



ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY

Biennial Report 2015–2017



Illinois
Department of
Agriculture





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Chapter 1

Executive Summary

The Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) lays out a plan to leverage existing programs to optimize nutrient loss reduction while promoting collaboration, research, and innovation among the private sector, academia, non-profits, wastewater treatment agencies, the agricultural sector, and state and local government. The primary strategy goals are to reduce annual loading of nitrate-nitrogen and total phosphorus to the Mississippi River and address the impacts on local water quality. The ultimate goal is to achieve 45 percent loss reductions in both nitrate-nitrogen and total phosphorus with the interim loss reduction goals of 15 percent nitrate-nitrogen and 25 percent total phosphorus by 2025.

This Biennial Report on the Illinois Nutrient Loss Reduction Strategy describes actions taken to achieve the goals since the document's release. Reflecting the strategy, efforts have been focused in three sectors that can play significant roles: agriculture, point source, and urban stormwater.

This report demonstrates that significant progress has been made towards reducing nutrient loads in Illinois rivers and streams since the strategy release in 2015. Many farmers are implementing best management practices (BMPs) and technologies for more efficient nutrient use. The large number of BMPs installed is an indication that this effort is making progress. In the point source sector, most major treatment plants have received permit updates and have facility upgrade plans in motion.

For the agriculture sector, the report is based on the premise that resources that fund and support outreach efforts lead to BMP implementation, which results in water quality improvements. The point source sector adoption of BMPs is primarily based on regulations and permit updates. The stormwater sector's improvements thus far are due to funding of state, community, and watershed projects.

Illinois has been able to make significant progress in many areas despite no new monies for implementation. Progress happened because of numerous partnerships that leveraged resources and retargeted efforts to nutrient loss reduction goals. As the program matures and more people and partners become involved, continuing and growing progress is expected.

Agriculture

The Agriculture Water Quality Partnership Forum (AWQPF or the forum) works to implement agricultural policy and management decisions related to the strategy.

In 2016, 89 staff members were engaged in strategy outreach, implementation, or research for this sector. This number describes existing agency employees and AWQPF members working on nutrient loss reduction goals. Many people outside of AWQPF who are also involved in implementation, such as farmers and private contractors, are not reflected in this number.

Forum members reported that the agriculture sector invested nearly \$55 million in nutrient loss reduction research, outreach, implementation, and monitoring. This amount reflects contributions from AWQPF members and other organizations that conduct work towards Illinois NLRs goals. However, some dollars put towards strategy efforts are difficult to quantify because farmers are also implementing BMPs outside of state and federal cost-share programs.

As Figure 1.1 below shows, AWQPF members reported extensive outreach efforts. In 2015, several agricultural groups proactively led efforts to inform farmers, retailers, and certified crop advisers about the importance of Illinois NLRs. Representatives travelled throughout the state to hold meetings at county offices, which were followed up by automated phone calls to Illinois residents. In 2016, AWQPF members promoted the strategy to producers through a wide variety of programs and activities, including field days, workshops, and conferences. Through these and other efforts, Illinois farmers have become largely aware of practices that mitigate nutrient loss.

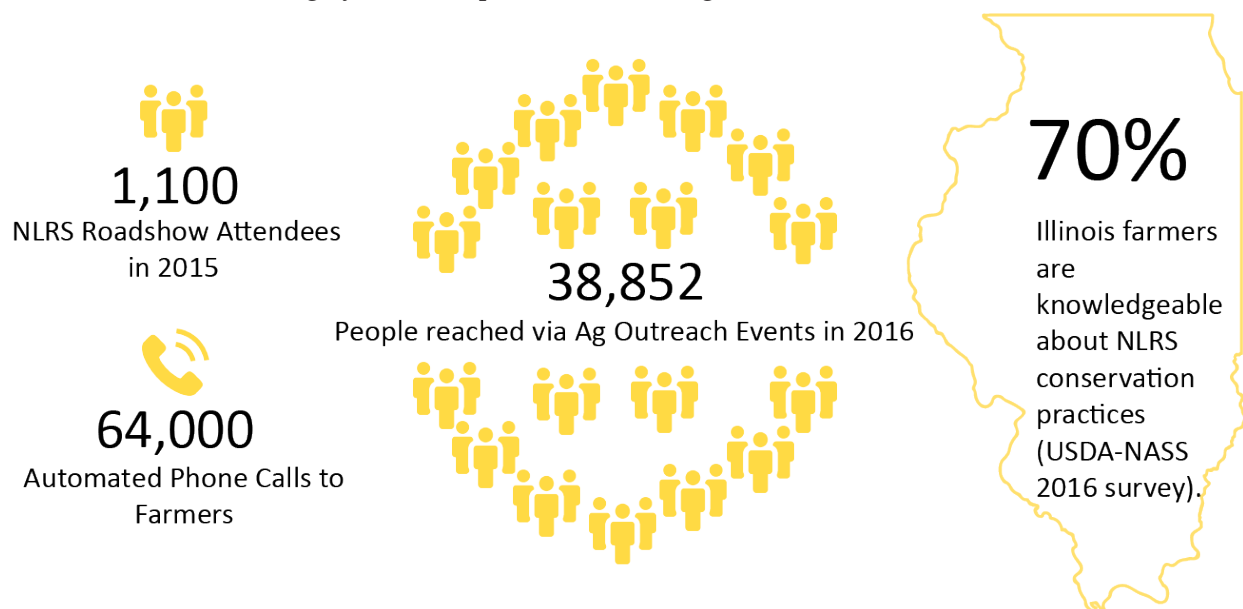


Figure 1.1. Agriculture outreach highlights

Resources and outreach have led to increases in BMP adoption on agricultural lands. Nitrogen application timing has shifted from fall only to fall and spring split applications on an increasing number of acres. Likewise, the number of acres of in-field and edge-of-field conservation practices has increased substantially since the 2011 baseline year. Figure 1.2 below illustrates BMPs reported through the Conservation Reserve Program (CRP) administered through the Farm Service Agency and the Conservation Reserve Enhancement Program (CREP) run through the Illinois Department of Natural Resources. This figure does not encompass all the available BMP implementation data, but it provides a snapshot of these programs.

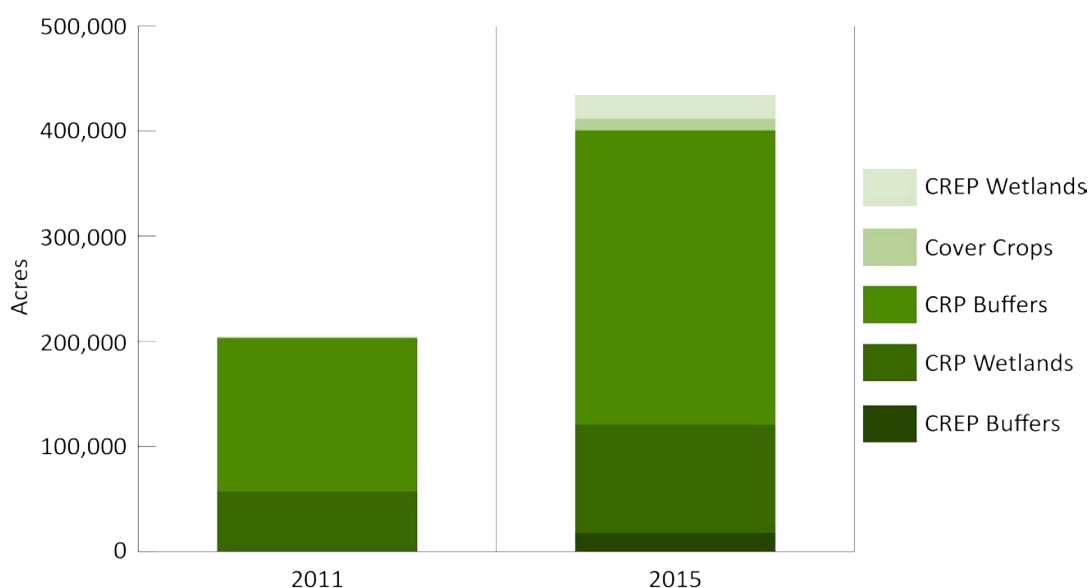


Figure 1.2. Agriculture BMPs reported by CREP and CRP (2011 and 2015)

Point Source

The Performance Benchmark Committee (PBC) is a new working group that was established to address implementation needs defined in Illinois NLRS. Both the agricultural and stormwater sectors had a plan in place to develop measures and benchmarks, so PBC set out to work with the point source sector in this process.

Facility improvements driven primarily by regulatory updates have promoted nutrient loss reduction. As part of the National Pollutant Discharge Elimination System (NPDES) permit renewal process, Illinois Environmental Protection Agency (EPA) requires major dischargers to submit a feasibility study for reducing phosphorus levels. Major dischargers are also required to submit and implement phosphorus discharge optimization plans for existing facilities.

Additionally, Figure 1.3 shows, nearly 80 percent of all effluent (design average flow or DAF) from wastewater treatment plants in Illinois is regulated under an NPDES permit with a total phosphorus limit (as of 2016). The number of permits with total phosphorus limits will continue to grow as existing major permits expire or are up for renewal.

Several of the largest major wastewater treatment facilities have directed significant resources toward nutrient removal. Through a survey, facilities reported allocating approximately \$37.4 million to fund feasibility studies, optimization studies, and capital investment in 2016.

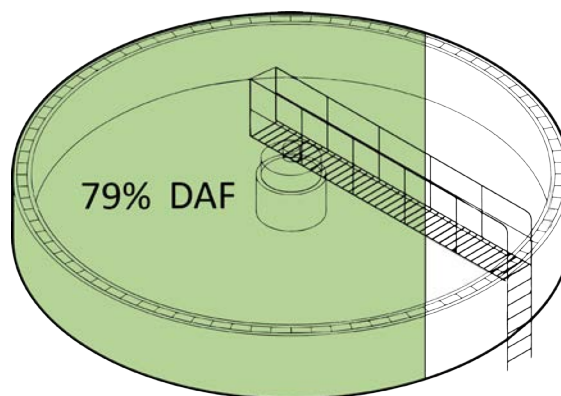


Figure 1.3. Percentage of point source effluent from major wastewater treatment facilities with phosphorus limits in NPDES permits

Urban Stormwater

In 2016, Illinois EPA provided \$4,349,708 for non-point source projects through Section 319 grants, which include both agricultural and urban projects.

In 2014, when stormwater mitigation projects became eligible for the Illinois EPA State Revolving Loan Fund, three projects were funded. In 2016, no new projects were funded, but the numbers are expected to increase as communities begin to implement stormwater management plans.

Illinois EPA provides avenues through which municipalities and local organizations can secure funding to address stormwater and nutrient loss issues. Through technical and financial assistance through the Section 319 grant program, Illinois EPA encourages stormwater projects such as those listed in Figure 1.4. Additionally, from 2011 through 2014, the Illinois Green Infrastructure Grant program funded 40 projects that addressed combined sewer overflow, stormwater retention and infiltration, and more.

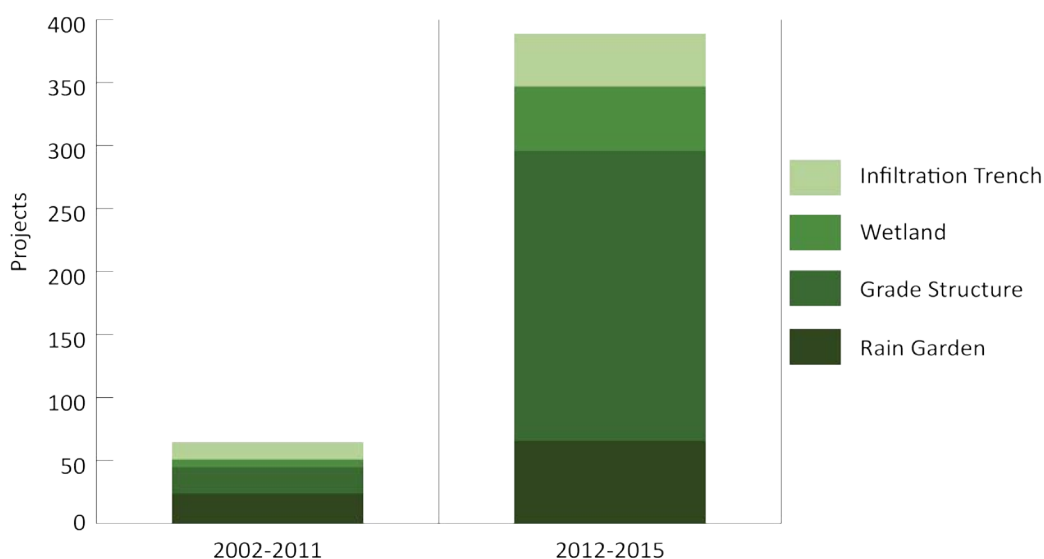


Figure 1.4. Number of Illinois EPA 319 urban stormwater projects (2002–2011 and 2012–2015)

Science Assessment Update

The Illinois NLRS Science Assessment has been updated in this report to include nutrient load data from 2011–2015 (Figure 1.5). Nitrate-nitrogen loads during that time decreased by 10 percent when compared to baseline 1980–1996 load data. The science assessment authors believe a plausible explanation for the decreasing nitrate-nitrogen concentration trend is improved nitrogen balances in the state. Fertilizer sales have changed little since 1980, and harvest removal of nitrogen in grain has greatly increased. This has led to a large decrease in residual nitrogen, and likely has led to a decline in both tile and riverine nitrogen losses. The 10 percent reduction in nitrate load at near average flow conditions for the state may suggest that the load reduction was not primarily due to below average water flows during 2011 to 2015, but that some progress has been made in decreasing nitrate-nitrogen losses from Illinois due to improved management and conservation efforts.

Evidence presented in chapter 4 of this report reveals that farmers are increasingly adopting 4R (right source, right rate, right time, right place) nutrient stewardship, which offers a possible explanation for why fertilizer sales have been static as crop yields continue to increase.

Conversely, total phosphorus loads increased by 17 percent over the same period, which may be explained by an increase in effluent flow due to population growth and land use changes that come from population growth. Additionally, some facilities had not yet completed upgrades to meet new permit requirements at reporting time. The impact of these upgrades will be reflected in future reports.

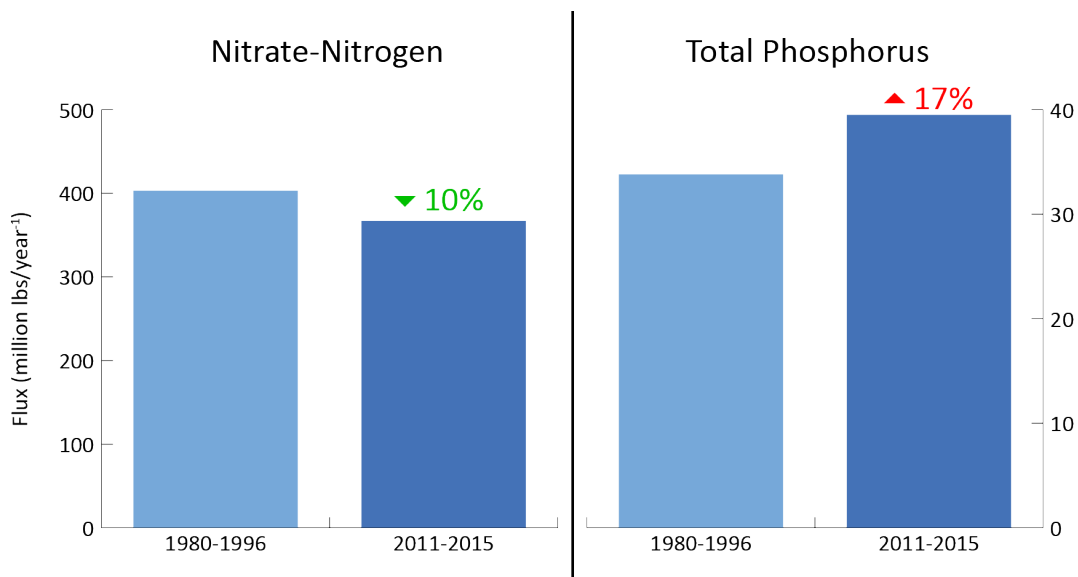


Figure 1.5. Nitrate-N and Total Phosphorus export from Illinois rivers

Overall, this first update since the release of the strategy finds that existing agricultural programs and personnel have collaborated on research and outreach to work towards optimizing nutrient loss reduction and that significant progress has been made. In the point source sector, ongoing efforts to update and upgrade facilities show promise for the future. Additionally, communities are beginning to address stormwater issues through green infrastructure and other approaches.

The state of Illinois can be proud of the successes that are documented in this report. The first two years of strategy implementation have provided the foundation on which future benefits can multiply.

This executive summary is a high-level profile of all the work being done by non-point and point sources. It offers a brief recap of all the resources, efforts, and results that have moved nutrient loss reduction forward in the three sectors. To learn more, see the detailed information in this biennial report.



Chapter 2

Tracking Implementation

The Illinois Nutrient Loss Reduction Strategy Biennial Report uses a tracking approach based on one implemented in the Iowa Nutrient Reduction Strategy. The Measure of Success committee at Iowa State University developed a logic model guided by measurable indicators of quantifiable change. The model represents progress towards achieving a 45 percent reduction goal in both nitrogen and phosphorus loads and serves as a framework to measure change recommended by the U.S. Environmental Protection Agency. Further, it provides the mechanism for reporting.

The Illinois logic model is shown in Figure 2.1. The process starts with measures that comprise the category of Resources, which then influence the Outreach category measures. Outreach leads to shifts in people's knowledge, attitudes, and behavior, which means changes in the Land and Facilities category will occur, and these changes are measured as adoption of best management practices (BMPs), such as conservation BMPs and upgrades to wastewater treatment facilities. Finally, these physical changes on the land can effect change in water quality, which is measured through both empirical water quality monitoring and through modeled estimates of nutrient loads in Illinois surface water. The measurable indicators identified for each category provide a standardized protocol for evaluating progress by tracking year-to-year changes and longer trends.

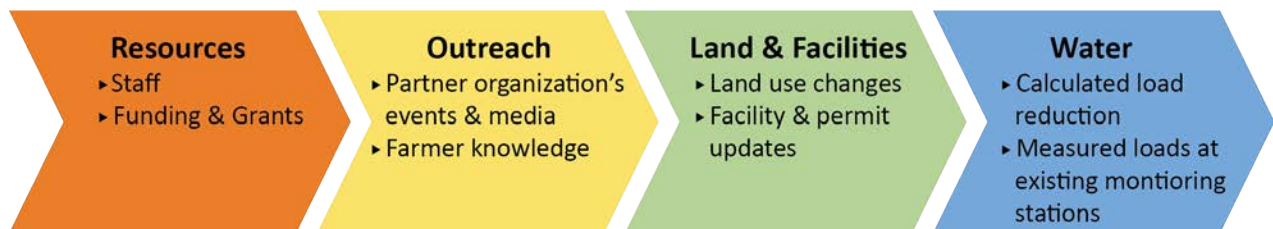


Figure 2.1. Measurable indicators of desirable change

Specific indicator information was compiled through a variety of methods and from numerous sources. For example, the Illinois Water Resources Center requested that Policy Working Group members provide data and details to help flesh out both Resource and Outreach measures. Additionally, the Illinois Association of Wastewater Agencies solicited information in a survey to their members. State and federal agencies provided data for the Land and Facilities measures.

Water category measures, which reflect the rate of nutrient loads leaving the state, are presented in the Science Assessment Update chapter. Throughout this biennial report additional Water category measures have been estimated. Details from the other categories are summarized throughout the report. Note that the category color codes in Figure 2.1 are conveyed throughout the report and correspond to the measure depicted.

In measuring the progress of the Illinois Nutrient Loss Reduction Strategy, the logic model serves as a comprehensive reporting tool to inform data collection, indicator development, and assessment of the successes and challenges associated with reducing nutrient loads from point and nonpoint sources. The logic model guides the assessment of overall progress, but it can also help refine the metrics in each of the four primary categories. The logic model framework will continue to be refined as additional information becomes available.

The following chapters detail the activities in the state of Illinois to accomplish nutrient loss reduction.



Chapter 3

Science Assessment Update

Mark B. David, Gregory F. McIsaac, and Corey A. Mitchell

In the Illinois Nutrient Loss Reduction Strategy (Illinois NLRs) Science Assessment, annual nitrate-nitrogen and total phosphorus loads from 1980 through 2011 water years were estimated in the eight major rivers that carry water and nutrients out of Illinois: Rock, Green, Illinois, Kaskaskia, Big Muddy, Little Wabash, Embarras, and Vermilion. In 2016, these load estimates were updated through 2015 using the same methods described in Illinois NLRs.

Total nitrate-nitrogen losses leaving Illinois from the eight major rivers in 2011–2015 were 10 percent less than losses during the 1980 to 1996 baseline period (Figure 3.1). This may be due to improved nitrogen balances in the agricultural areas of the state, particularly the tile-drained region of central and northern Illinois that are in the Illinois and Vermilion (Wabash) river watersheds. Fertilizer sales have had little change since 1980, and harvest removal of nitrogen in grain has greatly increased. This has led to a large decrease in residual nitrogen, and likely has led to a decline in both tile and riverine nitrogen losses. The 10 percent reduction in nitrate load at near average flow conditions for the state may suggest that the load reduction was not primarily due to below average water flows during 2011 to 2015, but that some progress has been made in decreasing nitrate-nitrogen losses from Illinois due to improved management and conservation efforts.

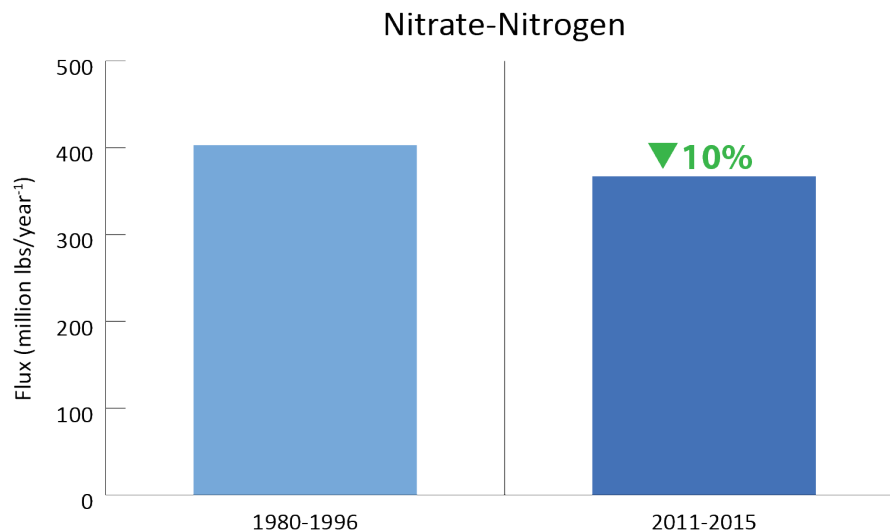


Figure 3.1. Comparison of nitrate-nitrogen flux in eight major Illinois rivers from 1980–1996 to 2011–2015

Almost all the nitrate load reduction for the state occurred in the Illinois and Vermilion (Wabash) rivers, where the 2011–2015 average nitrate-nitrogen loads were 15 and 22 percent less, respectively, than the 1980–1996 loads, while the river water flows were only 4 and 16 percent less, respectively. In contrast to these promising trends, the 2011–2015 average nitrate-nitrogen load in the Rock River was 72 percent greater than during the baseline period, while river discharge was only 8 percent greater.

The combined total phosphorus load leaving the state from the eight rivers in 2011–2015 was 17 percent greater than the baseline period (Figure 3.2)—the likely large drivers are increased point source contributions as well as increased river flows in the Kaskaskia and Little Wabash Rivers, where total phosphorus loads per acre tend to be higher than the rest of the state. The Metropolitan Water Reclamation District of Greater Chicago, the state’s largest point source, has only recently adopted water treatment processes to address total phosphorus.

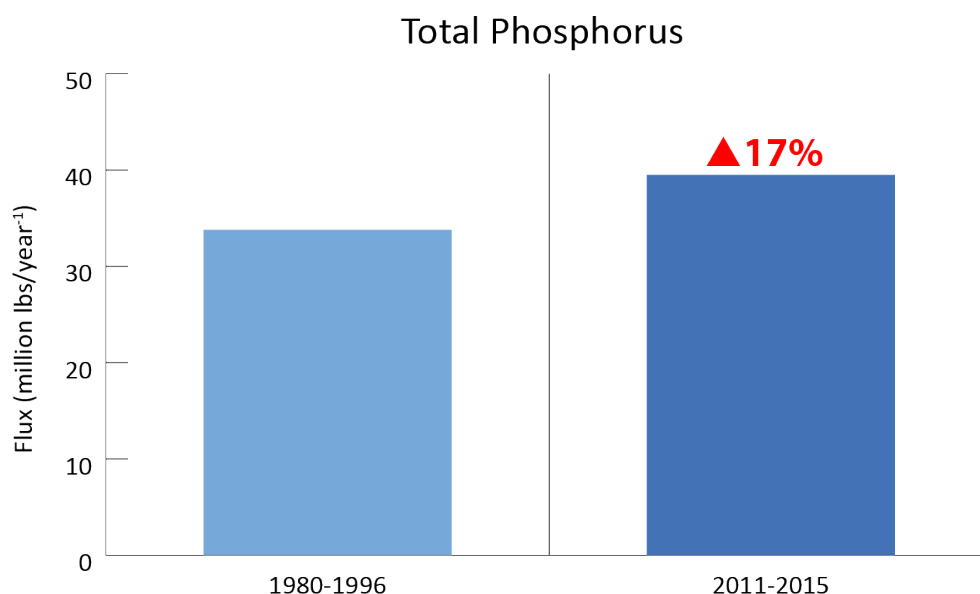


Figure 3.2. Comparison of total phosphorus flux in 8 major Illinois rivers between 1980-1996 and 2011-2015

The average total phosphorus loads in 2011–2015 in the Illinois, Kaskaskia, Big Muddy, and Little Wabash rivers ranged from 16 to 58 percent greater than loads during the baseline period. All these rivers, except the Illinois, had greater discharge during this time compared to the baseline period. Total phosphorus loads in the Green, Vermilion (Wabash) and Embarras rivers were 17–56 percent lower. The average river flows for the Green and Vermilion (Wabash) rivers from 2011 to 2015 were 12 and 16 percent less, respectively, with no difference for the Embarras River. There was little difference in the total phosphorus loads in the Rock River between the baseline period and 2011–2015, even though river flows were 8 percent greater during this time.

Five-year averages of nutrient loads seem appropriate for evaluating the loss of these nutrients through time. Future analyses should include evaluating five-year average loads in conjunction with five-year average river flows.

The method used to estimate total phosphorus loads is most uncertain at the beginning and end of the data record. Consequently, future estimates of the 2011–2015 average total phosphorus loads may differ from these estimates when data from 2016 and beyond are included in the analysis.



Chapter 4

Agriculture Water Quality Partnership Forum: Agricultural Sector

The Agriculture Water Quality Partnership Forum (AWQPF or the forum) works collaboratively to implement policy and management decisions related to the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) in the agricultural sector.

The forum is comprised of high-level officials from agencies and non-governmental organizations, including the American Farmland Trust, Association of Illinois Soil and Water Conservation Districts, Farm Service Agency, Illinois Certified Crop Adviser Board of Directors, Illinois Corn Growers Association, Illinois Department of Agriculture, Illinois Department of Natural Resources, Illinois Environmental Protection Agency, Illinois Farm Bureau, Illinois Fertilizer & Chemical Association, Illinois Land Improvement Contractors Association, Inc., Illinois Pork Producers Association, Illinois Soybean Association, Illinois Society of Professional Farm Managers & Rural Appraisers, Illinois Stewardship Alliance, Nutrient Research and Education Council, Prairie Rivers Network, The Nature Conservancy, University of Illinois at Urbana-Champaign, and U.S. Department of Agriculture Natural Resource Conservation Service.

Goals and Accomplishments

The forum is charged with the following objectives:

- ◆ Steer and coordinate outreach and education efforts to help farmers address nutrient loss and select the most appropriate best management practices or BMPs.
- ◆ Identify needed education initiatives or training requirements for farmers and technical advisors.
- ◆ Strengthen connections between industry initiatives, certified crop adviser continuing education requirements, state initiatives, and other technical services.

-
- ◆ Track BMPs.
 - ◆ Coordinate cost-share and targeting.
 - ◆ Develop other tools as needed.

Over the last two years, AWQPF has met six times and has made significant progress toward fulfilling the goals listed above.

Every meeting included discussions about member-led education and outreach efforts to help Illinois producers voluntarily adopt BMPs that reduce nutrient losses on their properties and across the state. The forum has fostered and promoted coordinated efforts among member and nonmember agencies as well as non-governmental organizations whenever possible. Consequently, Illinois has strong partnerships that help leverage staff resources to ensure farmers and other interested parties understand the nutrient loss issue and how to address it. Additional information is available in the Outreach Measures and Partnership Updates sections.

To track nutrient loss reduction implementation across Illinois, AWQPF established a technical subcommittee comprised of the following: Farm Service Agency (FSA), Illinois Department of Agriculture (IDOA), Illinois Department of Natural Resources (Illinois DNR), Illinois Environmental Protection Agency (Illinois EPA), U.S. Department of Agriculture National Agriculture Statistics Service (NASS), and U.S. Department of Agriculture Natural Resource Conservation Service (NRCS).

This subcommittee adapted Iowa's measures to Illinois' processes and priorities (see Figure 2.1, Tracking Implementation); these measures guided most of the tracking for the three sectors. The group held five meetings that focused on the Land and Facilities measures of the logic model framework. The technical subcommittee decided which Land and Facilities measures to track by selecting BMPs listed in Illinois NLRs. The subcommittee's member agencies identified the entities that could provide these data and aggregated data sets when appropriate. This process revealed information gaps for some BMPs. To address this, NASS was engaged by University of Illinois Extension to create and distribute a statewide survey to a random sample of 1,900 farmers and ranchers in the state. A summary of the results is found in Appendix A. Support for the survey came from the Nutrient Research & Education Council (NREC) and the Illinois Farm Bureau (IFB). A BMP tracking template that includes corresponding sources of data is found later in the chapter (Table 4.3).

Cost-share collaboration was formalized through a subcommittee of the NRCS State Technical Committee. This subcommittee examines cost-share rates for BMP implementation, advises changes to those rates, considers targeting incentives to priority watersheds, and coordinates agency collaboration where needed.

The forum continues to meet quarterly to make progress on objectives and to be updated on the latest nutrient research and programs in Illinois and surrounding states. During these meetings, AWQPF considers and can adopt additional actions to track progress toward implementing the strategy.

Agricultural Sector Implementation Report

To track the success of strategy implementation through the framework of the logic model, 14 AWQPF members reported on their staff and financial resources and their outreach efforts. These data inform the following Resource and Outreach Measures sections in this chapter. The NASS survey provides additional information to supplement the Outreach Measures. Land and Facilities measures were reported through federal and state agencies and informed by the NASS survey.

Resources Measures

Tracking the success of Illinois NLRS began with quantifying resources, in this case the staff members and funding that helped move implementation forward.

Staff Resources

In 2016, 89 staff members were engaged in Illinois NLRS outreach, implementation, or research for the agricultural sector. This number describes existing agency employees and represents multiple AWQPF members working in any capacity on nutrient loss reduction goals. Staff members have other duties but dedicate a portion of their time to assist in strategy implementation.

Estimates of staff time dedicated to Illinois NLRS implementation should not be assumed to be comprehensive. Currently, there is no tracking mechanism for private contractors implementing nutrient management activities. Many people outside of AWQPF are involved in strategy implementation, such as farmers and private contractors. Efforts are being initiated to include these significant contributions in future reports.

Funding Resources

Forum members reported that the agricultural sector invested \$54,834,638 in 2016 in nutrient loss reduction research, outreach, implementation, and monitoring. This total reflects contributions from AWQPF members and other organizations that conduct work targeted toward Illinois NLRS goals. A list of these organizations can be found in Figure 4.1.

Some dollars put towards strategy efforts are difficult to quantify, because farmers are also implementing BMPs outside of state and federal cost-share programs. These expenditures could include private contracting dollars not captured by traditional tracking methods. Therefore, figures reported in this document likely underestimate total dollars spent in Illinois for BMP implementation. As mentioned, AWQPF is exploring ways to capture this information.

Approximately 6 percent of these inputs (\$3,447,639) represent research support. These funds are primarily controlled through a state-mandated fertilizer tonnage assessment with the revenue collected and distributed by NREC. It is required that this funding be used exclusively for nutrient research and educational purposes. A list of NREC-funded research projects can be found in Appendix C and a summary of research activities appears later in this chapter.

Financial assistance funds from FSA and NRCS programs, which include Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), Regional Conservation Partnership Program (RCPP), along with agricultural easements and contract renewals, while not specifically targeted toward water quality improvement, provide the largest percentage of funding for BMP implementation in the agricultural sector at \$45,335,019. The Illinois EPA 319 program also contributes significant funding toward BMP implementation, providing approximately 9 percent of dollars spent on implementation. It is important to note there are substantial farmer contributions—from cost-share and from outside of these programs—not included in the implementation figure.

Reported funding for outreach and monitoring combined is \$757,420. This number does not include staff member and in-kind volunteer hours dedicated to these activities and so underestimates the true input. The breadth of Illinois NLRS outreach, much conducted by non-government organizations, should not be understated. Details of outreach topics, activities, and outcomes are described later in this chapter.

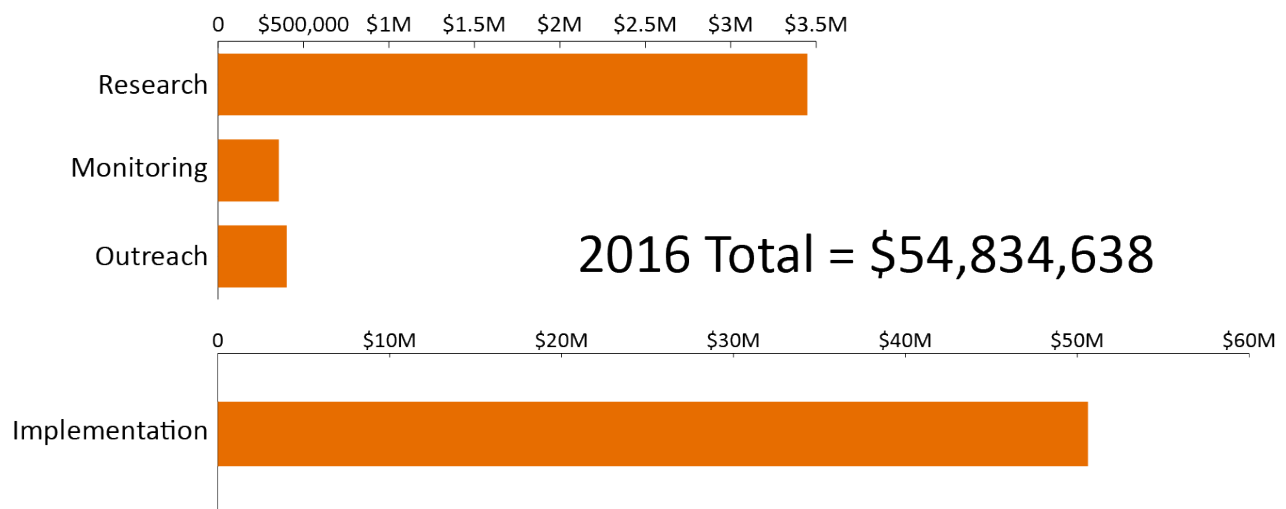


Figure 4.1. Funds supporting the agricultural sector of Illinois NLRS in 2016

Financial contribution information provided by Association of Illinois Soil and Water Conservation Districts, Farm Service Agency, Illinois Corn Growers Association, Illinois DNR, Illinois EPA, Illinois Farm Bureau, Illinois Fertilizer and Chemical Association, Illinois Land Improvement Contractors Association, NRCS, Illinois Pork Producers Association, Illinois Soybean Association, Nutrient Research & Education Council, and Trees Forever.

Outreach Measures

Education is key for farmers to adopt BMPs that can help reduce nutrient loading into nearby waterways. Outreach efforts to help farmers implement Illinois NLRS encompassed a range of avenues, from face-to-face meetings to social media to newspaper articles. These activities brought together agencies and non-governmental organizations to combine resources to promote awareness of the strategy.

Outreach Activities

Forum members reported engaging in many outreach efforts. It is important to note that outreach for the strategy goals actually began in the summer of 2015 before Illinois NLRS was released. The Illinois Farm Bureau (IFB), Illinois Fertilizer and Chemical Association (IFCA), Illinois Corn Growers Association (ICGA), and Illinois Soybean Association (ISA), through their membership in the Illinois Council on Best Management Practices (C-BMP), proactively led efforts to get the word out to farmers, agricultural retailers, and certified crop advisers about the importance of the strategy and how farmers can help reduce nutrient loads to Illinois waterways and beyond. Representatives travelled throughout the state to hold meetings at county offices and talk directly to 1,100 farmers, retailers, crop advisers, and other members of the agriculture industry.

These presentations were followed up by 64,000 automated phone calls to Illinois residents. More than 13,000 people listened to these robocall messages from representatives of IFB, C-BMP, and Illinois EPA, who informed listeners about strategy goals and release date. The calls also encouraged farmers to implement BMPs to improve water quality.

For the 2016 efforts, AWQPF members actively promoted the strategy to Illinois producers through a wide variety of programs and activities, including field days, workshops, and conferences. These efforts reached 39,325 people. (Table 4.1).

Table 4.1. Summary of outreach and education events held by partner organizations in the agricultural sector in 2016		
	Number of events	Total Reported Attendance
Outreach (fairs, tours, community education, presentations)	457	16,000
Field days	130	3,692
Workshops	607	12,695
Conferences	27	6,935
Total	1,221	39,325

Workshops were the most frequently offered form of outreach. Forum members sponsored and attended 607 workshops to promote Illinois NLRS implementation, reaching nearly 13,000 people. The workshops focused on in-depth examinations of nutrient management and land management practices that mitigate nutrient loss. In these workshops stakeholders were also introduced to the positive economic results associated with mitigating nutrient loss. Forum members also attended and contributed to collaborative projects such as watershed planning and conservation summits.

Outreach took place in many other venues, including farm tours, state fairs, training programs, and conferences for agricultural and environmental educators. In addition to the numbers reported in Table 4.1, Illinois DNR estimates employees interacted with 10,000 visitors at the Illinois State Fair Eco-World exhibit, where Illinois NLRS information, among other topics, was presented.

Forum members have also worked to expand the number of people with expertise on nutrient loss reduction. The Illinois Fertilizer and Chemical Association and Illinois Certified Crop Adviser Program, for example, offered training at various industry meetings on nutrient management

practices to certified crop advisers, who in turn pass that knowledge on to their client farmers. IFCA and their agribusiness members also provided expert speakers at various farmer meetings that were organized by Illinois soil and water conservation districts (SWCDs) and county farm bureaus (CFBs) to help expand the understanding of nutrient management practices that can reduce nutrient losses. Some members, like the IFB, ICGA, and various environmental organizations, have also brought information to K-12 educators to familiarize them with Illinois NLRS implementation efforts.

In addition to these presentations, AWQPF members have sponsored research and demonstration projects, including 130 reported field days that offered stakeholders an opportunity to see conservation practices in action. The field days attracted over 3,500 people.

Forum members have also mounted active media campaigns, using magazines, newsletters, press releases, and radio and television interviews to reach the farmer audience directly. Illinois Farm Bureau's *Farm Week*, for example, is a weekly digital and print publication that is delivered to approximately 74,000 subscribers. In 2016, *Farm Week* published 215 nutrient loss related articles, averaging four per issue.

Illinois Corn Growers Association, IFB, University of Illinois Extension, and other organizations are active on social media, including Facebook and Twitter, where they promote nutrient loss reduction management and implementation. Several AWQPF members collaborated on the Conservation Story Map, an interactive website that offers profiles of farmers who have successfully adopted conservation strategies. See <http://conservationstorymap.com> for more information.

Outreach Topics

Outreach efforts to raise awareness of the strategy have covered a range of topics, including many complicated questions that stakeholders had about implementation. Figure 4.2 illustrates the topics most frequently addressed.

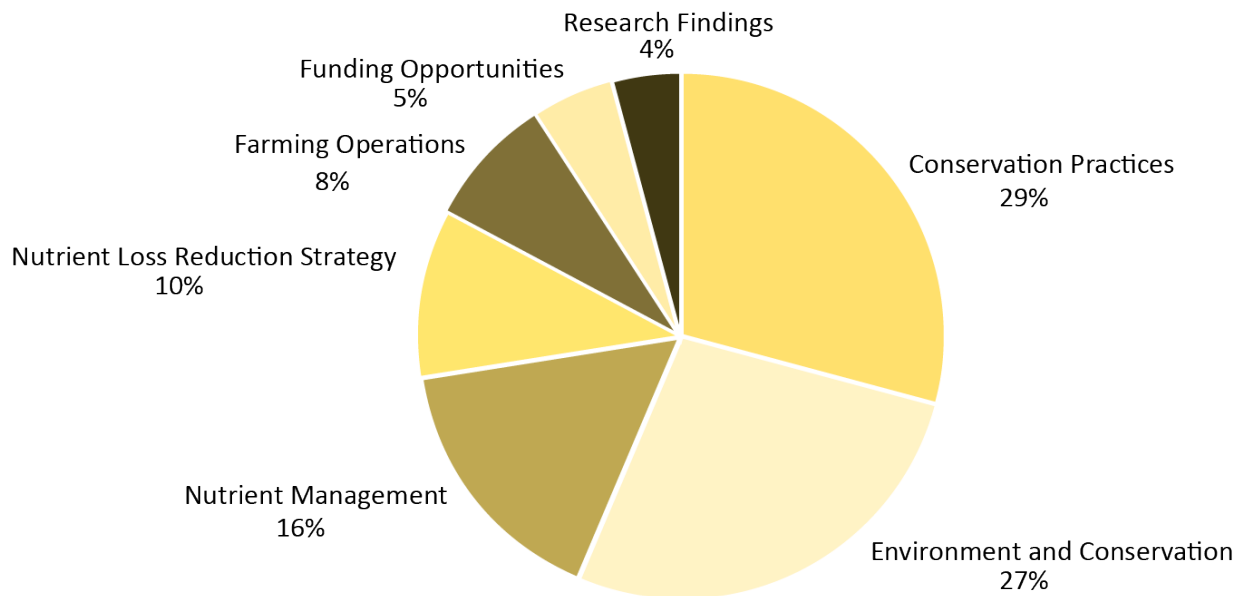


Figure 4.2. Outreach topics covered by AWQPF members and partner organizations in 2016 (n=610)

Twenty-seven percent of AWQPF member outreach activities focused on the environmental consequences of nutrient loss and the importance of conservation. Other priorities were sustainability and the importance of maintaining wildlife and pollinator habitats.

However, the main topic was conservation practice implementation, which comprised up to 29 percent of AWQPF outreach efforts. These included BMPs in general but also specific practices. The use of cover crops was a very popular topic, amounting to 23 percent of information presented on conservation practices. Forum members also focused on land management practices, like tillage. Finally, these representatives gave talks and held workshops on edge-of-field practices, such as buffers, constructed wetlands, and woodchip bioreactors, and on the economic benefits of adopting these practices. Edge-of-field practices also accounted for 23 percent of the topics covered in 2016.

Nutrient management was also a central topic. Members provided stakeholders with information about a variety of tools, including soil testing, N-Watch™ (explained later in this chapter), and the 4Rs (fertilizer management on a right source, right rate, right time, right place). The goal in these outreach efforts has been to share information about BMP options so farmers can decide which practices made sense for their operations. Farmers also learned about available cost-share programs.

In addition to educating farmers about how to implement measures that can mitigate nutrient loss, AWQPF members shared information about Illinois NLRs efforts, including goals and monitoring programs. Outreach activities also helped farmers to identify funding sources that might defray the costs of implementation.

Outreach Outcomes

The NASS survey indicated that Illinois farmers have become largely aware of a variety of strategies to mitigate nutrient loss. This is due to multiple outreach efforts. Table 4.2 shows that a significant majority of farmers are familiar with nutrient management practices. More than 76 percent had some knowledge about the 4R strategy, and almost a quarter of all farmers were very knowledgeable. Nearly 70 percent reported being somewhat or very knowledgeable about the MRTN (maximum return to nitrogen) calculator. More than 71 percent of farmers reported being familiar with drainage water management solutions, and farmers even seemed modestly familiar with more innovative solutions. For example, over 34 percent reported being somewhat knowledgeable or very knowledgeable about woodchip bioreactors.

Table 4.2. Farmer knowledge of nitrate-nitrogen BMPs (NASS survey result)					
	Not at all Knowledgeable	Slightly Knowledgeable	Somewhat Knowledgeable	Knowledgeable	Very Knowledgeable
Four R strategy	10.7%	13.1%	22.9%	31.3%	22%
MRTN strategy	11.5%	18.6%	26.1%	28.8%	15%
Drainage water management	8.1%	20.6%	35.8%	22.2%	13.3%
Bioreactors	43.1%	22.3%	24.8%	7.9%	1.9%

Land and Facilities Measures

An indication of progress on Illinois NLRs is the number of BMPs implemented on the ground. Many farmers who have learned about BMPs have adopted these practices.

The technical subcommittee determined the data sources for this section, which are shown in Table 4.3. The intent was to capture as much information on agricultural BMPs as possible for the baseline year of 2011 and the reporting year of 2015. Additional comprehensive tables, including watershed specific data, can be found in Appendix B. In general, nearly all numbers indicate significant progress in BMP implementation from 2011 to 2015.

Table 4.3. Agriculture Land and Facilities Measures BMP tracking template

BMPs	Data Source				
	FSA	Illinois DNR	USDA-NRCS	Illinois EPA	NASS
Reduced N rate from background to MRTN on 10 percent of acres					✓
Nitrification inhibitor with all fall-applied fertilizer on tile-drained corn acres					✓
Split application of 50 percent fall and 50 percent spring on tile-drained corn acres					✓
Spring-only application on tiled-drained corn acres					✓
Split application of 40 percent fall, 10 percent pre-plant, and 50 percent side dress					✓
Cover crops on all corn/soybean tile-drained acres	✓			✓	✓
Cover crops on all corn/soybean non-tiled acres	✓			✓	✓
Bioreactors on 50 percent of the tile-drained land			✓	✓	
Wetlands on 25 percent of tile-drained land	✓	✓		✓	
Buffers on all applicable crop land	✓	✓		✓	✓
Perennial/energy crops equal to pasture/hay acreage from 1987	✓				✓
Perennial/energy crops on 10 percent of tile-drained land	✓				

The Farm Service Agency Conservation Reserve Program

To be eligible for certain FSA program benefits, producers must file an accurate and timely acreage report for all crops and land uses, including failed acreage and prevented planted acreage.

The Farm Service Agency administers the Conservation Reserve Program (CRP) in Illinois. This is a voluntary program that assists participants in conserving and improving natural resources nationwide. Federal funds provide incentives (if applicable), cost-share, and annual rental payments in exchange for establishing and maintaining grass, wetland, and tree-based practices over a 10–15 year contract. Table 4.4 shows acres in nutrient BMPs reported by producers to FSA.

Table 4.4. Acres in nutrient BMPs reported by producers to FSA

	2011 Acres	2015 Acres	% Change
Cover crops ¹	768	11,064	▲ 1,340%
CRP Wetlands	57,463	45,790	▼ 20%
CRP Buffers	145,813	279,534	▲ 92%
Perennial/Energy/Pasture ²	985,531	1,524,379	▲ 55%

Green arrows indicate change toward nutrient loss reduction goals; red arrows indicate change away from goals.

¹ Acreage certified by producers with an intended use of cover only or green manure.

² Acreage certified by producers with an intended use of forage, graze, or left standing, in addition to CRP grass and tree practices.

Illinois Department of Natural Resources Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program (CREP) is a state incentive program tied to CRP. At the time of federal CRP enrollment, some participants in the Illinois and Kaskaskia River watersheds elected to extend the benefits of their CRP contract through a 15-year, 35-year, or permanent state easement that is funded by Illinois DNR and goes into effect when the federal CRP contract expires or is terminated.

The Conservation Reserve Enhancement Program achieves long-term environmental benefits by allowing 232,000 acres of eligible, environmentally-sensitive land in these two watersheds to be restored, enhanced, and protected over periods ranging from 15 years to perpetuity. Acres encumbered by CREP easements increased substantially from 2011 to 2015 (Table 4.5) largely in part to the expiration of federal CRP contracts associated with CREP easements and the expansion of the program into the Kaskaskia River watershed. Future numbers will eventually level off due to an overall decrease in expiring federal CREP contracts. Illinois DNR and SWCDs continue to manage and maintain the existing 1,400 conservation easements throughout the CREP watersheds.

Table 4.5. Acres with Illinois DNR Conservation Reserve Enhancement Program Easements

	2011 Acres	2015 Acres	% Change
Wetlands	483	22,609	▲ 4,581%
Buffers	202	17,893	▲ 8,758%
Perennial/Energy	81	6,043	▲ 7,360%

Green arrows indicate change toward nutrient loss reduction goals; red arrows indicate change away from goals.

The decrease in enrolled CRP wetlands illustrated in Table 4.4 may be due to federal contracts expiring and state easements going into effect. Otherwise, the general upward trend prevails.

USDA Natural Resource Conservation Service

The Natural Resource Conservation Service in Illinois administers multiple programs, including EQIP, CSP, and the Agricultural Conservation Easement Program, which includes the Wetland Reserve Easement Program (WREP). These programs address multiple natural resource concerns, including nutrient loss and wetland restoration protection and enhancement.

From 2009 to 2015, NRCS enrolled more than 150,000 certified acres in nutrient BMPs or conservation practices, including 80,000 acres in cover crops, through the EQIP program (Table 4.6). The Environmental Quality Incentives Program currently has more project applications than available funding, which has created a backlog. The Natural Resource Conservation Service expects the backlog of applications to increase unless program-funding levels increase.

Table 4.6. Acres enrolled in nutrient BMPs through the NRCS Environmental Quality Incentives Program 2009-2015

Conservation Practice	Acres
Nutrient management	49,932
Cover crops	80,659
Buffers	18.8
Residue and tillage management	22,388
Wetland restoration	0.7

The number of acres obligated to WREP is determined by a dollar allocation from USDA at the beginning of each fiscal year. Annually, from 2011 to 2015, reduced funding from USDA resulted in fewer new acres obligated for wetland easements (Figure 4.3). On the other hand, wetland conservation easements established through this program exist in perpetuity, so acres enrolled in this program in the past will remain on the landscape.

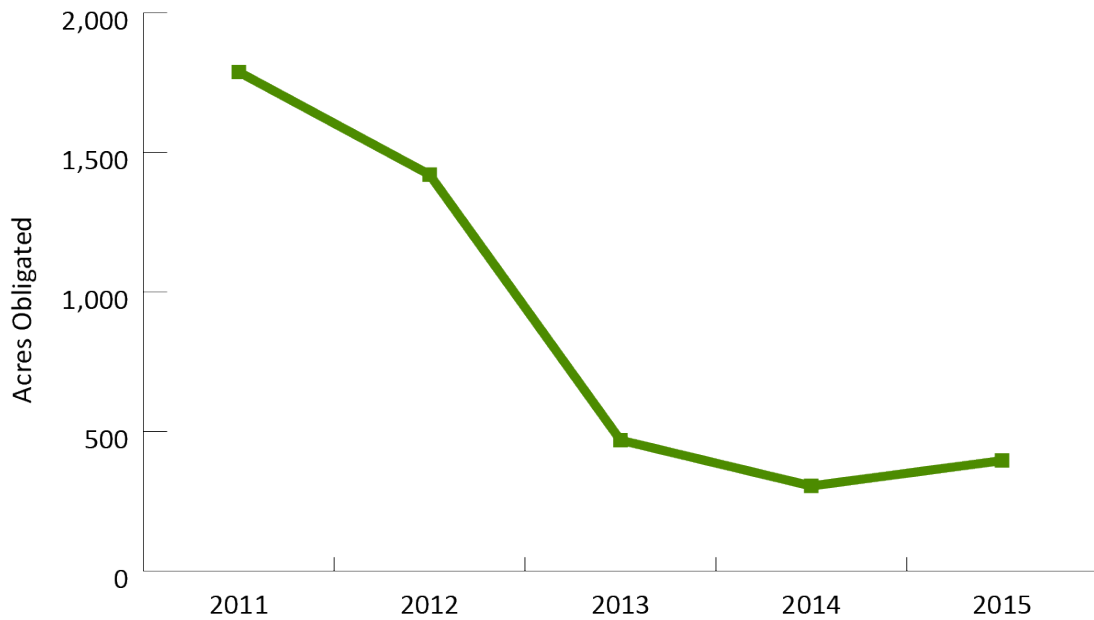


Figure 4.3. New wetland acres enrolled in Wetland Reserve Easement Program

Between 2011 and 2015, the number of new acres enrolled in CSP increased, on average (Figure 4.4). Unlike WREP, the number of contracts and acres enrolled in CSP is not based on funding levels but is determined by an acreage-allotment from USDA. CSP projects are funded until the acreage-allotment has been met. A total of 1.2 million acres was obligated to CSP contracts from 2011 to 2015. In 2014, Illinois requested and received additional CSP contracts acres from USDA, making that year's total over 399,000 acres.

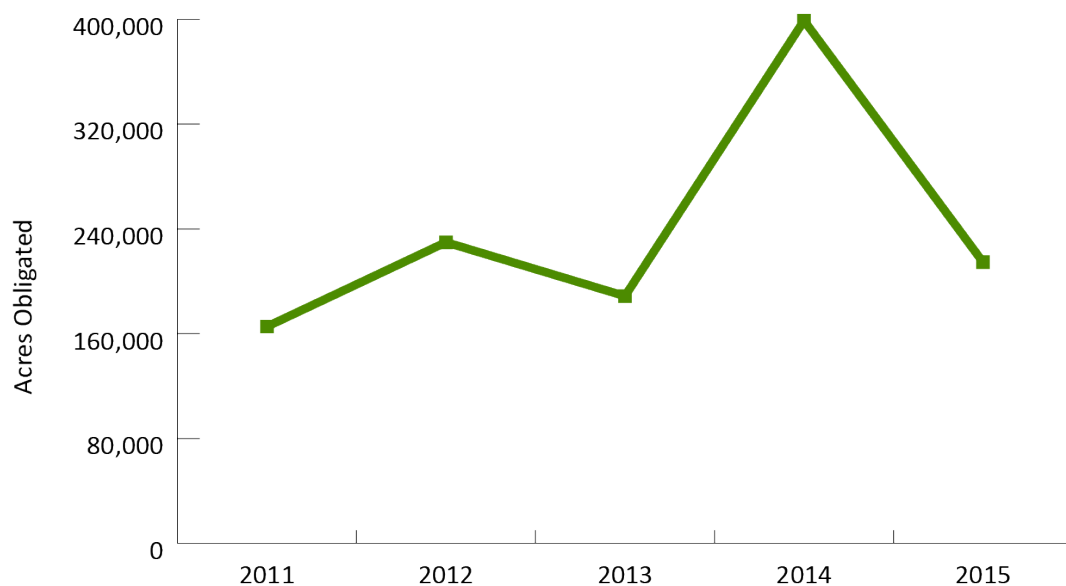


Figure 4.4. New acres enrolled in Conservation Stewardship Program

Woodchip Bioreactors

Currently, woodchip bioreactors are not a widely adopted practice in Illinois. Twenty bioreactors have been identified, and they are primarily university research and demonstration projects (Figure 4.5). Location information was provided by the University of Illinois, which conducts research at most of these sites. One site was identified by Lincoln Land Community College in Springfield. All but one are located in priority watersheds. Though other bioreactors may have been installed throughout the state, information on their locations is not readily available. Due to the strategy, awareness among individual farmers regarding bioreactors has increased and additional installations are expected in the coming years.

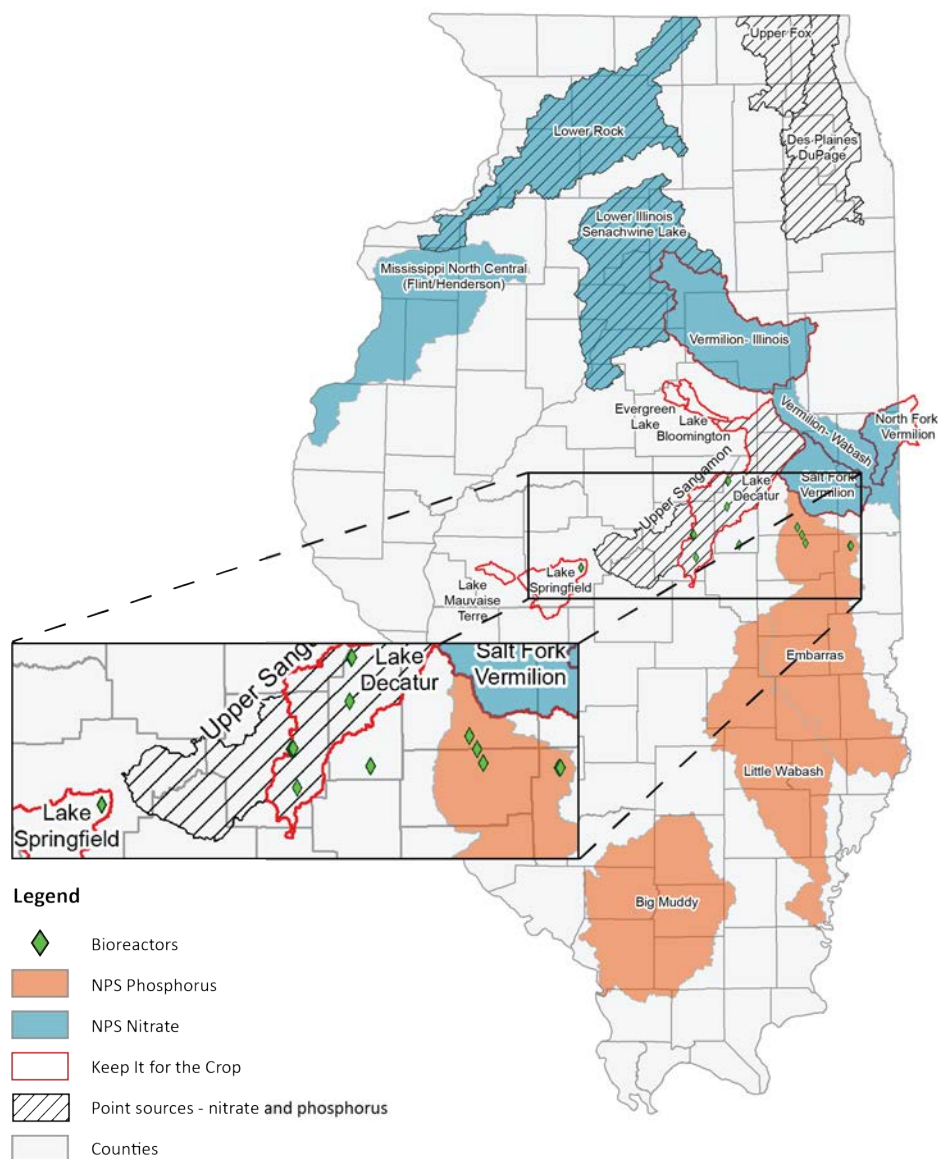


Figure 4.5. Woodchip bioreactor identified via University research and demonstration projects

Illinois Environmental Protection Agency Section 319 Non-Point Source Program

Section 319 of the Clean Water Act (33 U.S.C. 1329) provides grants that support the implementation of BMPs that address nonpoint source pollution in rural and urban areas. This program funds the establishment and management of conservation tillage, cover crops, filter strips, wetlands, and other agriculturally-related BMPs, specifically in watersheds with approved management plans that address reducing nutrient loading to Illinois waters. Comparing the baseline period with the reporting period, Table 4.7 reveals a decrease in the number of acres in which conservation tillage, cover and green manure crop, and wetland restoration were implemented. Of note though, is that the baseline is a 10-year period, while the reporting period is four years.

Table 4.7. Illinois EPA Section 319 Grant program			
	2001-2011 Acres	2012-2015 Acres	Change
Conservation tillage	9998	734	▼
Cover and green manure crop	3924	0	▼
Filter strip	8	13,882	▲
Nutrient management	0	107,061	▲
Wetland restoration	936	464	▼

Green arrows indicate change toward nutrient loss reduction goals; red arrows indicate change away from goals.

Conversely, there was a substantial increase in filter strip acres and nutrient management acres. These changes in focus are not unusual for the Section 319 Program, which offers competitive grants with limited funds. Grant proposals typically focus on local needs and concerns and local approaches to address those concerns. For example, applications received for Section 319 projects in southern Illinois may be more likely to focus on conservation tillage and cover crops, whereas applications received for projects in northern Illinois might focus on nutrient management plan development.

USDA National Agricultural Statistics Service

While it was a straightforward process to document BMPs put in place through federal and state programs, data on the number of practices implemented by farmers not engaged in incentive programs were not readily available. The NASS survey of a statistically significant sampling of Illinois farmers helped shed some light on this.

The NASS survey indicates that the timing of nitrogen application has shifted since 2011 (Table 4.8). The number of acres where at least half of the nitrogen was applied in the spring (pre-plant and side-dress) increased by 28 percent. In addition, the number of acres with spring-only applications increased by 7 percent.

Table 4.8. Fertilizer application strategies for corn on tilled acres (NASS survey result)			
	2011 Acres	2015 Acres	% Change
Less than 50% fall/winter applications, with remaining nitrogen applications split between pre-plant and side-dress applications	1,730,000	2,220,000	▲ 28%
Fall/winter nitrogen was 0% of total nitrogen (all spring applications)	2,480,000	2,660,000	▲ 7%
Fall/winter nitrogen was 50% or less of total nitrogen	940,000	950,000	▲ 1%
Fall/winter nitrogen was applied with a nitrification inhibitor ¹	3,240,000	2,970,000	▼ 8%
Total acres of corn planted	12,600,000	11,700,000	▼ 7%
Percent of total corn acres	25.7%	25.4%	▼ 1%

Green arrows indicate change toward nutrient loss reduction goals; red arrows indicate change away from goals.

¹ The survey results show that corn acres fertilized in the fall with a nitrification inhibitor on tilled ground declined by 8 percent from 2011 to 2015. However, compared to the total acres of corn in the state, the ratio of corn acres fertilized in that manner only declined slightly, from 25.7 percent of all corn acres to 25.4 percent of all corn acres.

The survey shows that cover crop acreage increased by 123 percent on tilled ground and 66 percent on non-tilled ground from 2011 to 2015 (Table 4.9). Additionally, the survey provides information about 2015 tilled acres draining into constructed wetlands and tilled acres planted to perennial crop acres (Table 4.10).

Table 4.9. Acres with cover crops (NASS survey result)			
	2011 Acres	2015 Acres	% Change
Corn/soybean acres planted to cover crops on tilled ground	220,000	490,000	▲ 123%
Corn/soybean acres planted to cover crops on non-tilled ground	380,000	630,000	▲ 66%

Green arrows indicate change toward nutrient loss reduction goals; red arrows indicate change away from goals.

Table 4.10. Acres with edge of field practices and perennial crops (NASS survey result)	
	2015 Acres
Tiled acres draining into bioreactors	(D)
Tiled acres draining into constructed wetlands	160,000
Tiled acres planted to perennial crops, including CRP plantings, hay, and miscanthus	230,000

(D) – Number withheld to avoid disclosing data for individual farms.

Water Measures

The final factor in this assessment process is to account for whether resources and actions to implement the strategy achieved their ultimate goals. While quantifying this poses some challenges, and it is early in strategy implementation, the Illinois EPA Section 319 grant program provides some promising data.

This grant program is unique in that BMP-associated load reductions to waterways are calculated as part of the process. These calculations reveal that BMPs have significantly reduced the impact of nutrients on Illinois waters. From 2002 to 2011, which are baseline years, Section 319 funding led to a reduction of nitrogen loads of 68,000 pounds annually, but between 2011 and 2015, the grants have accounted for 444,000 pounds of annual reductions (Figure 4.5). The annual reduction of total phosphorus is now 225,000 pounds. It is worth noting that the baseline timeframe is 10 years and strategy implementation reporting is only four years.

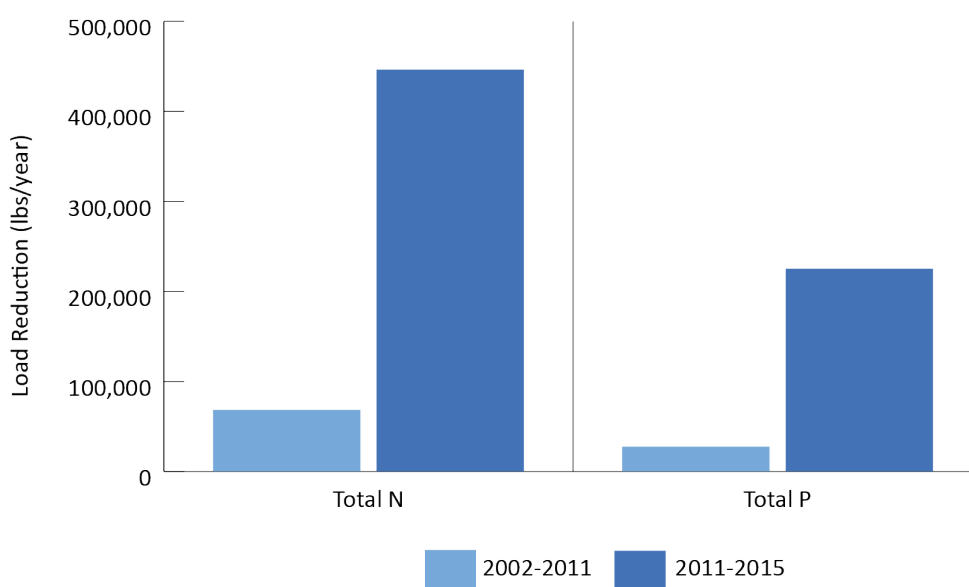


Figure 4.5. Calculated nitrate-nitrogen and total phosphorus load reduction (lbs/year) from Illinois EPA Section 319 agricultural non-point source projects

Similarly, significant progress has been made in reducing total suspended solids and sediment loads to Illinois lakes, rivers, and streams through the Section 319 program (Figure 4.6).

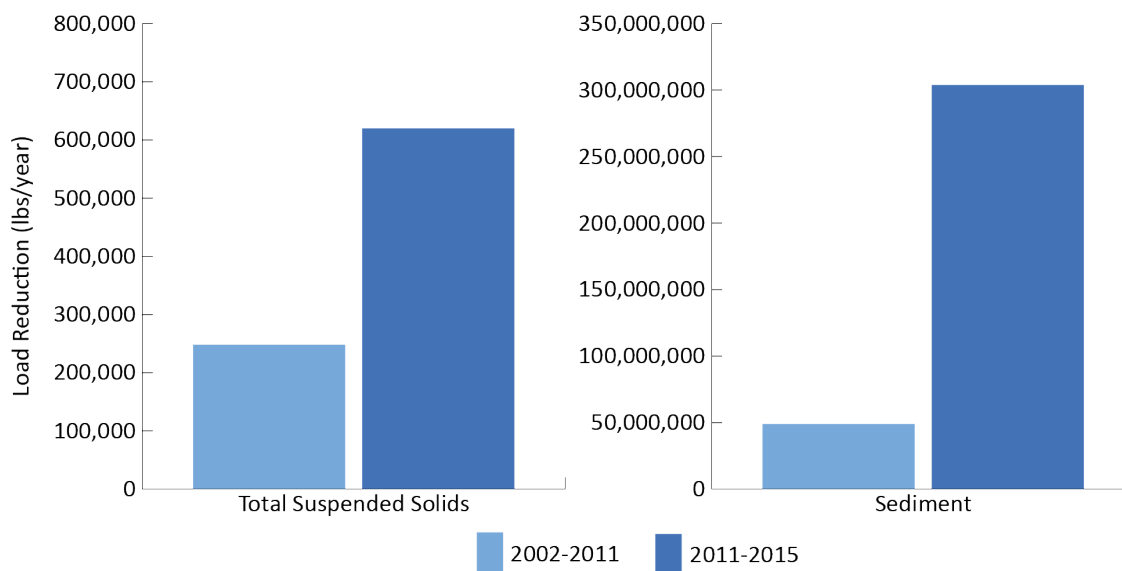


Figure 4.6. Calculated total suspended solids and sediment load reduction (lbs/year) from Illinois EPA Section 319 agricultural non-point source projects

Implemented BMPs that are not funded through Section 319 do not go through the Illinois EPA calculation process. Nonetheless, these BMPs are having a similar impact.

Metric Establishment and Collection

Establishing and collecting agriculture metrics has proven challenging. The AWQPF Technical Subcommittee tracked agricultural BMPs listed in the Illinois NLRs Science Assessment in the 2011 baseline year and the 2015 reporting year. However, agency data did not always correspond precisely with BMPs listed in the strategy and are not always collected consistently, year to year, by a given agency. For example, the strategy calls for perennial/energy crops on tile-drained land, but some available data specifies perennial/energy/pasture crops on all land. In every case, the best obtainable information was used for this report.

Current Programs and Projects Supporting Nutrient Loss Reduction Goals

In Illinois NLRS, there were 22 identified agricultural-related programs, initiatives, and projects developed by agencies and non-governmental organizations to help producers establish practices and strategies to reduce nutrient losses. Table 4.10 lists all programs referenced in the strategy. The following section highlights programs that have undergone significant changes or have noteworthy updates, and describes 13 new efforts that have been initiated since the 2015 release of the strategy.

Table 4.10. Agricultural programs and projects working toward Illinois NLRS goals

State Programs and Projects	32
Section 319	27
State Revolving Fund	Illinois NLRS p.6-3
Conservation Reserve Enhancement Program	23
Partners for Conservation Cost-share Program	32
Streambank Stabilization and Restoration Program.....	32
Federal Programs and Projects	Illinois NLRS p.6-5
Environmental Quality Incentives Program.....	24
Conservation Stewardship Program.....	25
Easement Programs	Illinois NLRS p.6-6
Regional Conservation Partnership Program	Illinois NLRS p.6-7
Cost-share and Technical Assistance Funding	Illinois NLRS p.6-7
Mississippi River Basin Initiative	Illinois NLRS p.6-7
Driftless Area Landscape Conservation Initiative.....	Illinois NLRS p.6-8
National Water Quality Initiative	Illinois NLRS p.6-8
Industry-Related Programs and Projects.....	33
Nutrient Research and Education Council	33
Keep it for the Crop Education and Outreach Program	Illinois NLRS p.6-9
Cover Crop Training Initiative.....	Illinois NLRS p.6-10
Lake Springfield Watershed Project	34
Demonstration Farm Partnership	Illinois NLRS p.6-11
Keep it 4R Crop Program.....	Illinois NLRS p.6-11
Nitrogen Rate Trials.....	35
N-WATCH™	35
Non-Profit Programs and Projects	36
New Initiatives Supporting Nutrient Loss Reduction Goals	37

Bold type and page number signify an update in this report. Details about programs listed in non-bold type and page number are in the Illinois Nutrient Loss Reduction Strategy.

During a time of restricted state funding, Illinois was able to make substantial progress on these initiatives because of numerous partnerships that leveraged resources. Additionally, AWQPF members have been willing to retarget existing resources toward nutrient loss reduction.

State Programs and Projects

Partners for Conservation Cost-share Program

The Illinois Department of Agriculture administers several initiatives through the Partners for Conservation (PFC) cost-share program that promotes advanced nutrient management, conservation tillage, and the use of cover crops.

During 2012–2014, 1,000 PFC projects were completed by landowners. Conservation practices that are eligible for cost-share assistance through PFC include terraces, grassed waterways, water and sediment control basins, grade stabilization structures, crop residue management, cover crops, and nutrient management plans. The state contributed almost \$2 million to the cost of these projects, approximately 50 percent of the cost of construction. The remainder was paid by landowners.

As a result, soil erosion was reduced on 35,753 acres of cropland. These practices also reduced nutrient loading to streams throughout the state by an estimated 33,794 pounds of nitrate-nitrogen and 16,910 pounds of total phosphorus. Sediment loads were reduced by 13,271 tons; this translates to an estimated 664 semi-trailer loads of sediment that did not end up in Illinois waterways.

Future numbers are likely to be lower, as the program is not currently funded.

Streambank Stabilization and Restoration Program

To stabilize and restore severely eroding stream banks that would otherwise contribute sediment to the state's rivers and tributaries, IDOA, with assistance from SWCDs, administers the Streambank Stabilization and Restoration Program (SSRP). Severely eroding stream banks can contribute as much as 30–50 percent of the sediment entering waterways from all sources. This program, funded through PFC, provides support for using low-cost techniques to stabilize eroding stream banks. Examples of these practices include rock riffles, stone toe protection, and bendway weirs.

From 2013–2016, 3.9 miles of eroding streambanks were stabilized, resulting in a 6,622 ton reduction in sediment delivery. Nitrate-nitrogen loading was also reduced by 13,195 pounds and total phosphorus by 6,601 pounds.

Industry-Related Programs and Projects

Nutrient Research & Education Council

The Nutrient Research and Education Council was created in 2012 by the State of Illinois and is managed by representatives from farmer organizations, commercial fertilizer, specialty fertilizer, and IDOA. Members of environmental organizations also provide input to the council and help identify research priorities for the organizations. NREC has ensured that funds designated for research stay on track. This funding has been a driving force in the development and implementation of science-based approaches to nutrient management in the state.

Between 2012 and 2016, NREC invested \$9.8 million in nutrient efficiency research. NREC supports four categories of research. These categories are described here, along with specific issues:

- ◆ Application and understanding of the 4Rs—identifying BMPs and expanding the understanding of these practices related to more efficient fertilizer applications and using those nutrients for crop production.
- ◆ Capture of excess nutrients in the field—primarily using cover crops
- ◆ Mitigation of excess nutrient loss to water supplies through edge-of-field practices, including woodchip bioreactors, wetlands, buffers, and other practices designed to capture nutrients before they reach water supplies.
- ◆ Other nutrient management issues, including understanding the impact of nitrogen oxides, phosphorus, and potassium removal in grain.

In addition, NREC funds education and outreach projects to bring research findings to Illinois' agricultural community.

The Nutrient Research and Education Council's priority for proposals is to fund projects that examine, test, and measure the effectiveness and economic viability of farming practices that can reduce nitrate-nitrogen and total phosphorus losses to water and are not detrimental to agricultural pro-

duction or yield. The council works with farmers and agricultural industry stakeholders to identify needs and prioritize areas of research. It requires that researchers design and implement projects with the goal of producing a published, peer-reviewed paper on the findings. The council also encourages education projects for farmers and crop advisers that are based on research findings and effectively promote and ensure BMP implementation.

The Nutrient Research and Education Council has an annual request for proposals that outlines specific annual priorities to potential applicants. Current NREC project topics can be found in Appendix C.

Lake Springfield Watershed Project

From 2014–2016, members of Illinois C-BMP engaged in a three-year program with Springfield City, Water Light & Power and the Sangamon County SWCD to reduce nitrate levels in Lake Springfield. This targeted BMP program included nitrogen rate trials, N-WATCH™ soil nitrate sampling, use of cover crops, and water quality testing in the tributaries that feed the lake.

In 2016, after three years of nitrogen rate studies in the Lake Springfield watershed as part of this partnership, the University of Illinois developed a maximum return to nitrogen system specifically tailored for that watershed. MRTN, which is supported by land grant universities, converts corn yield responses in rate trials to economic return responses and recommends the most profitable range of nitrogen application rates for farmers to use. This system provides a reliable recommendation so that nitrogen rates neither exceed what the plants need nor fall short of the amount needed to reach the optimum yield and economic return on the nitrogen investment.

The Lake Springfield MRTN led to a recommended decrease of 5–8 pounds of nitrogen per acre for corn (following soybeans) compared to the central Illinois MRTN recommendation. With thousands of acres of corn grown in this watershed each year, this reduction in recommended application rate represents a significant savings to the farmer and minimizes the potential for excess nitrogen loss to the lake. The Lake Springfield MRTN is available online in the Illinois section of the MRTN calculator website located at <http://cnrc.agron.iastate.edu/>. This program's first year is 2016 and its progress will be included in the next biennial report.

Nitrogen Rate Trials

The Nutrient Research and Education Council continues to fund on-farm nitrogen-rate trials that enhance science-based nitrogen application recommendations for growing corn using the MRTN university system. The University of Illinois develops protocols for these trials and IFCA coordinates implementation. They work closely with participants on the project to recruit farmers and retailers to take part in these studies, facilitate site mapping, and assure accurate collection and reporting of harvest yield.

In 2015, high nitrate-nitrogen loss conditions, as well as damage from standing water, resulted in high optimum nitrate-nitrogen rates. Conversely, in 2016, relatively low rates of nitrate-nitrogen were necessary to maximize yield because the soil provided a significant amount of mineralized nitrogen. Calculations reveal a very high efficiency—two-thirds of a pound of nitrate-nitrogen per bushel of yield, or 1.5 bushels per pound of nitrate-nitrogen used. In 26 trials only five had an optimum nitrate-nitrogen rate higher than the MRTN rate, and, on average, only 150 pounds of nitrate-nitrogen were necessary to produce an average yield at the optimum nitrate-nitrogen rate of 225 bushels per acre.

These results help demonstrate that the range of nitrogen rates established through the MRTN system factor in weather variations. The results also provide the best available recommendation for optimum economic return on nitrogen investment and thus mitigate the consequences of over-applying or under-applying nitrogen.

The Illinois Fertilizer & Chemical Association and the University of Illinois have shared this information in many outreach and educational sessions. Nitrogen rate results from trials in 2014–2016 are available on the IFCA website at <https://ifca.com/4R/Trials>. These data illustrate the response to various nitrogen fertilizer rates for corn under different weather, soil type, or crop rotation scenarios.

N-WATCH™

N-WATCH™ is a soil-testing program to monitor nitrate levels from applied nitrogen and soil mineralized nitrogen. The sampling results allow farmers and agricultural retailers to make nitrogen management decisions based on actual ammonium and nitrate levels in their soil; farmers can see whether these levels are deficient, adequate, or excessive.

With funding from NREC, IFCA manages 100 N-WATCH™ sites each year throughout the state at on-farm sites. These sites are sampled four times each year: early spring, spring, summer, and at plant maturity. IFCA coordinates the analysis of N-WATCH™ sites with University of Illinois nitrogen tracking research and provides an overview of soil nitrate levels. Findings from this research are communicated through University of Illinois bulletins, educational webinars, and industry conferences.

The information collected from N-WATCH™ sites, as well as from the nitrogen rate trials, has helped change how fertilizer is used in Illinois. Many farmers are now engaged in a nitrogen management system, rather than an application system.

A growing number of producers are splitting what used to be typically a fall nitrogen application to a fall and spring schedule, using a portion for each application. This reduces the overall risk of nitrogen loss.

Non-Profit Programs and Projects

The Nature Conservancy (TNC) has worked for over 25 years with researchers from the University of Illinois, Illinois State University, and multiple partners in the Mackinaw River watershed in central Illinois to improve water quality and protect biodiversity. TNC and its partners are currently engaged in paired-watershed projects in three locations there. Through one-on-one outreach, the group is working to increase implementation of strategic practices and to monitor watershed-scale effectiveness of conservation practices.

Previous research has shown that surface practices alone are not enough to effectively reduce the nutrient loads carried by subsurface tile drainage. To address this, seven constructed wetlands have been installed to intercept tile drain flow before it reaches the larger watershed. Research at the Franklin Research and Demonstration Farm in Lexington has shown that these treatment wetlands remove 12–48 percent of nitrate-nitrogen and 62–73 percent of phosphorus from tile-drained waters. Current research includes assessing the success of bundling infield cover crop practices with the edge-of-field wetlands.

The farm also provides an opportunity to engage in outreach through 12–15 group tours as well as county-wide field days.

Another TNC initiative to improve nitrogen management is a partnership with industry, state, federal, and non-profit agencies and organizations to coordinate a farmer network and to install and monitor seven new treatment wetlands in the Lake Bloomington watershed. This farmer network, built from an existing one, promoted nitrogen management. Within the first three years, farmers had enrolled as many as 92 fields. The farmers were informed of the success of their efforts as well as given specific prescriptions for their fields.

This project is focused on strategic outreach and the use of BMPs to achieve the larger goal of reducing nitrogen loss from farm fields in ways that makes agronomic sense for producers. These approaches will not only reduce the amount of nutrients leaving the state but will contribute to safe drinking water for the city of Bloomington.

The Nature Conservancy is also reestablishing functional floodplains at two sites along the Illinois River—the 2,000-acre Spunky Bottoms project in Brown County and the 6,600-acre Emiquon project in Fulton County. While the goals of these projects are to restore sustainable natural plant and animal communities and to contribute to the health of the Illinois River, reestablishing natural floodplain habitats and ecological processes will also improve water quality. Wetland processes improve water quality through denitrification, sequestration of phosphorous, sediment cycling, and the breakdown of other pollutants.

These projects will also improve groundwater recharge, stormwater storage, and carbon sequestration and provide opportunities for education, recreation, and compatible economic development. Based on a wide variety of ongoing scientific research and monitoring, lessons learned at these sites are being shared broadly and are influencing restoration and management of other large floodplain rivers locally, regionally, nationally, and internationally.

New Initiatives Supporting Nutrient Loss Reduction Strategy Goals

Illinois Farm Bureau Nutrient Stewardship Mini-Grant Program

Since the development of Illinois NLRs, IFB has developed several outreach and education programs on the nutrient loss issue, promotion of farmer-led innovation, and BMP demonstration. In doing so, IFB has built on existing momentum in its grassroots farmer membership to realize real improvements in water quality.

In 2016, the IFB Board of Directors dedicated \$100,000 to the Nutrient Stewardship Mini-Grant program to empower CFBs to implement the strategy in a meaningful way in their local areas. Fifteen projects around the state were funded, involving 30 CFBs and 73 local partners. Local partners multiplied IFB's funding by contributing more than \$100,000 in matching funds and 1,000 employee hours. County farm bureaus also contributed significant employee time.

- ◆ 395 farmers attended nine field days.
- ◆ Eight BMP videos were created.
- ◆ Six water-testing programs were established.
- ◆ Three lab-based testing programs were established.
- ◆ Three best management structures were installed.

County farm bureaus and their farmer members learned more about which BMPs might work best in their specific area. These outreach events also provided opportunities to enhance relationships between farmers and local partners. Most importantly, the majority of projects were led by local farmers, allowing them to share their innovative ideas, successes, and talents with fellow farmers.

In 2017, the second year of the mini-grant program, IFB renewed its commitment to advancement of nutrient stewardship through local solutions and partnerships. Funding was awarded to 18 projects in 22 counties, including partnerships with University of Illinois research stations participating in NREC-funded projects. See Figure 4.8 for a map depicting county and multi-county group CFBs participating in the mini-grant program in 2017.

4R4U: A Nutrient Stewardship Partnership

In 2016, IFB and GROWMARK announced a new initiative called 4R4U to demonstrate and investigate 4R nutrient stewardship practices at the local level. This statewide partnership, which also includes CFBs and the FS companies, is a pilot program to bring added use, awareness, and knowledge on nutrient stewardship through the 4R approach. Local test plots will be used to compare the effects of a range of practices on nutrient stewardship. Each of the 11 local partnerships depends on the cooperation and innovation of farmers and agricultural retailers. Practices that are being demonstrated and investigated on the local level include N-rates, multiple nitrogen applications, stabilizers, no-till planting, cover crops, and soil samples.

Lake Vermillion Watershed Project

The Illinois Fertilizer & Chemical Association is expanding its watershed partnership effort into a more formal structure in the Lake Vermillion watershed. This project is modeled on the Lake Springfield watershed partnership, which has been very successful in helping to manage the lake nitrate levels. The goal is to use N-WATCH™ to improve nitrogen management decisions throughout the growing season and implement a consistent number of N-rate trials to develop a MRTN for the Lake Vermillion watershed. Joining IFCA in this effort are the Vermillion County Farm Bureau, Vermillion County SWCD, and Aqua Illinois.

4R Metrics

4R Nutrient Stewardship considers the agronomic, economic, environmental, and social dimensions of nutrient management. The concept of the 4R system is to apply or recommend the right source of nutrient, at the right rate, at the right time, and in the right place.

In 2018, IFCA will incorporate a system for retailers to verify and report the implementation of 4R practices on acres in their facility territories. The 4R metrics captured are based on the IFCA 4R Code of Practice which include acres using split-applied nitrogen, acres using stabilized nitrogen, acres following MRTN, acres routinely soil tested with phosphorus levels applied accordingly, and frozen or snow-covered acres not receiving fertilizer applications. This reporting system will enable the industry to track progress on adoption and improve adoption on more acres over time.

As farmers are learning the value of split-nitrogen application, the fertilizer industry has responded to meet these demands. The 4R education efforts have resulted in a decrease in the rates of fall-

applied anhydrous ammonia. This change in nitrogen application timing has led agricultural retailers to increase their capacity to store UAN (liquid nitrogen) as well as urea (dry nitrogen), both of which are applied in the spring and can also be side-dressed as part of a split-application system.

In the past several years, the fertilizer industry has invested substantially in storage, transportation, trained personnel, and equipment to meet the demands of their customers. Additionally, the industry provides 4R approaches so that farmers can successfully manage both nitrogen and phosphorus throughout the season with the goal of improving nutrient use by the crop and mitigating the risk of nutrient loss.

Advanced Soil Health Training for Illinois Professionals

American Farmland Trust (AFT) leads the Advanced Soil Health Training for Illinois Professionals program, along with a cadre of farmers, agricultural retailers, certified crop advisors, and NRCS and SWCD representatives, to develop an advanced soil health curriculum. Initiated in 2015 and funded by a Sustainable Agriculture Research and Education (SARE) grant, the three-year program will increase participants' knowledge of a conservation cropping system—cover crops, nutrient management, tillage, and rotation management—to improve nutrient efficiency and water quality. The program is based on the science of improved soil biology and related nutrient efficiencies. Twenty participants will develop the knowledge and training skills to promote improved soil health in their communities and with clients. To fulfill a grant goal, program participants will provide advanced soil health training to an additional 400 Illinois farmers and agricultural professionals.

Upper Macoupin Watershed Regional Conservation Partnership Program Project

According to Illinois NLRS, the Macoupin Creek watershed is one of the top three phosphorus-yielding watersheds in the state. American Farmland Trust and 13 local and state partners lead the Upper Macoupin Watershed Regional Conservation Partnership Program project to increase conservation activity, stabilize soils, and reduce the loss of nutrients from farm fields into waterways in this watershed.

This project was among 111 national proposals selected in 2016 through the NRCS RCPP. Over the next five years, the project will provide farmers with a total of more than \$1 million in cost-share and technical assistance funding to implement conservation practices. Of these new federal funds, the majority—over \$800,000—will go directly to farmers as financial assistance for installing and

managing conservation practices to stem the loss of phosphorous and sediment to Macoupin Creek. The remainder will fund additional technical assistance for watershed farmers.

The partnership will also address the need for expensive new equipment, a significant barrier to the adoption of conservation practices that impact water quality. Local retailers CHS-Shipman and M&M Service Company are joining with Environmental Tillage Systems to offer reduced rates for the SoilWarrior system. SoilWarrior is a customizable precision zone tillage system that can apply multiple conservation practices, including strip tillage, nutrient placement, and cover crop seeding in one pass.

With \$1 million of new federal funds targeted to the Upper Macoupin Creek watershed, combined with an additional \$1.2 million in contributing funds from AFT and 13 partners, the watershed partnership aims to show measurable improvements in water quality by 2019.

Leadership for Midwestern Watersheds

American Farmland Trust is coordinating with multiple regional agencies, agricultural associations, and universities to provide leadership training for watershed managers and professionals. Since 2011, Leadership for Midwestern Watersheds (LMW) has brought together watershed project directors and other stakeholders to compare notes and share lessons learned about watershed projects. American Farmland Trust, Sand County Foundation, Iowa Soybean Association, and North Central Region Water Network sponsor LMW meetings to encourage the exchange of information and improve watershed project performance in the Midwest. For the last two years, the meetings have been focused on comparing and contrasting nutrient loss reduction strategies from states in the region to learn successful strategies.

The Leadership for Midwestern Watersheds is a community of practice—a group of conservation practitioners who work to improve water quality at a watershed scale. The group’s meetings are focused on topics that are essential to the success of watershed projects, and presentations support facilitated discussions that are the meetings’ core. Subjects have included engaging farmers, targeting conservation practices for the greatest impact, measuring results, governing projects, and scaling up lessons learned. The last LMW meeting in 2016 was held in November in Dubuque and included eight people who work in Illinois watersheds.

Building Connections with Absentee Farmland Owners

Prairie Rivers Network oversees the Building Connections with Absentee Farmland Owners of East Central Illinois project in collaboration with the Macon County SWCD. The project goal is to connect with and inform absentee owners of agricultural land in 10 nearby counties through a newsletter. The project was funded by the Lumpkin Family Foundation, which is focused, in part, on environmental issues in east central Illinois.

The *Common Ground* newsletter was mailed to more than 2,500 off-farm landowners, informing them about: the state's efforts to reduce nutrient losses from agricultural lands to waterways; the role of cover crops in improving soil health; and strategies and tools for working with tenant farmers on conservation practice use. The newsletter also provides opportunities to connect with a network of off-farm landowners through the AFT Conservation Learning Circle project. The newsletter was also emailed to SWCD contacts across east central Illinois, and Cover Crop Champion educators shared Common Ground with their circle of landowners, further expanding the distribution.

Precision Conservation Management Program

Precision Conservation Management (PCM) is a farmer-service program for applying financial business principles to conservation practices. This program was founded by Illinois Corn Growers Association in 2016. It is a public-private partnership, representing more than 30 agricultural associations, conservation groups, and state and federal agencies.

The goal of PCM is to help farmers integrate conservation into the everyday management of commodity crop operations by improving their understanding of the risks of adopting conservation practices. Precision Conservation Management's founding mission is to use farmer data to serve farmers' interests with a specific emphasis on conservation adoption.

The program's participants create their profile using the Farmer Portal, a web interface that quickly, accurately, and securely collects data to create a field-by-field inventory of detailed agronomic management practices. After creating farm profiles, PCM specialists work one-on-one with participating farmers, offering them a privately-funded incentive to develop a Resource Analysis and Assessment Plan (RAAP) specifically for their farm.

These plans assess sustainability strengths and weaknesses for each farm operation on a field-by-field basis and identify natural resource concerns. Using RAAPs, PCM specialists guide cooperators

through NRCS program options and other local opportunities to obtain financial and/or technical assistance for conservation practice adoption.

Precision Conservation Management approaches conservation from the perspective of the Midwest farmer—striving to protect business interests while implementing conservation practices that benefit the environment and local communities.

The Sustainable Agriculture Partnership at Illinois Central College

The Sustainable Agriculture Partnership (SAP) is a new collaboration of Illinois Central College (ICC), ICGA, Zea Mays Foundation (ZMF), AFT, and the Soil Health Partnership. It will be anchored at the Sustainable Ag Training and Demonstration Center.

This new effort is focused on educating farmers and agricultural advisors on cover crops, soil health, water quality, and sustainability practices. Implementing these practices will improve the productivity, profitability, and resiliency of farming operations while meeting Illinois NLRs goals and consumer demands for more sustainably-sourced agricultural products. The partnership is also involved in expanding the ICC soil laboratory to include multiple water quality, soil health, and habitat practices. This laboratory provides hands-on demonstrations of sustainable agriculture practices for a variety of student, professional, and public audiences. The Wetlands Initiative and NRCS are key partners in the design and development of these on-site practices.

The goals of SAP are:

- ◆ Making more efficient use of resources and knowledge from programs focused on sustainable agricultural practices, specifically, reducing duplicative or conflicting efforts through cooperation and communication.
- ◆ Establishing shared resources, including collaborative spaces, on-farm demonstration sites, and demonstration tools, such as the mobile rainfall simulator.
- ◆ Sharing knowledge, lessons learned, practical applications from current programs and connecting this information to private industry and other research efforts on cover crop use and soil health management.
- ◆ Establishing a Science Advisory Committee to review technical information and to guide the development of credible, science-based education and outreach materials on cover crops and soil health.

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- ◆ Establishing a network of cover crop and soil health systems specialists to share and promote this information.
 - ◆ Training those who work directly with farmers to use research results to develop core BMP recommendations as well as whole system approaches to improved production and environmental outcomes, specifically bringing together nutrient management practices with cover crop and soil health practices.
 - ◆ Educating farmers and advisors directly using printed materials, online resources, webinars, and videos in addition to informational meetings and field days at on-farm demonstration sites across the state. Individual, local farmer networks will also be facilitated by the cover crop and soil health systems specialists.
 - ◆ Incorporating information into community college agriculture curriculum and using demonstration sites for complimentary hands-on learning for students.

The partners plan to bring together education and research efforts with outreach components of the Illinois Cover Crop training initiative, Illinois Demonstration Farms partnership sites, Soil Health Partnership program, AFT's watershed efforts, and SARE-sponsored advanced soil health training. The partners will continue the momentum that has built around soil health, cover crop, water quality, nutrient and conservation topics through training, education, and demonstration projects in Illinois.

This effort will also support larger state and national efforts to increase the understanding and adoption of practices and whole farm systems that improve agricultural sustainability, water quality, soil health, nutrient stewardship and conservation. This work will connect to private industry efforts to increase the knowledge of trusted agricultural advisors and retailers, such as national and state certified crop advisor training.

Free, Confidential Water Testing Program

The confidential water testing program engages farmers in nutrient and water quality issues by providing specific information on nutrient losses from their operations.

The Illinois Corn Growers Association and ZMF are working with IFB and CFBs and 28 SWCD offices to provide nitrate sensors, training, educational kits, and promotional materials. The sensors provide a way for farmers and landowners to confidentially test tile, ditch, or stream water

for nitrate-nitrogen. By comparing results to other known concentrations and to research findings, farmers can begin to understand their impact on water quality and the potential economic loss and to consider management practices that may reduce nitrogen losses.

These test results are just a snapshot of ambient nutrient levels in water from tile drains, surface runoff, or nearby streams. Nutrient levels in runoff water can vary greatly depending on the time of year, temperature, rainfall, and in-field practices. Nevertheless, the test results combined with flow rates (the volume of water leaving a site) can be used to estimate the total nutrient loading into a waterbody. In addition, farmers can estimate the pounds per acre leaving the field. These numbers are a starting point for learning and discussion about practices that are available for farmers to reduce nutrient losses.

Illinois Cover Crop Programs

In the fall of 2015, ICGA and Beck's Hybrids began offering ICGA members opportunities to cost-share expenses that are associated with the initial adoption of cover crops. The programs are intended to facilitate cover crop adoption among farmers who are interested in this practice but who are hesitant to get started.

Farmers can access three cover crop programs:

- ◆ 1st-Time Cover Croppers: through a partnership of ICGA and Beck's Hybrids, this cost-share program provides aerial applications of up to 40 acres per farm of a winter-terminal (low risk) oats and radish cover crop mixture. It includes technical assistance from Beck's Hybrids cover crop specialists.
- ◆ Experienced Cover Croppers: through a partnership of ICGA and Beck's Hybrids, this cost-share program offers discounts on overwintering cover crop mixtures as incentives for farmers to grow cover crops on their 40-acre fields for multiple years. This program includes technical assistance from Beck's Hybrids cover crop specialists.
- ◆ Cover Crop Coupon: through a partnership of seven Midwest cover crop retailers, this coupon provides ICGA members a discount of \$150–\$200 on the purchase of cover crop seed.

Field Laboratories

Illinois Corn Growers Association and the University of Illinois are establishing a network of 3–5 field laboratories, which are long-term research sites established to assess conservation practices from agronomic, economic, and environmental perspectives. These sites are intended to serve as unique, state-of-the-art research platforms for multidisciplinary teams of university researchers to perform field-scale agronomic research while collecting high-resolution soil and water data, including water loss from tile drainage systems. The first field laboratory was established near Decatur in 2016.

Future Strategic Actions

The Agriculture Water Quality Partnership Forum will focus on quantifying BMP implementation outside of state and federal cost-share programs, which will provide valuable data for efforts to assess strategy success. The programs and projects described in this chapter will continue through the next reporting period and some AWQPF members will initiate new projects. Most importantly, AWQPF members will continue to work together to implement activities and provide direction for the agricultural community on innovative approaches to reducing nutrient loss from agricultural lands.



Chapter 5

Performance Benchmark Committee: Point Source Sector

The Performance Benchmark Committee (PBC or the committee) is a new working group that was established to address implementation needs defined in the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy). Both the agricultural and stormwater sectors had a plan in place to develop measures and benchmarks, so PBC set out to work with the point source sector in this process. Thus, this chapter serves a dual purpose—to provide point source implementation progress and to report on PBC activities.

The committee is comprised of representatives from the Association of Illinois Soil and Water Conservation Districts, City of Aurora, Heartland Ag Group Ltd., Illinois Association of Drainage Districts, Illinois Department of Agriculture, Illinois Environmental Protection Agency, Illinois Environmental Regulatory Group, Illinois Farm Bureau and county offices, Illinois Pork Producers Association, Macon County Soil & Water Conservation District, Metropolitan Water Reclamation District of Greater Chicago, Monsanto, Prairie Rivers Network, Sierra Club, and U.S. Department of Agriculture Natural Resource Conservation Service. As noted below, not all members participated in the meetings focusing on the point source sector.

Goals and Accomplishments

The Performance Benchmark Committee is charged with collaborating with sector work groups to identify on-the-ground steps to meet the 2025 interim milestones, the ultimate nutrient loss reduction targets, and local water quality goals. The committee had four meetings in 2016.

With its focus on the point source sector, PBC members from the Illinois Environmental Regulatory Group, Metropolitan Water Reclamation District of Greater Chicago (MWRD), Illinois Environmental Protection Agency (Illinois EPA), and the Sierra Club worked together to gather data and develop measures and goals. The committee followed the logic model adapted by the agriculture sector (presented in the Implementation Approach chapter) and determined metrics appropriate for the point

source sector. One noteworthy difference is that, under a regulated system, outreach measures are not as critical to achieving facility changes and accomplishing strategy goals as in a voluntary system. Nevertheless, it is important to the residents of Illinois to understand why plants are required to make upgrades to protect water quality, therefore outreach information is included in this report.

To gather metrics data on actions that address nutrient loss reduction, the committee collaborated with the Illinois Association of Wastewater Agencies (IAWA) to develop and administer a survey of facility operators. The survey included questions about staff and funding resources, outreach, and the type of nutrient removal systems that have been implemented or will be used in facilities around the state.

Updates to existing point source sector programs and other accomplishments toward nutrient loss reduction are described in more detail throughout this chapter.

Point Source Sector Implementation Report

Outreach Measures

In 2016, point source sector members and non-profits primarily reached relevant audiences through presentations and attending conferences. Table 5.1 reflects reported outreach efforts by members of the point source sector. The target audience was a small but significant group of decision makers and practitioners.

Table 5.1. Summary of outreach and education events held by partner organizations in the point source and non-profit sectors in 2016

	Number of events	Total Reported Attendance
Outreach (fairs, tours, community education)	17	484
Field Days	1	8
Workshops	15	343
Conferences	7	528
Total	40	1,363

Point source sector facility managers have worked to foster collaboration with the agriculture sector to address nutrient loss issues. For instance, among other activities, MWRD maintains a row-crop demonstration site to test agricultural best management practices (BMPs) and monitor their effects on water quality. More information on the nutrient loss reduction demonstration project can be found in the Point Source Projects and Programs section of this chapter. MWRD also hosted the Illinois Farm Bureau (IFB) for a half-day workshop and tour at the Stickney Water Reclamation Plant facility. At the workshop, participants learned about current nutrient loss reduction efforts and explored future partnership opportunities between the point source and agricultural sectors.

Point source sector members and non-profits have published several articles about nutrient loss reduction in magazines and online, such as the village of Carpenterville's website, and in newsletters, for example, the Environmental Defenders of McHenry County newsletter. In addition, MWRD participated in news stories about nutrient loss reduction through the Associated Press and on public television's *Chicago Tonight*.

Challenges in Data Acquisition

The survey of facility operators was available on the IAWA website and linked from the Illinois Water Environment's online news page. The survey was promoted at the Fox River Study Group annual meeting and at the Illinois Water Conference. Plus, the Illinois Association of Water Pollution Control Operators encouraged its membership to participate. Despite these efforts, participation was very low—11 people, who represented 18 facilities and the Sierra Club, completed the survey. This level of response provided input from only a small number of major point source sector facilities. However, because of the size of these facilities, 59.4 percent of Illinois' effluent flow was represented. Future efforts will explore new approaches to engage stakeholders in tracking and reporting.

Land and Facility Measures

As part of the National Pollutant Discharge Elimination System (NPDES) permit renewal, Illinois EPA requires major dischargers to submit feasibility studies for reducing phosphorus levels with the following components:

- ♦ An evaluation of technology-based treatment alternatives for reducing phosphorus levels to consistently meet a potential future effluent limit of 0.5 mg/L and 0.1 mg/L.

- ◆ Biological nutrient removal will have preference over chemical precipitation for reducing total phosphorus because of its reliable performance, overall sustainability, and reduced indirect environmental impact.
- ◆ An evaluation of construction, operation, and maintenance costs for each treatment alternative.
- ◆ A timeline for implementation.

As of 2016, Illinois EPA has issued 128 permits with phosphorus limits which represents 58 percent of facilities (Figure 5.1). Expressed as flow, however, this is nearly 80 percent of all effluent (Figure 1.3, Executive Summary). When existing permits expire or are up for renewal, the number of permits with total phosphorus limits will continue to grow.

Major dischargers are also required to submit and implement phosphorus discharge optimization plans for existing facilities, with the following components:

- ◆ An evaluation of possible source-reduction measures.
- ◆ A plan for optimizing operations to achieve the lowest total phosphorus effluent levels possible with existing equipment.
- ◆ An evaluation of minor facility modifications to optimize reductions in phosphorus discharges.
- ◆ An evaluation of possible levels of reduction.
- ◆ A discussion of potential local impacts and the benefits of reduction.
- ◆ A timeline for implementation.
- ◆ The submittal of annual progress reports.

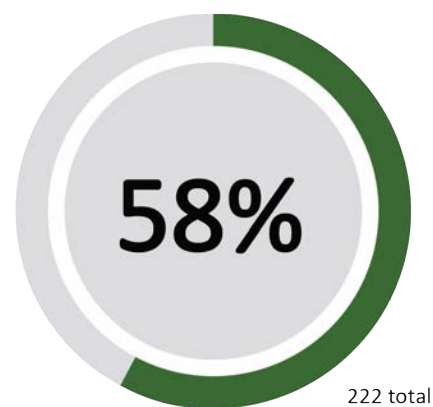


Figure 5.1. Percentage of Major NPDES permits with phosphorus limits

As of 2016, 44 feasibility studies and 26 optimization studies have been submitted to Illinois EPA. Fifty-five of the permits issued are awaiting feasibility studies and 50 issued permits are awaiting optimization studies. As Figure 5.2 shows, 123 permits that require feasibility studies are in progress, and 146 permits that require optimization studies have yet to be issued.



Figure 5.2. Feasibility studies and optimization studies submitted by Illinois major facilities (222 total)

Watershed Approach

A priority for Illinois EPA is to encourage and work with local watershed groups to meet the nutrient loss reduction objectives in the strategy. This includes non-point source, stormwater, and point source nutrient loading. As part of this effort, Illinois EPA is using permit conditions to require feasibility studies and cost-effective implementation of control technologies using existing infrastructure. Where possible, facilities will employ improvements to meet Illinois NRLS objectives. Currently, Illinois EPA is working with the Fox River Study Group (FRSG), DuPage River Salt Creek Workgroup (DRSCW), Hickory Creek Watershed Workgroup (HCWWG), Lower Des Plaines Watershed, and North Branch Chicago River Watershed.

Fox River Study Group

The Fox River Study Group is a diverse coalition of stakeholders who have been working together since 2001 to preserve and enhance water quality in the Fox River Watershed. In 2015, the FRSG completed the Fox River Implementation Plan (FRIP), which is the watershed community's road map to eliminate water quality impairments due to low dissolved oxygen levels, high total phosphorus levels, and nuisance algae in the Fox River below the Stratton Dam in the city of McHenry.

FRIP is the product of data collection and scientific assessment undertaken by FRSG with the support of Illinois EPA, Illinois State Water Survey, county and municipal governments, water reclamation districts, watershed and environmental groups, and consulting firms. Through FRIP, computer models assess the impacts of reducing total phosphorus loading as well as the impacts of removing Fox River dams on total phosphorus levels, dissolved oxygen, and algae in the river.

Several major wastewater treatment plants that discharge to the Fox River are in the process of adding controls on their total phosphorus discharges to meet an annual average limit of 1.0 mg/L. As the upgrades are completed over the next few years, annual total phosphorus loads from these plants will be reduced from 600,000 to 270,000 pounds per year. Compared to the 2010–2013 load, calculated using actual summer average flows and total phosphorus concentrations at the plants, this will result in approximately a 75 percent reduction in total phosphorus loading during summer months. Key findings from FRIP can be found in Appendix C. Figures 5.3 and 5.4 depict the number of Fox River major facilities with phosphorus limits in their permits and those that have submitted feasibility and optimization studies, respectively.

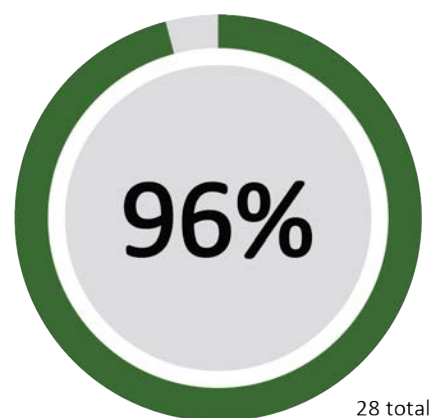


Figure 5.3. Percentage of Major NPDES permits with phosphorus limits in the Fox River Watershed



Figure 5.4. Feasibility studies and optimization studies submitted by Illinois major facilities in the Fox River Watershed (28 total)

In the fall 2016, algae levels (in the water column and stream-bottom coverage) in the Fox River were measured at six sites during low-flow conditions. These measures were in addition to continuous dissolved oxygen measurements, which are helping efforts to investigate sites where modeling predicts low dissolved oxygen. The group has also contracted with the U.S. Geological Survey (USGS) to collect continuous dissolved oxygen data on the Fox River near Algonquin during the summer season of water years 2016–2018. Current models predict low dissolved oxygen levels in this stretch of the river.

The Illinois State Water Survey is preparing a report on temporal and spatial trends connected to nutrient-related water quality parameters in the Fox River from 1998 through 2016. This report is an update of the survey prepared for FRSG in 2004.

FRSG also continues to conduct a monthly, all-volunteer monitoring effort of the main stem and tributaries of the Fox River. This project is now in its 15th year of data collection.

DuPage River Salt Creek Workgroup

The DuPage River Salt Creek Workgroup was established in 2005 as a result of Total Maximum Daily Loads (TMDLs) that were being developed for the east and west branches of the DuPage River and Salt Creek (located in portions of Cook, DuPage, and Will counties in northeastern Illinois). This workgroup seeks to implement targeted watershed activities that resolve problems in priority waterways efficiently and cost-effectively.

In 2015, DRSCW negotiated special conditions to their NPDES permits that substantially increase financial commitments to restoration efforts. Special condition projects completed by DRSCW in 2016 include:

- ◆ Dam removal and stream restoration in The Preserves at Oak Meadows, a golf course along the Salt Creek in Addison.
- ◆ Development of a conceptual plan for modifying the dam on the Salt Creek in Fullersburg Woods in Oak Brook.
- ◆ Partial funding of a USGS study that monitored total phosphorus reductions in nonpoint source pollution as a result of implementing BMPs that include street sweeping and leaf collecting.

Additionally, DRSCW is designing the modification of the Fawell Dam along the West Branch of the DuPage River in Naperville. It is selecting a consulting firm to lead the framework development of a watershed-scale total phosphorus-trading program for point source dischargers.

Figures 5.5 and 5.6 depict the number of DuPage River Salt Creek major facilities with phosphorus limits in their permits and those that have submitted feasibility and optimization studies, respectively.

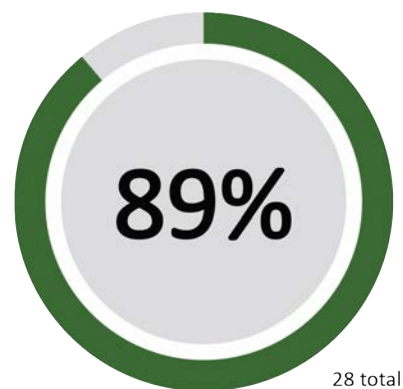


Figure 5.5. Percentage of Major NPDES permits with phosphorus limits in the DuPage River Salt Creek Watersheds



Figure 5.6. Feasibility studies and optimization studies submitted by Illinois major facilities in the DuPage River Salt Creek Watersheds

Hickory Creek Watershed Planning Group

Hickory Creek, a vital sub-watershed of the Lower Des Plaines Watershed, has seen significant environmental degradation. In response to anthropogenic impacts, a team of southwest suburban municipalities and environmentally-focused non-profit organizations created the Hickory Creek Watershed Planning Group to improve water quality there. The group completed the Hickory Creek Watershed Plan in 2011.

The planning group currently includes representatives from Joliet, New Lenox, Frankfort, Homer Glen, Mokena, Tinley Park, Orland Park, the Forest Preserve District of Will County, Will County Stormwater Management Planning Committee, Illinois American Water, and Huff & Huff, an environmental consulting firm.

The group is working to reduce non-point source pollution, improve habitats and water quality, and engage a wide audience. Specifically, HCWPG is conducting in-stream water quality monitoring and is documenting sources of non-point source pollutants. The group will prepare action plans, implement BMPs, participate in community outreach, and evaluate the ability of local projects to address watershed nutrient loss reduction goals for both point and non-point sources. In addition, HCWPG is in the early stages of developing a third-party TMDL for the watershed.

The Illinois Department of Natural Resources is currently working toward removing the Pilcher Park Dam in Joliet, which will have a profound impact on levels of dissolved oxygen and algal growth in the lower reaches of Hickory Creek. The Hickory Creek Watershed Planning Group is concentrating on addressing impairments from chloride, *Escherichia coli*, and sediment by implementing anti-icing and de-icing practices, green infrastructure, and streambank stabilization. The focus on these pollutants will continue until the dam removal is complete, at which point, stream characteristics will change dramatically.

All six of the major wastewater treatment facilities in the Hickory Creek Watershed have the phosphorus limit in their respective NPDES permits. HCWPG will prepare a TMDL, which will be completed when the dam is removed and the interim 1 mg/L phosphorus limit is in place on all discharges in the waterway. Figures 5.7 and 5.8 depict the number of Hickory River major facilities with phosphorus limits in their permits and those that have submitted feasibility and optimization studies, respectively.



Figure 5.7. Percentage of Major NPDES permits with phosphorus limits in the Hickory Creek Watersheds

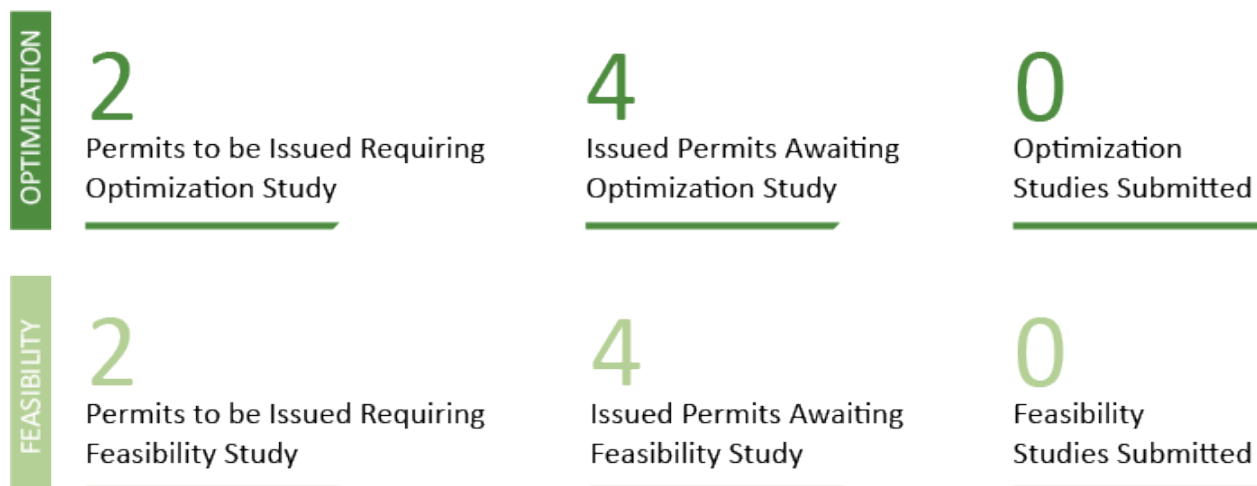


Figure 5.8. Feasibility studies and optimization studies submitted by Illinois major facilities in the Hickory Creed Watershed

The Des Plaines River Watershed Workgroup

A watershed-based planning effort for the Des Plaines River is underway and is scheduled to be completed in 2018. The planning area covers 235 square miles of the watershed and is primarily located in Lake County, but it includes portions of Cook County and Kenosha County in Wisconsin.

The Des Plaines River Watershed Plan will include recommended actions to address both point and non-point source pollutant loads. Watershed planning will evaluate stressors in the watershed, including sources of nutrients that cause dissolved oxygen impairment, as well as other pollutants of concern.

The watershed planning process includes an extensive water quality monitoring program that is sponsored and funded by the Des Plaines River Watershed Workgroup (DRWW), a collaboration of wastewater treatment plants, municipalities, and other agencies and organizations. The monitoring program will sample 70 sites, which will include biological and habitat assessments, in addition to water and sediment chemistry.

In 2016, DRWW held nine watershed-planning meetings with the Des Plaines River Watershed Planning Committee. It is anticipated that this stakeholder-led effort will use monitoring data and watershed plan recommendations to determine nutrient loss reductions that will restore the Des Plaines River and then implement the plan recommendations.

Figures 5.9 and 5.10 depict the number of Des Plaines River major facilities with phosphorus limits in their permits and those that have submitted feasibility and optimization studies, respectively.



Figure 5.9. Percentage of Major NPDES permits with phosphorus limits in the Des Plaines River Watersheds



Figure 5.10. Feasibility studies and optimization studies submitted by Illinois major facilities in the Des Plaines River Watershed

Current Programs and Projects Supporting Nutrient Loss Reduction Goals

In Illinois NLRS, there were six identified point source-related programs and initiatives to reduce nutrient losses. The following section highlights programs that have undergone significant changes or have noteworthy updates and describes three efforts that were not discussed in the original strategy (Table 5.2).

Table 5.2. Point source programs and projects working toward Illinois NLRS goals

Permit Limits for Phosphorus	50
Watershed Approach.....	51
Watershed Protection Utility*	58
Permit Limits and Facility Upgrades for MWRD	59
Agricultural Sector and Point Source Sector Partnership: Testing BMPs*	60
Resources Measures*	61
Total Maximum Daily Loads.....	63
Concentrated Animal Feeding Operations	64
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Bold type and page number signify an update in this report. Asterisks signify efforts not in the strategy.

Watershed Protection Utility

In 2014, as part of the U.S. Water Alliance Mississippi River Nutrient Dialogues, discussions began about the development of an Illinois Watershed Protection Utility (WPU). Thus far, about 20 organizations have joined these conversations to explore opportunities to establish a new finance and governance entity. A WPU would advance statewide nutrient loss reduction strategies more cost effectively through an approach that engages all nutrient stakeholders as well as the general public.

In April 2016, the Joyce Foundation awarded a grant to the U.S. Water Alliance, in part, to support the development of a white paper that summarizes stakeholder perspectives on WPU governance and function. With this funding a consulting firm, Ross Strategic, was hired to convene a series of stakeholder interviews and hold a one-day stakeholder workshop. Each stakeholder sector—govern-

ment, water utilities, universities, non-governmental organizations, agriculture, and private industry—was interviewed via GoTo Meeting. Ross Strategic also conducted six conference calls with stakeholder sub-groups in the spring and summer of 2016. The white paper draft was discussed at an in-person meeting in September with all the stakeholders.

Permit Limits and Facility Upgrades for Metropolitan Water Reclamation District of Greater Chicago

The Metropolitan Water Reclamation District of Greater Chicago, which operates the largest wastewater treatment plants in the state, adopted a resource recovery approach to reduce total phosphorus in the effluent from its largest water reclamation plants. When permits for the Calumet, Stickney, and O'Brien plants were renewed in 2013, the implementation of monthly averages of 1 mg/L total phosphorus effluent limit was included for the next 4–10 years. The district worked directly with Illinois EPA, with input from Illinois Association of Wastewater Agencies and environmental groups, to negotiate permit conditions.

National Pollutant Discharge Elimination System permits for the three plants mentioned above were appealed to the Illinois Pollution Control Board and Illinois Appellate Court for the First District concerning the appropriateness of the 1 mg/L total phosphorus effluent limit. A coalition of environmental groups argued that the permit limit of 1 mg/L was not protective against violations of Illinois water quality standards regarding dissolved oxygen, offensive conditions, and unnatural sludge.

The outcome of the permit appeal was a settlement agreement. The terms of the settlement agreement were modifications of NPDES permits to include the following:

- ◆ A nutrient oversight committee will be established to prepare a nutrient implementation plan.
- ◆ MWRD is responsible for installing a water quality monitoring station on the Des Plaines River.
- ◆ MWRD will potentially participate in a watershed group or trading program.
- ◆ A lower technology-based phosphorus effluent limit of 0.5 mg/L will be established, with compliance by 2030, if feasible—unless a lower limit is required under the implementation plan.

The Calumet O'Brien and Stickney NPDES permits were reissued on July 6, 2017.

In 2015, average phosphorus removal was 93 percent (based on influent phosphorus load) at Stickney, with optimization of the system still in progress. In May of 2015, the Ostara® process went online, resulting in controlled production of phosphorus recovery in sidestream in the form of a slow-release fertilizer, magnesium ammonium phosphate. In fact, through the recovery process, 9,000–10,000 tons of fertilizer will be produced annually for Crystal Green®. This is an opportunity for a more environmentally-friendly phosphorus lifecycle.

Currently, testing of enhanced biological phosphorus removal and the Ostara® process are under way at Calumet, O'Brien, Egan, and Hanover Park facilities. Looking forward, the Stickney plant expects to complete construction of the waste-activated sludge stripping process by December 2017. This process further increases phosphorus removal.

Agricultural Sector and Point Source Sector Partnership: Testing BMPs

To bring together a range of stakeholders to tackle nutrient loss develop and test agricultural BMPs, MWRD established a Nutrient Loss Reduction Research and Demonstration Project on Agricultural Land at its Fulton County site.

The site is approximately 13,000 acres of mostly strip-mined land; about 4,000 acres were reclaimed and for almost 40 years have been used for row crop production. Through MWRD funding, collaborations with universities and agricultural entities bring together soil scientists and technicians to develop BMPs. The site provides the opportunity to test agricultural BMPs on a field-scale or watershed scale with scenarios that might not be accessible on farmers' fields.

During 2015 and 2016, MWRD established research to test the effectiveness of planting cover crops early, installed monitoring systems to collect baseline data on fields where BMPs will be implemented for watershed-scale evaluations, and began to set up other BMPs demonstrations. In 2016, MWRD joined with several University of Illinois departments, Illinois Central College (ICC), the Ecosystem Services Exchange, and Argonne National Laboratories to hold a workshop at the site. A cover crop field day took place in collaboration with ICC.

Resources Measures

The point source sector has contributed significant resources toward feasibility studies and capital improvements.

Table 5.3 reflects information from the IAWA survey and includes the following 2016 investments and others:

- ♦ The Bloomington-Normal Water Reclamation District committed \$184,000 to a nutrient removal feasibility study at its West Plant and \$17,000 in personnel time to nutrient removal activities.
- ♦ The Carpentersville Wastewater Treatment Plant invested approximately \$45,000 in a total-phosphorus-removal feasibility study and other research.
- ♦ MWRD committed approximately \$10,000 in 2015 and 2016 in both in-kind and monetary contribution to study the feasibility of BMP implementation and support.
- ♦ Bioreactor installations were part of MWRD's contribution to the Regional Conservation Partnership Program project—Nutrient and Sediment Loss Reduction in Macon County. In addition, MWRD invested approximately \$20,000 to collaborate with the University of Illinois and other institutions to support research.
- ♦ Agricultural BMP demonstrations were established on MWRD's land reclamation site in Fulton County.

Table 5.3. Funds supporting 2016 nutrient loss reduction-related activities in the point source sector

Nutrient loss reduction-related activity	Dollar Amount
Feasibility studies and other research	\$513,442
Capital improvement	\$36,904,000
Total	\$37,417,442

Capital improvement projects reflect significant resource allocation. IAWA members provided the following information. Only projects completed by 2016 are included in Table 5.3.

- ◆ The Greater Peoria Sanitary District invested \$12 million in biological phosphorus removal upgrades that reduce total phosphorus levels leaving the plant. The upgrades are expected to be completed in 2017.
- ◆ The DeKalb Sanitary District spent \$2.5 million designing a new biological nutrient removal plant to replace its current attached growth plant. Construction of the \$46.35 million project is expected to begin in 2017.
- ◆ MWRD invested \$2.125 million in design and \$31.879 million in construction of a total-phosphorus-recovery system, the Ostara Pearl® side-stream, at the Stickney Water Reclamation Plant. This system went on line in May of 2016.
- ◆ The North Shore Water Reclamation District has budgeted \$14 million to design and construct biological phosphorous removal systems at its three water reclamation facilities; these projects are expected to be completed in 2018. The district also invested \$400,000 for the design and construction of a chemical phosphorous removal system at its water reclamation facility in Waukegan and \$2.3 million for the design and future construction of chemical phosphorous removal systems at water reclamation facilities at both Clavey Road and Gurnee.
- ◆ The Fox Metro Water Reclamation District (FMWRD), which services Aurora and several surrounding communities, has embarked on the following compliance measures:
 - ◆ In 2016, construction began on the South Wastewater Treatment Facilities (WWTF) to reduce phosphorus entering the Fox River. The cost of the South WWTF construction, including associated infrastructure, is \$93.5 million.
 - ◆ Construction is scheduled to begin in 2017 on phosphorus reduction upgrades to the North WWTF. These improvements are expected to be operational in 2019 and cost \$18.3 million.
 - ◆ FMWRD is actively collecting phosphorus input data and studying input reductions in its service area.
 - ◆ Both the North WWTF upgrades and the new South WWTF will include biological phosphorus removal with supplemental chemical removal. These improvements are anticipated to remove 67 percent of phosphorus in FMWRD effluent to meet a 1 mg/l phosphorus limit by 2021.

Some utilities made significant investments prior to 2016 that are not represented in Table 5.3. For example, in 2014, MWRD implemented full-scale biological total phosphorus removal at the Stickney Water Reclamation Plant and at some plants has conducted evaluations and pilot-scale testing. The Urbana-Champaign Sanitary District has also engaged in pilot-scale testing to optimize biological total phosphorus removal at two treatment plants. With help from a consultant, the Glenbard Wastewater Authority has begun a detailed feasibility study to identify a cost-saving approach to meeting future phosphorus regulations within existing tank space. At the same time, Glenbard is converting to a high-efficiency, diffused-air, conventionally-activated sludge treatment process with enhanced biological phosphorus removal and is shifting away from a high-purity, oxygen-activated sludge treatment process. Funding amounts for these activities have not been reported.

Total Maximum Daily Loads

TMDLs developed for impaired watersheds include point source waste load allocations (WLA) for total phosphorus and nitrate-nitrogen when these nutrients are listed as a potential cause of impairment. Waste load allocations vary, depending on the magnitude of loadings from point sources in a watershed and the degree to which the water quality standard is exceeded. Point source reduction goals vary for TMDLs with nutrient-related point source contributions. These goals are incorporated into NPDES permits at renewal or modification stages. Currently, 21 TMDLs addressing total nitrate-nitrogen WLAs for NPDES point sources and 60 WLAs focused on total phosphorus are complete (Figure 5.11). Thirteen TMDLs are being developed to address WLAs for nitrate-nitrogen and 26 WLAs for total phosphorus. Since these TMDLs are not finalized the numbers may change slightly prior to approval by the U.S. Environmental Protection Agency.

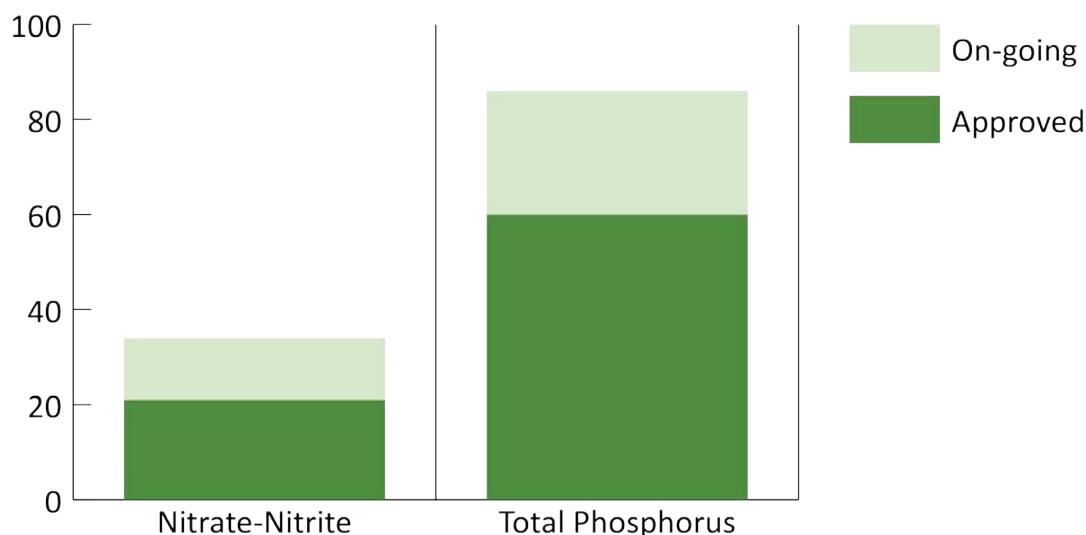


Figure 5.11. TMDL Waste Load Allocations for Nutrients

Concentrated Animal Feeding Operations

Discharges from concentrated animal feeding operations (CAFOs) can be a source of nutrient pollution that impairs local water bodies. Illinois EPA has identified 288 active large CAFOs (permitted and unpermitted) in Illinois through its on-site inspection program and internal reviews. This number is up from 249, which was reported in Illinois NLRS.

In addition to the on-site inspection program, Illinois EPA annually conducts compliance inspections of 20 percent of permitted CAFOs and 20 percent of large unpermitted CAFOs identified. Since July 1, 2015, Illinois EPA field staff have conducted approximately 260 livestock facility site visits to determine compliance or provide assistance in improving operations. Through these inspections and previous enforcement acts currently 31 facilities are covered under the general CAFO NPDES permit; previously, 36 were covered. However, through education and guidance, the five previously permitted facilities have reached compliance with current CAFO regulations and are now designed, constructed, operated, and maintained in such a manner that the facility no longer discharges or proposes to discharge to waters of the United States. Therefore, NPDES permit coverage is unnecessary.

State Revolving Fund

The Illinois EPA State Revolving Fund provides low-interest loans for wastewater treatment infrastructure. This includes wastewater treatment plant upgrades to improve nutrient removal, green infrastructure, urban stormwater treatment, and control of combined and sanitary sewer overflows. The loan program is maintained to ensure adequate resources are available to finance improvements required under NPDES permits. Funding levels remain healthy with approximately \$592 million in federal fiscal year 2016 and similar levels projected for the immediate future.

Future Regulatory Actions

Water Quality Standards

The narrative standard for offensive conditions (35 Ill. Adm. Code 302.203) prohibits unnatural excessive algal or plant growth. This standard is mainly intended to address aesthetic issues that may limit the use of waterways.

Illinois EPA has been working toward revising and strengthening the narrative to make it clear when excessive algal or plant growth is considered a threat to the aquatic life use.

As Illinois EPA worked to revise the standard, issues became apparent, which that have put the process on hold. For example, the definition of an offensive condition is subjective, and putting thresholds on subjective decisions is difficult at best. This issue may be resolved when the work of the Nutrient Science Advisory Committee recommends scientifically-based water quality standards. Furthermore, momentum is growing to establish a technology-based standard to develop phosphorus limits in permits.

As a result, Illinois EPA has not submitted a revised narrative standard to the Illinois Pollution Control Board. However, in lieu of this, Illinois EPA is now regulating phosphorus loads from major dischargers when there is a downstream dissolved oxygen violation as a response to algae growth or excessive algal growth found in a waterbody.

Future Strategic Actions

Performance Benchmark Committee: Point Source Sector

The point source sector will continue to work with PBC members, Illinois EPA, and scientists to develop a benchmark for measuring progress towards reducing nutrient loads to Illinois waters. The committee will focus on implementing a tracking and reporting system for individual point sources. The programs and projects described in this chapter will continue through the next reporting period.

Biological Nutrient Removal

Implementation of biological nutrient removal technology is encouraged in permits with a total phosphorus limit. To promote this technology, Illinois EPA may provide flexible compliance schedules, long-term average total phosphorus limits, or other conditions consistent with the federal Clean Water Act, as well as other federal and state regulations.

Water Quality Offset and Trading Programs

Illinois EPA will continue to promote trading, urban and rural partnerships, or other offsets as part of watershed planning and implementation efforts. Trading may be used when considering NPDES permits after an appropriate, enforceable, and transparent program is developed. Illinois EPA is working with several watershed groups that are considering trading as a tool to meet water quality standards.



Chapter 6

Urban Stormwater Working Group: Stormwater Sector

The Urban Stormwater Working Group (USWG or the group) works to reduce nutrient loss to waterways from the urban stormwater sector as defined in the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy).

The group consists of representatives from municipalities, counties, non-governmental organizations, and state agencies involved in urban stormwater management. Members of USWG include the Association of Illinois Soil and Water Conservation Districts, Center for Neighborhood Technology, Center for Watershed Protection, Chicago Metropolitan Agency for Planning, cities of Champaign, Peoria, and Urbana, DuPage and Madison counties, Greater Egypt Regional Planning and Development Commission, Illinois Department of Natural Resources, Illinois Department of Transportation, Illinois Environmental Protection Agency, Illinois Environmental Regulatory Group, Lake County Stormwater Management Commission, Metropolitan Planning Council, Metropolitan Water Reclamation District of Greater Chicago, National Great Rivers Research and Education Center, Prairie Research Institute, Prairie Rivers Network, Sierra Club, and The Conservation Foundation.

Initially, southern Illinois communities and Municipal Separate Storm Sewer Systems (MS4s) were underrepresented on the working group. USWG now includes members from these stakeholders. Refer to the Partner Update section in this chapter for additional discussion about the MS4 program.

Goals and Accomplishments

USWG is charged with the following objectives:

- ◆ Explore funding, identify legislative initiatives, and develop plans.
- ◆ Coordinate outreach.
- ◆ Orchestrate statewide efforts related to green infrastructure expansion, MS4 program training, and urban stream, lake, and stormwater monitoring.

The group met five times over the last two years. The Urban Stormwater Working Group created a subcommittee to explore the possibility of producing a workshop series to inform elected officials and practitioners about stormwater management and concerns. This subcommittee laid the groundwork for these workshops and will be working towards developing a summary document to educate elected officials about stormwater issues.

To ensure that existing public education materials are comprehensive, USWG performed a gap analysis and found no obvious omissions. Therefore, the group is redirecting efforts to assist MS4 communities in developing survey questions to evaluate public outreach efforts, as part of permit requirements. A list of existing materials can be found in Appendix B.

The group also created a tracking subcommittee to determine the best way to document urban non-point source mitigation practices in Illinois. The subcommittee followed the logic model adapted by the agriculture sector (presented in the Implementation Approach chapter) and determined metrics appropriate for the stormwater sector. Tracking stormwater best management practices (BMPs) is challenging due to MS4 reporting methods and limited staff at both permittees and the permitting agency. Future efforts should include developing a method for MS4s to conveniently self-report this information to USWG.

Stormwater Sector Implementation Report

Resources Measures

In 2016, the Illinois Environmental Protection Agency (Illinois EPA) provided \$4,349,708 for non-point source projects through Section 319 grants, which includes both agricultural and urban projects. In 2014, under Public Act 98-0782, stormwater mitigation projects became eligible for the Illinois EPA State Revolving Loan Fund and three projects have been awarded funding. In 2016, no new projects were funded, but going forward the numbers are expected to increase.

In addition to state funding, there are 22 communities in Illinois that assess utility fees to offset the cost of stormwater control and treatment by municipal infrastructure. These payments provide a stable and significant source of funding, nearly \$24 million annually, according to the 2016 Western Kentucky Stormwater Utility Survey (<https://www.wku.edu/engineering/civil/fpm/swusurvey>). However, it is unclear what percentage of this amount is directed specifically to projects that would reduce nutrient loading.

Outreach Activities

Public outreach and education is required by the MS4 stormwater permit. Permit holders are required to distribute educational materials and inform residents about potential impacts on water quality from polluted stormwater runoff discharges. Similar to tracking BMPs and with 440 permitted MS4s in Illinois, quantifying outreach efforts from annual reports is not practical in terms of available staff resources. Further, education efforts that are specific to nutrient loss reduction are not clearly defined. However, green infrastructure education may provide a good measure of relevant outreach. Refer to the Partner Update section in this chapter for additional discussion about the MS4 program.

The Urban Stormwater Working Group has compiled a list of stormwater outreach materials that can be found in Appendix B. Most of these publications were created by DuPage County, the Chicago Metropolitan Agency for Planning, and Illinois-Indiana Sea Grant.

Land and Facilities Measures

Illinois Environmental Protection Agency Section 319 Grant Program

Section 319 is a grant program under the Clean Water Act (33 U.S.C. 1329) that provides funding for states with approved non-point source management plans. These states award grants to support non-point source pollution control projects. Through technical and financial assistance, Illinois EPA encourages the development of watershed-based plans consistent with current principles. Whether in development or complete, these watershed plans are tracked through the Research Management Mapping Service. Visit www.rmms.illinois.edu for more information.

Participation and implementation of green infrastructure in this grant program increased substantially from the baseline years of 2002–2011 to 2012–2015 (Tables 6.1–6.3).

Table 6.1. Section 319 urban non-point source projects (number created) funded by Illinois EPA

Practice	2002-2011	2012-2015	Change
Oil and Grit Separator	0	12	▲
Rain Garden	24	42	▲
Street Sweeping	0	1	▲
Sediment Basin	0	10	▲
Grade Stabilization Structure	21	209	▲
Urban Stormwater Wetlands	6	45	▲
Infiltration Trench	14	28	▲
Level Spreader	0	7	▲
Rock Outlet Protection	9	7	▼

Table 6.2. Section 319 urban non-point source projects (acres) funded by Illinois EPA

Practice	2002-2011	2012-2015	Change
Green Roof	0	1.37	▲
Critical Area Planting	0	0.21	▲
Recreation Area Improvement	0	6.00	▲
Tree Planting	0	5.00	▲
Bio-retention Facility	0.10	0.00	▼
Bioswale	2.66	2.50	▼
Urban Filter Strip	4.07	6.61	▲
Grass-Lined Channels	0	3.15	▲
Porous Pavement	4.48	10.96	▲

Table 6.3. Section 319 urban non-point source projects (feet) funded by Illinois EPA

Practice	2002-2011	2012-2015	Change
Terrace	0	4,000	▲
Water and Sediment Control Basin	0	2,000	▲
Subsurface Drain	0	1	▲

Green arrows indicate change toward nutrient loss reduction goals; red arrows indicate change away from goals.

Illinois Green Infrastructure Grants

Initiated in 2011, the Illinois Green Infrastructure Grant (IGIG) program funded 40 projects in three categories: Combined Sewer Overflow Rehabilitation; Stormwater Retention and Infiltration; and Green Infrastructure Small Projects. To date, not all projects are completed. As Figure 6.1 shows, the practice that covered the most land area was porous pavement at 5.69 acres. In addition to these practices, IGIG funded 11 rain gardens and one cistern. By the time all 40 projects are completed, total numbers of all practices will rise significantly. This program has not been funded since 2014, but Illinois EPA supports the premise of this grant program and is working to find funding for future projects.



Figure 6.1. New acres with urban non-point source BMPs funded by the IGIG program in 2015

Rain Barrel Programs

Fifty-eight Cook County municipalities and 23 non-governmental organizations participate in MWRD's rain barrel program. In 2014–2016 these entities distributed 124,264 free barrels to residents. While the program ended in 2016, MWRD continues to provide barrels at cost.

Water Measures

The Section 319 grant and Illinois EPA IGIG programs calculate load reductions for installed BMPs. Figure 6.2 indicates that BMPs significantly reduced nutrient loading to Illinois waters. From the baseline years of 2002–2011, Section 319 funding led to an annual reduction of total nitrate-nitrogen loads of 33,336 pounds, and between 2012 and 2015, grant projects have accounted for 79,301 pounds of annual reductions. The annual reduction of total phosphorus, which has a baseline of 15,248 pounds, is 37,206 pounds for 2012–2015.

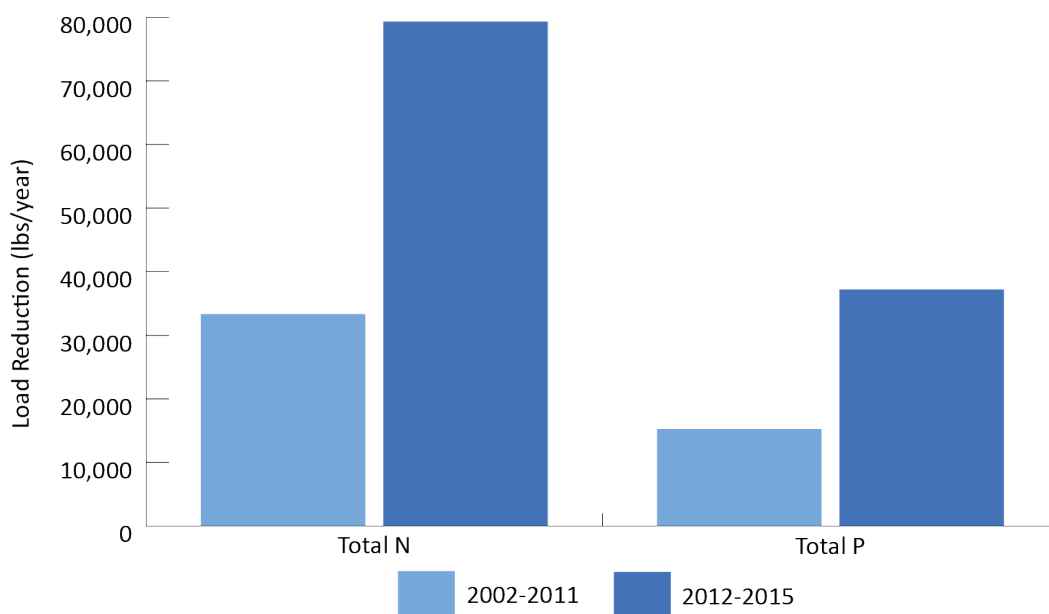


Figure 6.2. Calculated total nitrogen and total phosphorus load reduction (lbs/year) from Illinois EPA 319 urban non-point source projects

Additionally, Section 319 practices significantly reduced total suspended solids and sediment loading (Figure 6.3). The greatest impact was between 2012 and 2015—reducing the amount of total suspended solids by 1,930,727 pounds per year.

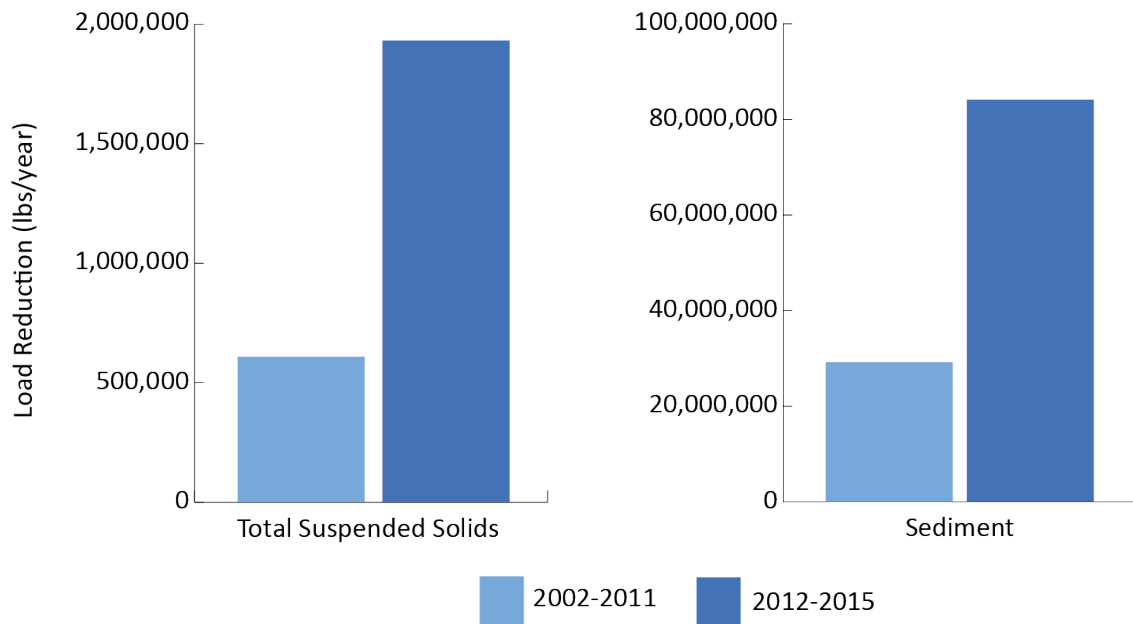


Figure 6.3. Calculated load reduction of total suspended solids and sediment (lbs/year) from Illinois EPA 319 urban non-point source projects

Load reductions for 2015 attributable to the IGIG program are 196 pounds of nitrogen and 17.3 pounds of phosphorus, 25,376 pounds of total suspended solids, and 2,000 pounds of sediment reduced, all annually (Table 6.4).

Total N	Total P	Total Suspended Solids	Sediment
196	17.3	25,376	2,000

Metric Establishment and Collection

Although MS4s are regulated by Illinois EPA, there is no association of state-wide stormwater permit holders. Thus, no mechanism exists for the regulated stormwater sector to survey members to provide resource, outreach, and land and facilities measures. Currently, MS4 permittees do submit a required annual report to Illinois EPA. However, as mentioned earlier, the format is narrative, which is challenging for data retrieval. USWG will explore methods to make this reporting more conducive to capturing nutrient BMP metric information.

Current Programs and Projects Supporting Nutrient Loss Reduction Goals

In Illinois NLRS, there were eight identified urban non-point source stormwater-related programs and initiatives. Table 6.5 lists all that were referenced in the strategy. The following section highlights programs that have undergone significant changes or have noteworthy updates.

Table 6.5. Urban non-point source programs and projects working toward Illinois NLRS goals

Section 319	69
Municipal Separate Storm Sewer System Permit	Illinois NLRS p. 7-2
Clean Water Initiative and State Revolving Fund	74
Illinois Green Infrastructure Grants	71
Rain Barrel Programs	71
Streambank Stabilization and Restoration Program	Illinois NLRS p. 7-4
Total Maximum Daily Load	Illinois NLRS p. 7-4
Calumet Stormwater Collaborative	75

Bold type and page number signify an update in this report. Details about programs listed in non-bold type and page number can be found in the strategy.

Clean Water Initiative and State Revolving Fund

Illinois EPA is updating rules to prioritize the funding of green infrastructure as well as traditional water pollution control projects. The change comes in response to a recent loan program eligibility expansion in the Clean Water Initiative (Public Act 98-0782), which allows funding for implementing green infrastructure and stormwater treatment projects. An interest rate discount will be available for projects that: primarily serve communities without sewers; focus on nutrient removal or nutrient loss reduction; provide green infrastructure improvements; lower water demand; or reduce energy demands at wastewater treatment facilities.

Calumet Stormwater Collaborative

The Calumet Stormwater Collaborative (CSC) has been going strong for over three years, and, with more than 40 agencies participating, it continues to grow. The collaborative has developed free, on-line green infrastructure design templates for communities, a new data mapping tool for the region, and a logic model for green infrastructure training and maintenance programs.

Additionally, through the work of CSC, the Metropolitan Planning Council was awarded a grant from Illinois EPA to create supplemental planning documents for four sub-watersheds in Cook County, including the Calumet region. This will allow communities in these sub-watersheds to apply for Section 319 grants.

Future Regulatory Actions

Stormwater Discharge Monitoring Program

Illinois EPA is providing technical assistance to watershed groups that are developing programs to help municipalities monitor stormwater discharging into impaired streams. Illinois encourages MS4 permittees to collaborate with other permit holders or watershed groups to design and implement watershed monitoring programs that assess water quality and identify and eliminate pollution sources that cause impairments.

Post-Development Stormwater Performance Standard

In 2013, the Post-Development Stormwater Performance Standard Work Group submitted recommendations to Illinois EPA to help define performance standards. The expectation was that the recommendations would be revised or passed on as is to the Pollution Control Board for rule making. During the process, U.S. EPA reconsidered state performance standard criteria. Illinois EPA is waiting for further direction from U.S. EPA before moving forward on the proposed standard.

Future Strategic Actions

Urban Stormwater Working Group

The Urban Stormwater Working Group will give priority to making MS4 permittee annual reporting more conducive to capturing nutrient BMP metric information. Gathering this information statewide rather than piecemeal will tell the big picture story of nutrient loss reduction efforts in Illinois municipalities. To help reduce volume and nutrient loadings from storm events, the working group will also focus on outreach and education to municipalities and counties that do not have stormwater plans.

Stormwater Management Planning

Illinois EPA will continue to encourage municipalities and counties to develop comprehensive, science-based stormwater plans to reduce stormwater volume, which decreases nutrient loading. Existing plans created by watershed planning groups and municipalities are often driven by flood events and lack the necessary details for implementing stormwater management.

Storm Sewer System Mapping

Illinois EPA will continue to work with all municipalities to fully map storm sewer systems as required by the current MS4 general permit. Few communities currently have system maps, the exception is combined sewer overflow communities that are required to develop a long-term control plan as part of National Pollutant Discharge Elimination System permits.

Stormwater Management Employee Training

Illinois EPA will continue to encourage all municipalities to implement a stormwater management employee training program, which is required in the current MS4 general permit. The program should include pollution prevention measures to prevent or reduce the discharge of nutrients to waterways.



Chapter 7

Nutrient Monitoring Council

The Nutrient Monitoring Council (NMC) works to develop, coordinate, and implement monitoring activities to calculate annual nutrient loads leaving the state and to determine loading trends in priority watersheds identified in the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy). In this effort, NMC discussions include program design, data collection and methods, data analysis and assessment, quality assurance, reporting, and evaluation.

NMC is chaired by the Illinois Environmental Protection Agency (Illinois EPA) and has 13 members representing agencies, universities, and organizations involved in monitoring and assessing nutrient loads and their impacts. These include Aqua Illinois, the Illinois Corn Growers Association, Illinois Department of Natural Resources, Metropolitan Water Reclamation District of Greater Chicago, Sierra Club, U.S. Army Corps of Engineers, U.S. Geological Survey, and at the University of Illinois: Department of Agriculture and Biological Engineering; National Center for Supercomputing Applications; Illinois State Water Survey; and Illinois Natural History Survey.

Goals and Accomplishments

Specifically, NMC is charged with:

- ♦ Generating estimates of five-year average loads of nitrate-nitrogen and total phosphorus leaving Illinois compared to 1980–1996 baseline conditions.
- ♦ Generating estimates of nitrate-nitrogen and total phosphorus loads leaving selected Illinois NLRS-identified priority watersheds compared to 1997–2011 baseline conditions.
- ♦ Identifying trends in loading over time in statewide- and Illinois NLRS-priority watersheds.

NMC will also document local water quality outcomes in selected priority watersheds (or smaller watersheds nested within) where nutrient loss reduction efforts are being implemented and develop a list of prioritized nutrient monitoring activities and associated funding to accomplish the aforementioned goals.

NMC has met seven times since May of 2015. The council's biggest accomplishment thus far has been to establish a network of U. S. Geological Survey (USGS) super gages (Figure 7.1) in 2015. These super gages provide direct monitoring and evaluation support for generating estimates of five-year running average loads of nitrate-nitrogen and total phosphorus leaving Illinois.

At each super gage, streamflow, nitrate, orthophosphate, turbidity, temperature, specific conductivity, dissolved oxygen, and pH will be continuously monitored through March of 2020. Summary bulletins regarding the network operation, including annual loading estimates, will be developed after each full year of data collection. The Nutrient Monitoring Council will finalize major interpretive and analytical reports by March of 2018 and 2021.

During its December 2016 meeting, NMC recommended an additional super gage be installed in waters of the Illinois River in Joliet at the Route 53 Ruby Street Bridge. This super gage would capture nitrate-nitrogen and total phosphorus loads coming from the concentrated urban environment in northeastern Illinois. Annual loading estimates would be calculated

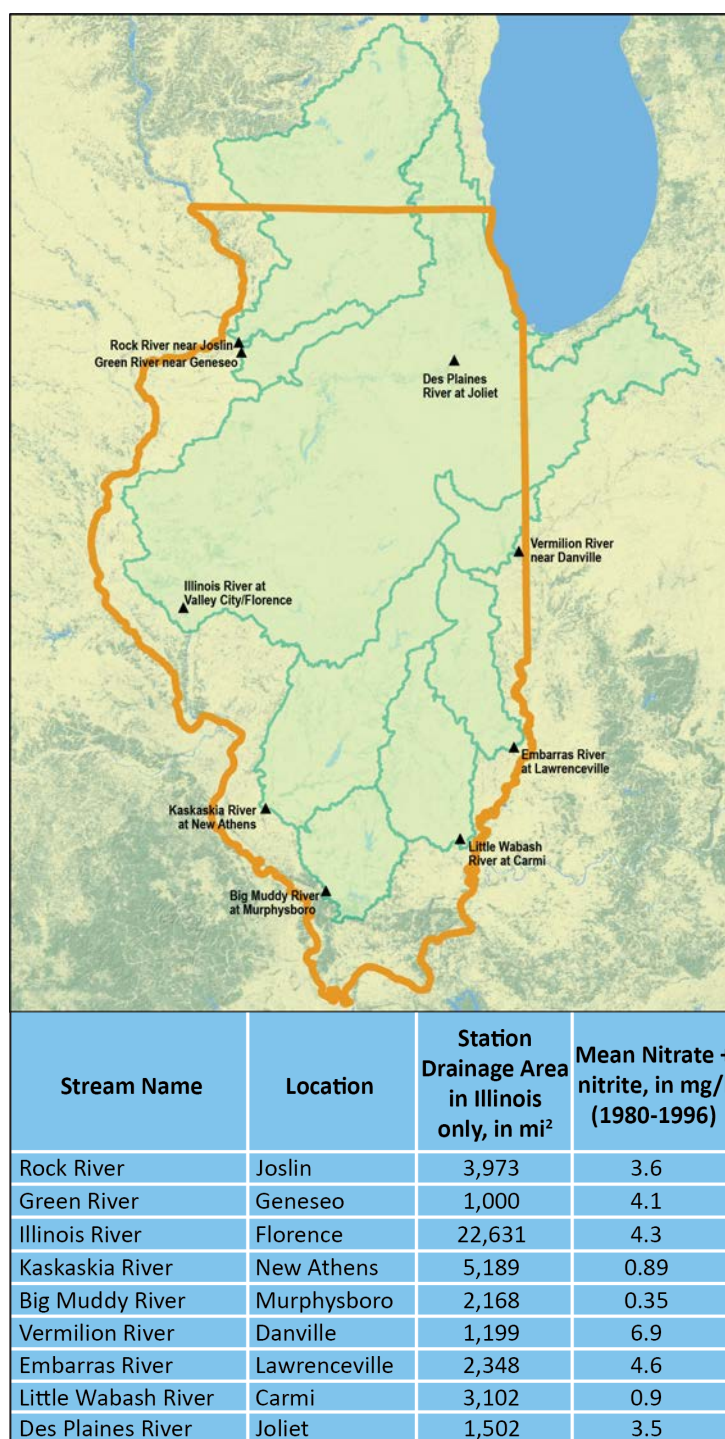


Figure 7.1. Nine-Station network of USGS super gages funded by Illinois EPA and corresponding data

at this station, which encompasses the Chicago River and Des Plaines River watersheds, to track the impacts of Illinois NLRs implementation regarding point source controls, stormwater management, and other activities. The Metropolitan Water Reclamation District of Greater Chicago has committed to funding this super gage for four years.

To document the impact of Illinois NLRs implementation on local water quality in selected priority watersheds, NMC began the process of identifying nutrient monitoring efforts that have or are taking place throughout Illinois and, more specifically, in Illinois NLRs-priority watersheds (e.g., by whom, what parameters, where, when, and why). See Appendix D for maps that depict monitoring efforts.

The council identified watersheds where significant nutrient monitoring and BMP implementation are occurring or are expected to take place (Figure 7.2). These watersheds are candidates for the development of Priority Watershed Nutrient Monitoring Plans. The plans would serve as monitoring road maps and would include operation, maintenance, and, if necessary, new installations. The goal is to document local water quality outcomes through data collection, processing, and analysis.

NMC began developing a template to identify available water resource data in any given watershed, including chemical (e.g., nutrients, dissolved oxygen, pH), physical (e.g., streamflow, habitat), and biological (e.g., fish and macroinvertebrate indexes, increase in sensitive species) data. These data, if currently available or ultimately collected, would be useful for establishing baseline and future conditions so that local water quality outcomes can be quantified.

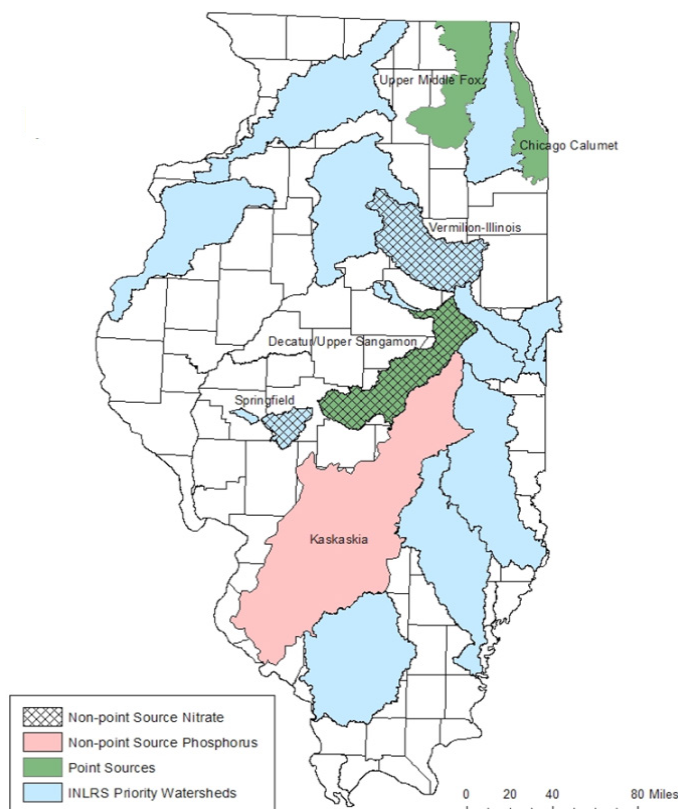


Figure 7.2. Candidate watersheds for nutrient monitoring plan development

Future Strategic Actions

NMC will continue efforts described above through the next reporting period. If additional funds become available to the council, NMC will work to prioritize monitoring efforts implemented through this funding.



Chapter 8

Nutrient Science Advisory Committee

The Nutrient Science Advisory Committee (NSAC) was established to recommend numeric nutrient standards for Illinois streams and rivers to the Illinois Environmental Protection Agency (Illinois EPA). For the nutrient numeric standard recommendation to become a standard, Illinois EPA must file a proposed standard(s) to the Illinois Pollution Control Board to be enacted and approved by the U.S. EPA.

The Nutrient Science Advisory Committee members were selected through an evaluative process conducted by an Illinois Nutrient Loss Reduction Strategy (Illinois NLRs) Policy Working Group subcommittee. Seven science experts comprise the committee, representing agencies and universities, including Indiana University, Loyola University Chicago, Southern Illinois University, U.S. EPA, U.S. Geological Survey, and University of Illinois.

Goals and Accomplishments

In 2015, NSAC officially convened in Champaign, Illinois. At this gathering, NSAC and Illinois EPA focused on the process of developing nutrient standards. The group established a timeline of 18–24 months to complete this work, and NSAC expects to accomplish this by early 2018.

The Nutrient Science Advisory Committee is taking an empirical, data-driven approach to identifying numeric standards. To that end, the group developed a work plan based largely on the principles of environmental risk assessment. The plan will be modified as needed.

The Nutrient Science Advisory Committee activities have mainly been focused on identifying and compiling relevant data. NSAC relies heavily on Illinois EPA data from 2006–2015. The committee is working closely with Illinois EPA to determine the strengths and weaknesses of specific data sets for developing numeric nutrient standards. NSAC also solicited details about data sets from other agencies and non-governmental organizations and hosted a webinar to discuss the data sets.

Illinois EPA data sets were found to be the most consistent, both temporally and spatially, as well as the most comprehensive in representing conditions throughout Illinois. However, in the course of NSAC discussions, it became evident that more data analyses would be necessary. U.S. EPA has provided funds to engage Tetra Tech, a private contractor, to perform an updated analysis of Illinois EPA data to support NSAC efforts to develop the numeric nutrient criteria.

NSAC operates independently of other Illinois NLRS groups, but has provided updates and documents to the Policy Working Group as warranted and continues to do so.

Future Strategic Actions

As discussed, NSAC expects to complete a recommendation to Illinois EPA regarding nutrient water quality standards. Provided the committee finds that the analyses reveal relationships between nutrients and aquatic life, the recommendation will include water quality standards for phosphorus and nitrogen for Illinois rivers and streams. The recommendation will be accompanied by a report that will include proposed next steps for the committee. Being independent of the Policy Working Group, NSAC will look to Illinois EPA for direction on future actions.





Appendices

Appendices are found online at the Illinois EPA website.

www.epa.illinois.gov/topics/nlrs