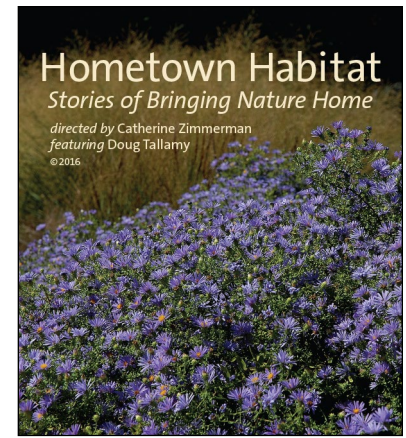
Catherine Zimmerman, an award-winning director of photography, has worked on education and environmental documentary films for over 40 years. Her 2016 documentary, “Hometown Habitat: Stories of Bringing Nature Home,” has been a labor of love. Her film not only introduces us to community Hometown Habitat heroes, but also features ecologists, entomologists and other experts who share the science behind why native plants are excellent for wildlife habitat, water quality and overall ecosystem health.

Zimmerman and her film crew traveled across the country for more than two years, visiting individuals and groups who are restoring habitats and preventing pollution from entering waterways, one garden at a time. Community projects ranged from New York City’s efforts to plant trees to improve air and water quality to individual church congregations installing rain gardens and other low impact development landscape practices to capture and treat the stormwater runoff on their church property. The film crew found its way to Florida, where artists are using their craft to help solve environmental problems in watersheds prone to stormwater flooding. They visited a conservation community development in the prairies of the Mississippi River Basin, where clustered development allowed preservation of open space. Their travels also took them to the streams and rivers of the Rocky Mountains, the Chesapeake Bay, the Great Lakes and Columbia River, where they viewed success stories and works-in-progress by energetic and committed people from all walks of life. To learn more about the background of the film and the processes that went into its creation, watch Catherine’s Zimmerman’ [interview](#) conducted by Kim Eirman of EcoBeneficial!, a horticulture communications and consulting company.

Canopy”, to give film festival attendees a virtual experience of life in the Amazon rainforest via 360-degree viewing.

Without a doubt, independent documentary filmmaking requires creativity, dedication and belief in a cause. Catherine Zimmerman, the director/producer of the 2016 documentary, “Hometown Habitat: Stories of Bringing Nature Home,” is an excellent example. Her film expresses how and why native plants are critical to the survival and vitality of local ecosystems across the United States. Motivated to bring this message to others, Zimmerman spent over two years filming inspiring stories of community commitment to conservation landscaping. The 90-minute-long Hometown Habitat film was recently screened at the One Earth Film Festival (Chicago, Illinois), and is scheduled for numerous screenings by community groups across the United States. (For an in-depth look at the story behind the Hometown Habitat film, see box on the previous page.)

Look for announcements in your local newspaper and on social media from community theaters and organizations to find free screenings of eco-documentaries offered near you. If you’re fortunate to live close to such a film festival site, be sure to check it out!



Hometown Habitat is being shown for free at numerous venues in 2017, thanks to local groups who sponsor screenings.

Webinars Help Water Quality Professionals Understand Watershed Models

Want to know more about watershed models? The U.S. Environmental Protection Agency (EPA) formed the Water Quality Modeling Workgroup in 2013 to facilitate collaboration among EPA and state employees who are using water quality models for Clean Water Act implementation purposes (e.g., total maximum daily loads [TMDLs], water quality standards). The workgroup steering committee offers a series of [two-hour webinars](#) to help water quality professionals better understand how models operate and can be used to solve problems facing water quality professionals. The first three webinars covered modeling basics, such as selecting, developing, and running hydrology and water quality models. Subsequent webinars focus on modeling specific pollutants (e.g., nutrients, sediment, metals) and other emerging issues.

New webinars will be announced on the [Impaired Waters and TMDLs: TMDL Modeling webpage](#). Archived versions of the following webinars are available for viewing:

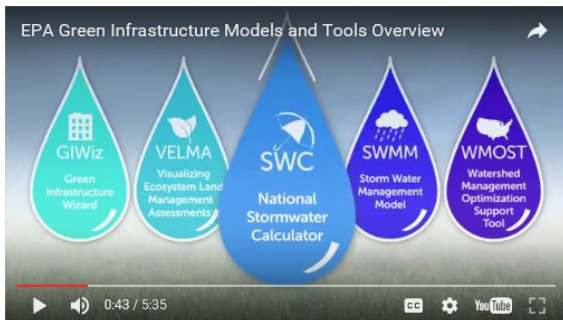
- [Water Quality Models 101—What Are These Things?](#) (March 2015)
- [Brick by Brick: How Water Quality Models Are Developed](#) (April 2015)
- [Interpreting and Using Water Quality Models](#) (June 2015)
- [Nooksack River QUAL2Kw Temperature Model and Climate Change Scenarios](#) (July 2015)
- [Modeling Nutrients: Nutrient Cycles, Potential Impacts on Water Quality and Developing Nutrient Endpoints](#) (September 2015)
- [Modeling Nutrients in Rivers, Streams, Lakes, Reservoirs and Estuaries](#) (October 2015)
- [Sediment Modeling - Part 1](#) (January 2016)
- [Modeling Dissolved Oxygen](#) (August 2016)
- [Watershed Modeling Using HSPF \[Hydrological Simulation Program--Fortran\]](#) (September 2016)
- [Sediment Modeling: Part 2](#) (November 2016)
- [Introduction to SWAT \[Soil and Water Assessment Tool\]](#) (April 2017)

Need More Modeling Resources?

EPA's [Watershed and Water Quality Modeling Technical Support Center](#) offers numerous tools and mathematical models to support the development of TMDLs, waste load allocations and watershed protection plans. Based out of Athens, Georgia, the Center offers assistance in multiple areas, including reviewing proposed TMDLs, applying models during TMDL development, acquiring and analyzing data, assessing and selecting the most appropriate best management practices, and creating new models. More details are provided in the [TMDL Modeling Toolbox fact sheet](#).

EPA's Office of Research and Development recently hosted a webinar featuring its [Green Infrastructure Modeling Toolkit](#) of five models and tools for planning, designing and evaluating green infrastructure. The highlighted tools included:

- GIWIZ [Green Infrastructure Wizard]
- VELMA [Visualizing Ecosystems for Land Management Assessment Model]
- SWC [Stormwater Calculator]
- SWMM [Storm Water Management Model]
- WMOST [Watershed Management Optimization Support Tool]



EPA's Office of Research and Development recently hosted a webinar featuring its [Green Infrastructure Modeling Toolkit](#). A 5-minute [overview video](#) is available on the toolkit website.

EPA's Office of Wetlands, Oceans and Watersheds offers web-based education through its [Watershed Academy Webcasts](#) site. On March 9, 2017, the Watershed Academy highlighted the new tool "Model My Watershed" in a free, hour-long [webinar](#). The user-friendly, online "Model My Watershed" modeling application, developed and maintained by the Stroud Water Research Center, helps users learn how land use and soil together determine whether rainfall infiltrates into the soil, runs off into streams, or is evaporated and transpired by plants. This web tool provides an easy-to-use, professional-grade modeling package to inform land-use decisions, support conservation practices, and enhance watershed education. The webcast provided an overview and a demonstration of the application and highlighted how the tool is being used by several states for their TMDL, nonpoint source and municipal stormwater programs.

Reviews and Announcements

Agricultural Nonpoint Source Pollution

Innovative Conservation Grants Protect Water Quality in Diverse Communities

In fall 2016, the U.S. Department of Agriculture (USDA) announced a \$26.6 million investment into 45 projects that will spur innovative conservation initiatives on both rural and urban farms across the country. Public and private grantees will provide matching investments, bringing the total value of support to \$59 million. The investment is made through USDA's Conservation Innovation Grants program, which fosters innovation in conservation tools and strategies to improve things such as on-farm energy and fertilizer use as well as market-based strategies to improve water quality and increase resilience to changing weather patterns. The [2016 projects focus](#) on water quality, conservation finance and assistance to historically underserved USDA customers. Approximately 25 percent of the funding announced today will go to projects that benefit historically underserved producers, military veterans, and new and beginning farmers.

Midwest Row Crop Collaborative Announced

Agricultural stakeholders, food companies and environmental partners recently launched the [Midwest Row Crop Collaborative](#) to support farmers and strengthen conservation in Illinois, Iowa and Nebraska. Leading food and agriculture supply chain companies and conservation organizations have formed an "end-to-end" partnership to help farmers improve the health of their soil and protect water quality. Founding members include Cargill, Environmental Defense Fund, General Mills, Kellogg Company, Monsanto, PepsiCo, The Nature Conservancy, Walmart and the World Wildlife Fund. The MRCC has adopted the same reduction goals as the Hypoxia Task Force, with an interim target of 20 percent nutrient (primarily nitrogen and phosphorus) reduction by 2025 and a 45 percent nutrient reduction goal by 2035.

Website Highlights Farmer Heroes

The U.S. Environmental Protection Agency's (EPA's) "[Farmer Heroes Manage Nutrients On Farm](#)" website features farmers from across the country who are voluntarily adopting practices

to minimize nutrient runoff from their operations. The National Association of Conservation Districts and EPA identified the farmers for their efforts to implement best management practices to reduce pollution while also improving or sustaining their profits, soil quality and crop yields.

Data Resources

Web-based Water Quantity and Quality Modeling System Available

The [Hydrologic and Water Quality System \(HAWQS\)](#) Beta is a web-based interactive water quantity and water quality modeling system that employs as its core modeling engine the [Soil and Water Assessment Tool \(SWAT\)](#), an internationally recognized public domain model. HAWQS provides users with interactive web interfaces and maps; pre-loaded input data; outputs that include tables, charts and graphs; a user's guide; and online development, execution and storage of a user's modeling projects. HAWQS will expand EPA's repertoire of water quality decision support systems by including a modeling system that can simulate water quality impacts across very large geographic areas which result from particular watershed management decisions. HAWQS Beta, which was released in June 2016, will be used to identify additional enhancements and features by engaging individuals who will use HAWQS to support policy, regulatory or other water quality decision making. For more information, download the [HAWQS Beta Flyer](#), or view the archived [HAWQS Beta webcast](#).

Web Portal to Help Communities Prepare for Weather Resilience

EPA has launched a new online portal that provides local leaders with information and tools detailing how to increase a community's resilience to a changing climate. Using a self-guided format, the Adaptation Resource Center ([ARC-X](#)) provides information tailored specifically to community needs. ARC-X leads users through all steps of an adaptation process, including (1) understanding the implications of changing climate for their particular region or issues of concern, (2) identifying adaptation strategies that can be implemented to address climate-related risks, (3) examining case studies that illustrate how other communities with similar concerns have successfully adapted, (4) presenting potential EPA tools to help implement adaptation strategies, and (5) identifying sources of funding and technical assistance (including [climate adaptation training](#)) from EPA and other federal agencies.

Green Stormwater Infrastructure

EPA Announces Winners of 2016 Campus RainWorks Challenge

In April 2017, EPA announced the winners of the fifth annual [Campus RainWorks Challenge](#), the only national college competition to engage the next generation to design solutions for stormwater pollution using green infrastructure. Teams of undergraduate and graduate students, working with a faculty advisor, developed innovative green infrastructure designs in one of two categories: (1) the Master Plan category, which examines how green infrastructure can be integrated into a broad area of a school's campus, and (2) the Demonstration Project category, which focuses on how green infrastructure can be integrated into a particular site on the team's campus. The 2016 challenge winners are Kansas State University, City of College of New York, University of Maryland, and University of Cincinnati.

EPA Launches Guide for Long-Term Stormwater Planning

In fall 2016 EPA announced [Community Solutions for Voluntary Long-Term Stormwater Planning](#), a package of resources to help communities plan long-term strategies for managing stormwater pollution. These tools include a step-by-step guide to help communities develop long-term stormwater plans, a web-based toolkit for the planning process, and technical assistance for five pilot communities to develop plans as national models. This approach was built on input from states, communities, industry, academia and nonprofit organizations. Initially the draft guide will be used by five communities selected for \$150,000 each in technical assistance to develop long-term stormwater management plans (Burlington, IA; Chester, PA; Hattiesburg, MS; Rochester, NH; and Santa Fe, NM). These communities will also beta-test EPA's web-based toolkit, which will be refined and released more broadly in late 2017.

Publication Addresses Using Green Infrastructure to Increase Resiliency

As different parts of the country become drier, wetter or hotter, community leaders and citizens are looking to green infrastructure to improve their community's resiliency to the effects of shifting weather patterns. In 2015 EPA convened charrettes, or intensive planning sessions, in four cities to demonstrate how this type of planning could help communities cope with a range of challenges. Each city's charrette focused on different issues based on the most pressing climate impacts they were facing as well as their current level of green infrastructure implementation. EPA recently released a publication, [Green Infrastructure and Climate Change: Collaborating to Improve Community Resiliency](#), which summarizes the issues and the recommendations developed by each charrette.

Report Highlights Groundwater Recharge Benefits of Green Infrastructure

EPA commissioned a study to estimate the groundwater recharge benefits realized from adding small green infrastructure practices on new development and redevelopment nationwide. The study focused on areas in the United States where groundwater is a significant contributor to urban and agricultural water sources and where water shortages might occur in the future. Broad assumptions, national datasets, and simplified recharge calculation and monetization approaches were used to provide general insight into the monetary benefits of small-storm retention practices. The approach was vetted by a panel of experts from government, academia and industry, with recommendations for improved methodologies for future studies. The results suggest that using green infrastructure can save hundreds of millions of dollars in groundwater resources over time when only applying the practices to new development and redevelopment. If retrofitting or increased retention were to occur, the groundwater benefits would be even more significant. The study results are summarized in a 75-page report, [Estimating Monetized Benefits of Groundwater Recharge from Stormwater Retention Practices](#).

Watershed Management

EPA's National Lakes Assessment Finds Nutrient Pollution is Widespread in Lakes

In December 2016, EPA released the results of its [2012 National Lakes Assessment](#), which shows that nutrient pollution was widespread in the nation's lakes during the 2012 assessment. Four in 10 lakes are suffering from too much nitrogen and phosphorus, which can cause algae blooms, decrease oxygen levels, degrade habitat for fish and other life, and lower water quality for recreation. The National Lakes Assessment also found the algal toxin, microcystin, in 39 percent of lakes (although these were present below levels of concern). Low concentrations of the herbicide atrazine were found in 30 percent of lakes. The assessment is part of a series of National Aquatic Resource Surveys designed to provide information about the condition of water resources in the United States. The surveys are conducted in partnership with states and tribes to provide national-scale assessments of the nation's waters. An earlier National Lakes Assessment was conducted in 2007, but this latest study was expanded to include smaller lakes and to increase the number of lakes assessed. Lake managers can use the new [interactive dashboard](#) to evaluate site-specific information and to explore population-level results. Conducted on a 5-year basis, future lake surveys will help water resource managers assess broad-scale differences in the data and perform trends analysis to better inform future lake management.

Report Links Leaf Litter to Phosphorus in Stormwater

The timely removal of leaf litter can reduce harmful phosphorus concentrations in stormwater by over 80 percent in Madison, Wisconsin, according to a recent [U.S. Geological Survey \(USGS\) study](#). Autumn leaf litter contributes a significant amount of phosphorus to urban stormwater, which then runs off into waterways and lakes. Excessive amounts of nutrients such as phosphorus and nitrogen can cause eutrophication, or the depletion of oxygen in water, resulting in death of aquatic animals like fish. The study found that without removal, leaf litter and other organic debris in the fall contributed 56 percent of the annual total phosphorus load in urban stormwater compared to only 16 percent when streets were cleared of leaves before a rain event.

Report Reviews Removal of Obsolete Dams

EPA's Office of Water recently released [FAQs on Removal of Obsolete Dams](#), which provides answers to frequently asked questions regarding the applicability of EPA programs on the removal of obsolete dams. Removal of these dams has been on the rise in the United States for a variety of reasons, including ecological restoration, economic development of communities, addressing concerns with localized flooding, improving recreational opportunities, restoring fish spawning and migration, addressing safety issues for recreational users due to dangerous hydraulics below dams, responding to storm events, and ensuring the safety of downstream communities. EPA developed the document to help nongovernment organizations, state and local officials, and private landowners make decisions regarding removing obsolete dams. The document describes the impacts of obsolete dams on water quality and public safety, the permitting requirements for removal of these dams, and potential sources of funding that might be available to support removal. The document does not change existing policy on dam removal.

Updated SECURE Water Act Report Available

The U.S. Bureau of Reclamation has published an updated [SECURE Water Act Report](#) to Congress. The report highlights findings from basin-specific collaborative planning studies to provide a western United States perspective on anticipating impacts to water resources arising from changing climate and identifying corresponding adaptation strategies. The report notes that projected changes in temperature, precipitation and snowpack are likely to impact the timing and quantity of stream flows in all western basins, which could affect the amount of water available to support farms and cities, hydropower generation facilities, fish and wildlife health, and other uses such as recreation. A companion [visualization tool](#) shows changes in temperature, precipitation and snowpack across eight major river basins.

Urban Waters Receives EPA Funding for Revitalization

EPA awarded \$1.3 million in 2016 [Urban Waters grants](#) to 22 organizations in 18 states to help protect and restore urban waters and to support community revitalization and other local priorities. Many urban waterways have been polluted for years by sewage, runoff from city streets, and contamination from abandoned industrial facilities. Healthy and accessible urban waters can enhance economic, educational, recreational and social opportunities in surrounding communities. This year's Urban Waters grantees will inform and engage residents in stormwater management and pursue community-based plans to address pollution in waterways. To accomplish these goals, many projects will address trash in waterways; test rivers, streams and lakes for pollutants; and prepare the next generation of environmental stewards for careers in the green economy.

Urban Waters Voices Video Series Highlights Successes

In its [Urban Waters Voices video series](#), EPA highlights many examples of urban rivers cleanup work being completed by federal partners and local communities. Recently released videos highlight restoration and management efforts on the [Passaic](#), [Patapsco](#) and [Middle Rio Grande](#) rivers.

Other

EPA Finalizes Rule on Small Municipal Separate Storm Sewer Systems

On December 9, 2016, EPA updated its regulations governing how small municipal separate storm sewer systems (MS4s) obtain coverage under National Pollutant Discharge Elimination System (NPDES) general permits. The change promotes greater public engagement by establishing clear requirements on the opportunities for public participation on the permitting process. The [NPDES Stormwater Final MS4 General Permit Remand Rule](#) establishes two alternative approaches that a NPDES permitting authority can use to issue and administer small MS4 general permits. Both approaches ensure that the permitting authority establishes what is necessary for the MS4 to reduce the discharge of pollutants from its MS4 to the maximum extent practicable, to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act.

Both approaches also ensure that the public participation requirements of the Clean Water Act are met. This regulation does not establish any new substantive requirements for small MS4s.

Final 2017 Construction General Permit Issued

The final Construction General Permit (CGP) permit took effect on February 16, 2017, and will last for five years. The 2017 CGP is similar to the 2012 CGP it replaces; it includes discharge limitations and requirements for self-inspections, corrective actions, staff training and development of a stormwater pollution prevention plan. It also includes several new protections such as requiring waste containers to have lids or be covered when not in use or at the end of the business day, requiring controls to minimize exposure of building materials containing PCBs to precipitation and stormwater, and requiring large land disturbances to be stabilized faster. For more information, please view the [CGP website](#) or [CGP resource documents](#).

Gulf Shrimp Prices Reveal Hidden Economic Impact of Hypoxic Waters

A Duke University study, published in *The Proceedings of the National Academy of Sciences*, provides evidence linking Gulf of Mexico hypoxia to economic impacts. Hypoxic (low-oxygen) zones in the Gulf of Mexico drive up the price of large shrimp relative to smaller sizes, causing economic ripples that can affect consumers, fishermen and seafood markets alike. For more information, read the January 2017 Duke University [press release](#).

Survey Reveals Public Perceptions of Water Quality in Iowa

In 2015 the University of Northern Iowa's Center for Social and Behavioral Research contacted more than 2,000 Iowa residents and polled them on their perceptions, knowledge, behavior and attitudes toward water quality in the state of Iowa. This effort was supported by the Iowa Department of Natural Resources with Clean Water Act section 319 funds as part of a statewide campaign to inform residents about Iowa water quality issues, motivate citizen involvement, and change both individual behaviors and community practices. The survey explored topics related to general views on the environment, the degree of knowledge of water quality and causes of water pollution, amount of participation in recreational activities involving water, environmental behaviors that could impact water quality, awareness of strategies that could be used to improve water quality, and responsibility for and willingness to invest in water quality improvement. For example, a majority (85 percent) of Iowa residents agreed that clean water was needed for economic growth in Iowa. When asked how likely they would be willing to change a single behavior to improve water quality as part of a local effort, 70 percent of people surveyed said they probably or definitely would change their behavior. For more information, download the survey report, [Public Perceptions of Water Quality in Iowa: A Statewide Survey](#), or view a copy of an [online slide presentation](#).

USGS Field Method is a Breakthrough for Contaminant Analysis in Water

USGS recently published a [new techniques and methods report](#) highlighting a portable continuous-flow centrifuge which aims to save time and money on contaminant analysis of particles suspended in water samples. In the past, contaminant analysis required the collection of large volume samples and separation of the water from the suspended sediment to obtain enough contaminant for reliable chemical analysis in the laboratory. Separation of suspended sediment from water in a laboratory is time-consuming and costly. It requires shipping large amounts of water to a laboratory for separation or shipment of a large industrial centrifuge to the field. Consequently, few studies or monitoring programs have measured the chemical quality of suspended sediment because of the difficulty in consistently obtaining samples for laboratory analysis.

Recent and Relevant Periodical Articles

Financing Integrated Green Stormwater Infrastructure to Improve Community Health, Resiliency—Getting the Best Deal for the Money!

This article, published in the October 13, 2016, issue of the Bloomberg BNA's *Daily Environment Report* and posted on EPA's website, discusses the needs and effective financing solutions for building a comprehensive integrated green stormwater infrastructure program that combines the strengths of green and grey solutions to provide multiple community benefits, including mitigation and rehabilitation of critical infrastructure damaged by extreme wet-weather events.

Rain as a resource: St. Paul innovates shared, sustainable stormwater management

This article, published in the December 9, 2016, issue of *MinnPost*, describes two innovative infrastructure systems, referred to as “shared, stacked green infrastructure systems,” that have been introduced in St. Paul, Minnesota. Along the Green Line light-rail corridor, the new system included installing a 5-mile-long tree trench system along both sides of the transit line. The city planted 1,000 trees and added nine rain gardens and stormwater planters along University Avenue to absorb and filter runoff. Near the Green Line's terminus, the city installed a rainwater harvesting and reuse system—the first municipal system of its type in Minnesota. A 27,000-gallon cistern captures rainwater from the roof of Metro Transit's operations and maintenance facility; the water is treated and used to irrigate a nearby ball field and flush the toilets.

Websites Worth a Bookmark

Low Impact Development Center

This redesigned website offers expanded project information, links and resources focused on sustainable stormwater management solutions for urban and developing areas.

Microplastics in our Nation's Waterways

This website, developed by the USGS, discusses the prevalence of microplastics in lakes and rivers. These minuscule plastic fragments (smaller than 0.04 inch) flake off of decomposing plastic bottles and bags, and have been manufactured into some toothpastes and lotions. The site reviews data showing which areas are most heavily affected by microplastics, discusses next steps, and provides links to additional information.

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