



ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY

Biennial Report

2019





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**The data in this report covers calendar years
2017-2018. Report released November 2019.**

This report was prepared using United States Environmental Protection Agency funds under Section 319 of the Clean Water Act distributed through the Illinois Environmental Protection Agency. The findings and recommendations contained herein are not necessarily those of the funding agencies.



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Special Thanks

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And to our stakeholder partners who
contributed content and photos.

Cover Photo: Layne Knoche



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CHAPTER 1 EXECUTIVE SUMMARY

The Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy), released in July 2015, was followed by the first biennial report released in August 2017. Since that time, strategy partners in the Policy Working Group and several other working groups—guided by the Illinois Environmental Protection Agency (EPA), Illinois Department of Agriculture, and University of Illinois—have continued to provide considerable support and focus to advance nutrient loss reduction. This Illinois NLRS Biennial Report 2017–18 provides a summary of these efforts.

The overall objective of the strategy is to improve water quality, not only in Illinois, but downstream, to reduce the hypoxic zone in the Gulf of Mexico. The strategy sets a long-term goal of reducing loads from Illinois for total phosphorus and total nitrogen by 45%, with interim reduction goals of 15% nitrate-nitrogen and 25% total phosphorus by 2025.

As identified in the strategy, three sectors (agriculture, point source, and urban stormwater, respectively) are sources of nutrient loss in Illinois. For each of these sectors, measures of implementation help provide a full scope of efforts and accomplishments in the state to achieve strategy goals.

Further, Illinois has a robust water-quality monitoring network that provides data to calculate nutrient loads both within and leaving its borders. This knowledge is essential to assess progress in meeting the goals of the strategy and to identify any necessary adjustments.



*The overall objective of the strategy is to **improve water quality**, not only in Illinois, but downstream, to reduce the hypoxic zone in the Gulf of Mexico*

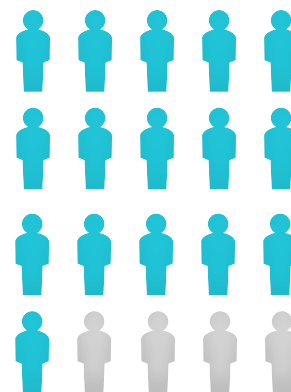


Agriculture

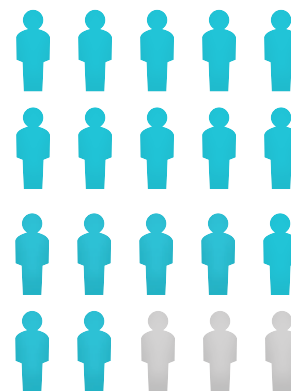
The agricultural sector report is based on the premise that resources that fund and support outreach efforts lead to implementation on the land, which results in water quality improvements.

The agricultural sector partners reported that in 2017 \$25,291,318.50 was invested in nutrient-loss-reduction efforts and in 2018 \$33,941,940.67 was invested. Agricultural organizations sponsored hundreds of events for farmers, agricultural retailers, and the public about practices that can reduce nutrient loads in Illinois waters. In 2017-18, they had nearly 84,500 attendees at these events. In addition to face-to-face interactions, agricultural organizations sponsored multi-media campaigns to provide information about the strategy and its implementation. Illinois NLRS was featured in newsletters, factsheets, newspaper articles, and on radio programs. The Illinois NLRS survey conducted by the U.S. Department of Agriculture National Agricultural Statistics Service (NASS) showed that most farmers have at least some knowledge about best management practices listed in the strategy. Approximately 80% said that they were knowledgeable about nutrient management or constructed wetlands and 85% knew about cover crops.

As for what is happening on the land, the survey results in Table 1.1 and Figure 1.1 show that on



Approximately **80%**
of respondents said that they
were knowledgeable about
**nutrient management or
constructed wetlands**



Approximately **85%**
of respondents said that they
were knowledgeable about
cover crops



one-third of their 2017 corn acres, producers used the Maximum Return to Nitrogen (MRTN) strategy to help determine the amount of nitrogen to apply. In addition, producers used other industry-recommended techniques on 69% of their corn acres. In 2017, many producers considered two or more strategies before applying nitrogen to some corn acres, therefore, the sum of percentages in Table 1.1 is greater than 100.

Table 1.1. Acres with a nitrogen management strategy

	Acres in 2011	Acres in 2015	Acres in 2017
Acres of corn planted	12,600,000	11,700,000	11,200,000
Acres where an MRTN strategy was used to determine application rates	8,820,000 or 70% of planted acres	9,430,000 or 81% of planted acres	3,730,000 or 33% of planted acres
Other industry-approved technique acres	Not asked	Not asked	7,750,000 or 69% of planted acres

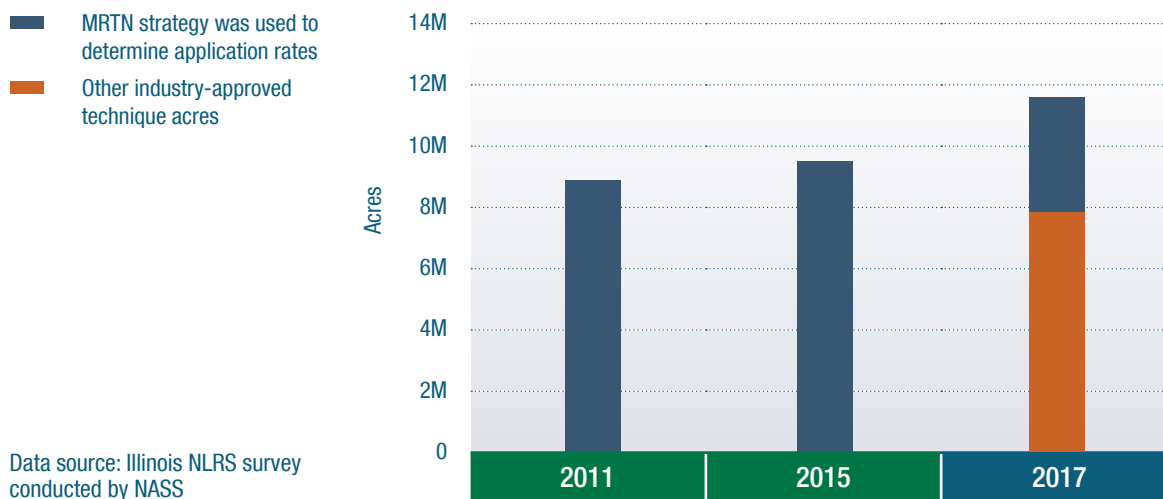


Figure 1.1. Acres with a nitrogen management strategy

It appears that agricultural stakeholder interest and activities have remained high despite limited public resources that have been available to support new initiatives. Stakeholders have continued to successfully, and effectively, redirect and re-target their existing programs and resources to NLRS actions.



Point Source

One of the strategy's interim goals is a 25% reduction in phosphorus discharges by 2025. Annual statewide total phosphorus loads from point sources have been reduced by 4.3 million pounds, when comparing 2018 discharges with 2011 baseline year levels. This represents a 24% reduction in phosphorus from point sources.

As the strategy was developed, the expectation was that, due to ongoing work at several significant wastewater treatment facilities across the state, reductions were imminent. This proved to be true. By the end of 2018, as construction projects were completed, in particular at the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), Sangamon County Water Reclamation District (serving the greater Springfield area), and Greater Peoria Sanitary District, as well as other facilities across Illinois, the point source sector achieved 96% of its interim reduction goal.



*Annual statewide total phosphorus loads from point sources have been **reduced by***

24%

Urban Stormwater

Tracking the urban stormwater sector's strategy implementation activities is now getting underway as part of the state's reporting efforts. One vital measure of success for this sector is outreach—for example, in 2018, 6,000 people were reached at face-to-face

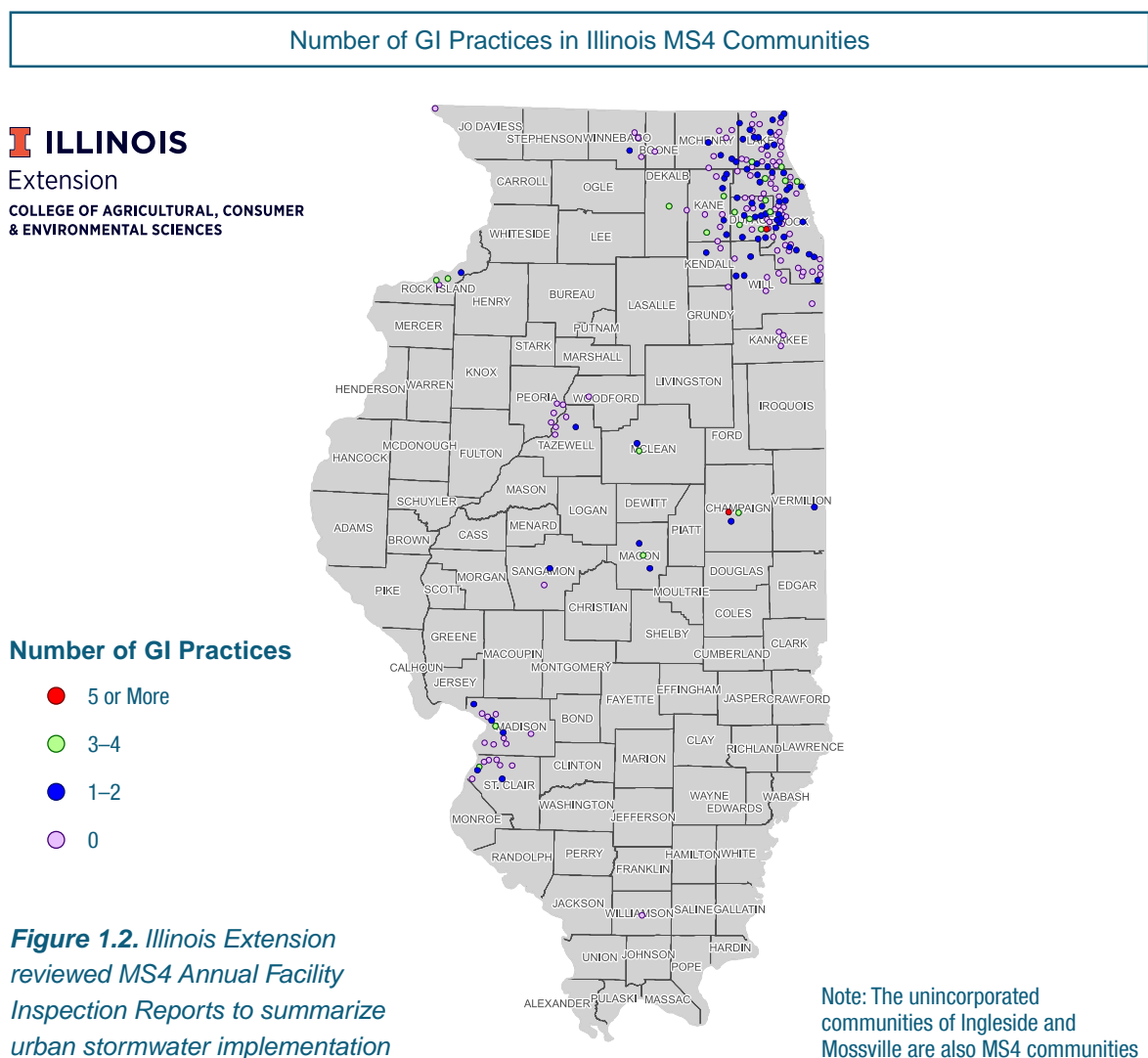


6,000 people
*were reached at **stormwater outreach events** in 2018*



events primarily held in DuPage County. The MWRDGC collaborative project called Space to Grow transforms Chicago schoolyards into vibrant green spaces and provides another way to assess progress in this sector. Collectively, the project's four pilot sites have a design retention capacity of 731,004 gallons per rain event. Plans are in the works to expand the program to 30 more schools.

Illinois Extension conducted a review of 287 Annual Facility Inspection Reports from Municipal Separate Storm Sewer Systems (MS4s) to summarize urban stormwater implementation. Results show that dry weather screening and street sweeping programs were the most often used physical practices. Green Infrastructure (GI) practices were also listed by many communities. Figure 1.2 depicts the distribution of communities and number of GI practices and funding programs reported by them.





Science Assessment Update

The Illinois NLRS Science Assessment Update reports on estimated and quantified changes in riverine nitrate-nitrogen and total phosphorus loads and yields in Illinois. Data sources included river-flow data from the U.S. Geological Survey (USGS) and concentration data from Illinois EPA, USGS, MWRDGC, Fox River Study Group, and University of Illinois, to calculate nitrate-nitrogen and total phosphorus loads for the eight major rivers draining Illinois through the 2017 water year and to estimate aggregated statewide annual losses. Calculations were also done at the eight-digit Hydrologic Unit Code (HUC8) watershed scale.

For the five-year period of 2013–17, the statewide water flow, nitrate-nitrogen loads, and total phosphorus loads were estimated to be 13%, 7%, and 26%, respectively, above the 1980–96 baseline period (Figure 1.3). Much of the increase in the nitrate load occurred in the Rock River, while much of the increase in total phosphorus load occurred in the Illinois River.

Illinois EPA provided point source discharges of total nitrogen and total phosphorus for 2017. Statewide, point source total nitrogen discharge was about 75 million lb/yr, or about 14%, less than the 2011 estimate.

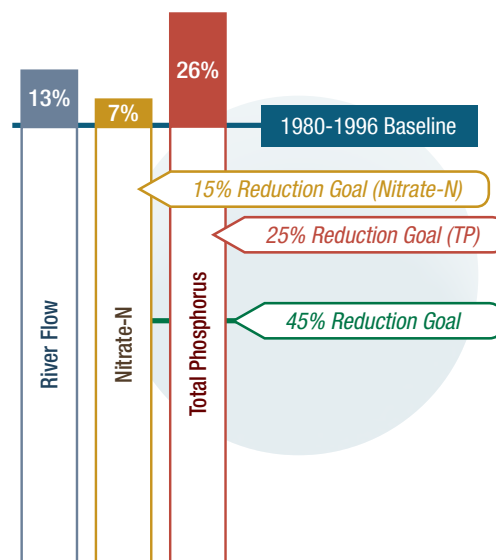
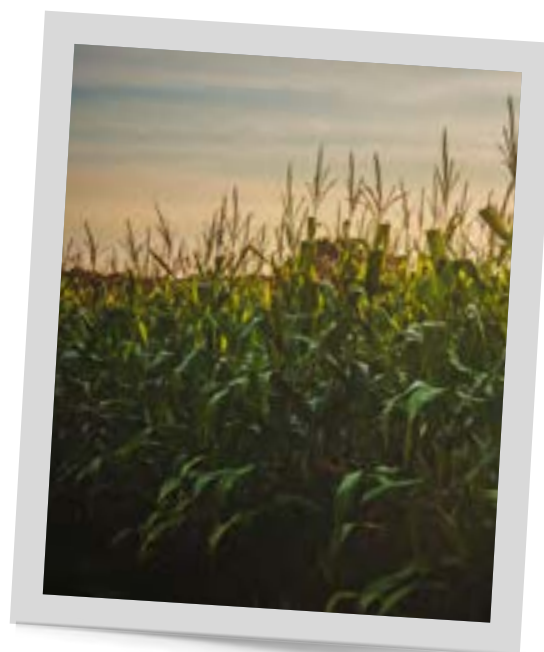


Figure 1.3. Percent increase from baseline to average 2013–2017





Point source total phosphorus discharge for 2017 was estimated to be 14 million lb/yr, or about 22%, less than the 2011 estimate of 18.1 million lb/yr.

Nitrate and total phosphorus yields were also estimated for the HUC8 watersheds:

- In general, 2012–17 nitrate-nitrogen yields were similar to values calculated for 1997–2011.
- For watersheds with nitrate-nitrogen yield greater than 11 lb N/ac-yr, changes in nitrate yield were correlated with change in water yield.
- For three watersheds in northwest Illinois (Mackinaw River, Spoon River, and Flint-Henderson) some reduction in nitrate-nitrogen yield appears to be independent of water yield changes.
- Changes in estimation methods used for the Lower Illinois River and Lower Sangamon River resulted in lower estimates of nitrate-nitrogen loads for these watersheds.
- Reductions in total phosphorus yield in Chicago and Des Plaines River watersheds between 15% and 27% corresponded to reductions in point source discharges in those watersheds.
- Conversely, increases in total phosphorus yield were calculated for the Upper Sangamon River, Macoupin Creek, and several other watersheds.

Adaptive Management

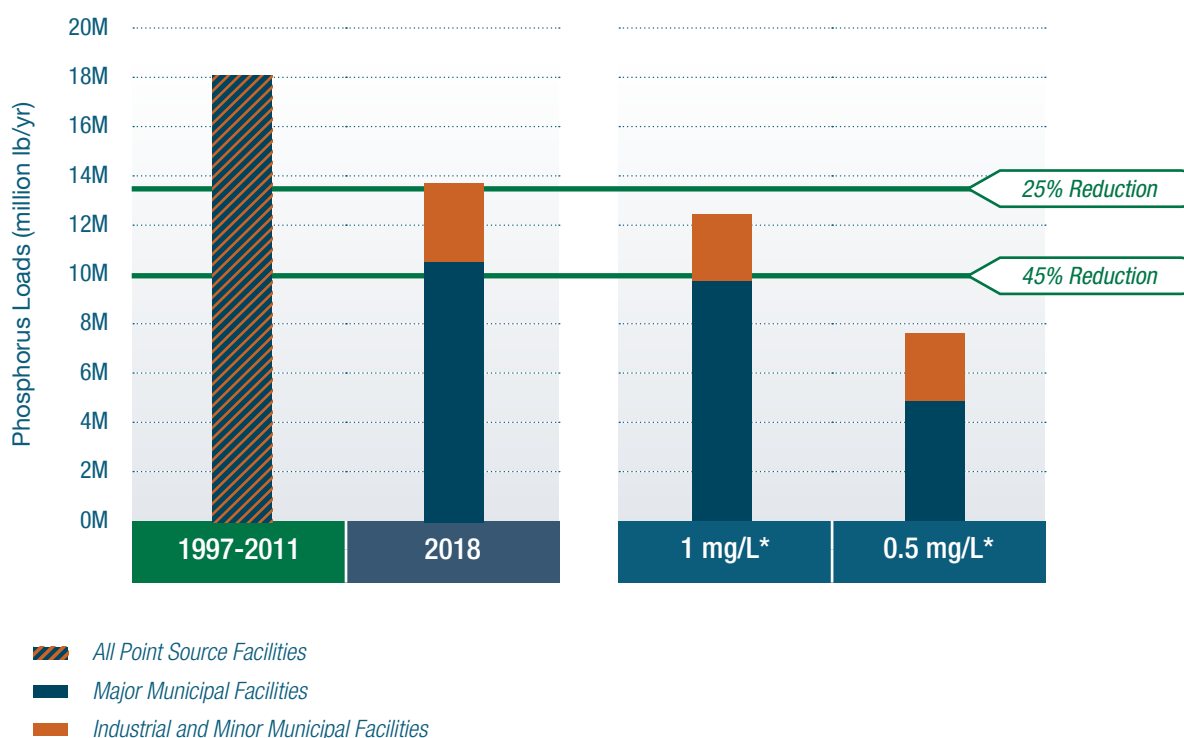
Adaptive management involves learning and adapting to new research, monitoring, and policy information as it affects the decision-making process. Including adaptive management as an integral component to the overall strategy helps ensure that Illinois NLRS is a living document, remaining relevant to all stakeholders over time and focused on traditional and new activities that can enhance both in-state and Gulf of Mexico water quality. Determining sector implementation status, as compared to nutrient reduction goals discussed in the strategy, can be a first step in adaptive management.





Figure 1.4 shows the 1997-2011 updated baseline load of 18.1 million lb/yr from all point sources. The 2018 annual total phosphorus load from 213 major municipal point source facilities was approximately 11 million lb/yr and from industrial and minor municipal point sources was 2.7 million lb/yr. Currently, 65 major municipal facilities are required to meet a 1 mg/L total phosphorus concentration limit in their respective permits. In the next few years, eight more major municipal facilities are on schedule to meet a 1 mg/L total phosphorus concentration. The graph shows an estimate of future annual total phosphorus loads from the point source sector if all major municipal facilities meet 1 mg/L and 0.5 mg/L total phosphorus concentrations, respectively. It assumes that the industrial and minor municipal point source level remains steady.

The estimated reductions are conservative because the calculations assume that facilities are discharging at their design average flows while, in reality, many facilities discharge less than that.



* Includes all point source facilities not differentiated by type or size

Figure 1.4. Total phosphorus (point source load), estimated future total phosphorus (point source load)



Photo courtesy of University of Illinois, College of ACES



CHAPTER 2 INTRODUCTION

Background

Excess nutrient loss from agricultural runoff, point source effluent, and urban stormwater can cause downstream water quality issues. Illinois is a significant contributor of nitrate-nitrogen and total phosphorus that reach the Gulf of Mexico. When these nutrients reach the Gulf, they can fuel algal growth, creating a large bloom that depletes oxygen when it decomposes. In Illinois, algae can also be a concern in local lakes and streams.

The Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy), released in July of 2015, is a framework for using science, technology, and industry experience to assess and reduce nutrient loss in Illinois waters as well as the Gulf of Mexico. Strategy development was a response to the Gulf Hypoxia Action Plan 2008, created by the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, and guided by the U.S. Environmental Protection Agency (EPA) memorandum: Recommended Elements of a State Nutrients Framework. The strategy's primary goals are ① reduce nutrient loads leaving the state by way of the Mississippi River, and ② improve local water quality for the benefit of Illinois residents. The ultimate goal is to achieve 45% loss reductions in both nitrate-nitrogen and total phosphorus with the interim loss reduction goals of 15% nitrate-nitrogen and 25% total phosphorus by 2025.

The strategy calls for biennial reports that compile “the implementation of the strategic actions for the previous 24 months” to be developed

Photo courtesy of Illinois Farm Bureau

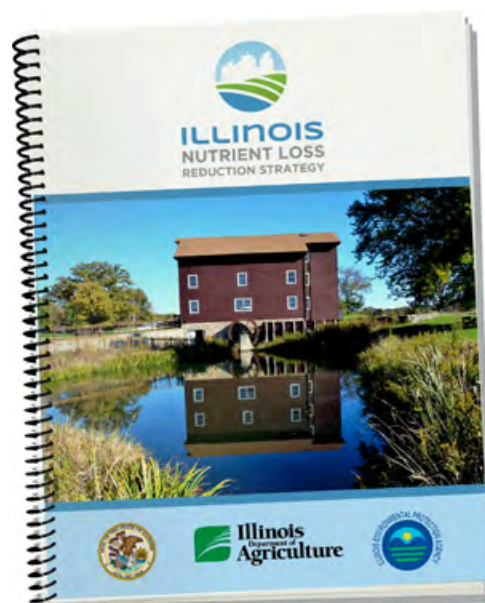


*The Illinois Nutrient Loss Reduction Strategy is a framework for using **science, technology, and industry** experience to assess and reduce nutrient loss*



every other year. These reports are intended to provide an overview of efforts and progress to reduce nutrient loss in Illinois. The first biennial report was released in August of 2017. It features data from the 2011 baseline year and reports on 2015–16 implementation activities. The report, and other nutrient related documents, are housed on the Illinois EPA website (go.illinois.edu/nlrs).

This report—the second biennial report—covers implementation for 2017–18. It builds on the first report by incorporating additional implementation data. The report also features a science assessment (Chapter 3) that updates nutrient loads and yields by watershed and compares them to those in the strategy.



The Partnership Approach and Work Group Structure

Illinois NLRS was developed by Illinois EPA, the Illinois Department of Agriculture, the University of Illinois, and a multi-stakeholder Policy Working Group (PWG) of partners such as federal and state agencies, agricultural organizations, wastewater treatment agencies, non-governmental organizations, and industries. One of many strengths of the nutrient loss reduction effort in Illinois is the willingness of partners to leverage existing programs as well as to create new ones to achieve strategy goals.

The PWG partnership approach informed the creation of additional work groups called for in Illinois NLRS to address implementation and monitor progress toward strategy goals. These work groups include the Agriculture Water Quality Partnership Forum (AWQPF), Urban Stormwater Working Group (USWG), Nutrient Monitoring Council, Nutrient Science Advisory Committee, Performance Benchmark Committee, and a Communications Work Group. Both AWQPF and USWG have subgroups that address data tracking. The Urban Stormwater Working Group has an education subgroup.

University of Illinois Extension facilitates and coordinates meetings, conferences, and report writing for Illinois NLRS under an agreement with Illinois EPA. Chapter 7 provides a synopsis of the working group activities in 2017–18.



Logic Model

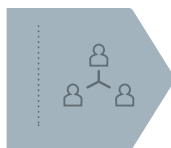
The first biennial report introduced and explained a logic model—measurable indicators of desirable change—that was adapted from the Iowa Nutrient Reduction Strategy to gauge implementation progress. As Figure 2.1 shows, the measures include Resources, Outreach, Land & Facilities, and Water. These measures are defined as follows:



Figure 2.1. The NLRS Logic Model



RESOURCES: The logic model starts with the category of Resources. Resource measures refer to financial investment. These include funding, grants, and the staff who administer them.



OUTREACH: Outreach leads to shifts in people’s knowledge, attitudes, behavior, and investment. The Outreach measures include field days, presentations, conferences, meetings, print or media, radio or television, social media, newsletters, awards, and surveys.



LAND AND FACILITIES: The Land and Facilities measures are adoption of best management practices (BMPs) such as agricultural conservation BMPs, upgrades to wastewater treatment facilities, and stormwater management BMPs. These physical changes on the land can affect change in water quality.



WATER: The final measure of change is Water. Water category measures, which reflect nutrient loads, are presented in the Science Assessment Update chapter.





Data for the first two measures of this reporting tool—Resources and Outreach—are obtained primarily through voluntary reporting by strategy partners. The spreadsheet responses are in the Appendix. Data for the third measure, Land & Facilities, is compiled from the most appropriate and best available data sources for each respective sector. Finally, as mentioned, the Water measure is addressed in this report’s Science Assessment Update.

The measurable indicators provide a standardized protocol for evaluating progress by tracking year-to-year changes and longer trends.

Navigating this report

This biennial report follows the logic model approach to describe actions and accomplishments toward strategy goals, but it begins with the end in mind—Chapter 3, the Science Assessment Update, presents an assessment of water measures.

Chapters 4–6 are focused on three sectors (agriculture, point source, and urban stormwater, respectively) which are sources of nutrient loss in Illinois, as identified in the strategy. In each of these chapters, the first three logic model measures—Resources, Outreach, and Land & Facilities—are addressed for each sector. Partner programs are also featured in the sector chapters, which highlight considerable work toward strategy goals.

New to this report are chapters 7 and 8. Chapter 7 highlights summaries of work group activities. Chapter 8, titled Adaptive Management, is focused on the fact that the strategy is a living document and allows for new and revised approaches to be considered as a result of implementation, monitoring, and public feedback. This chapter discusses the state’s trajectory toward meeting strategy goals.

Photo courtesy of Gregory F. Mclsaac

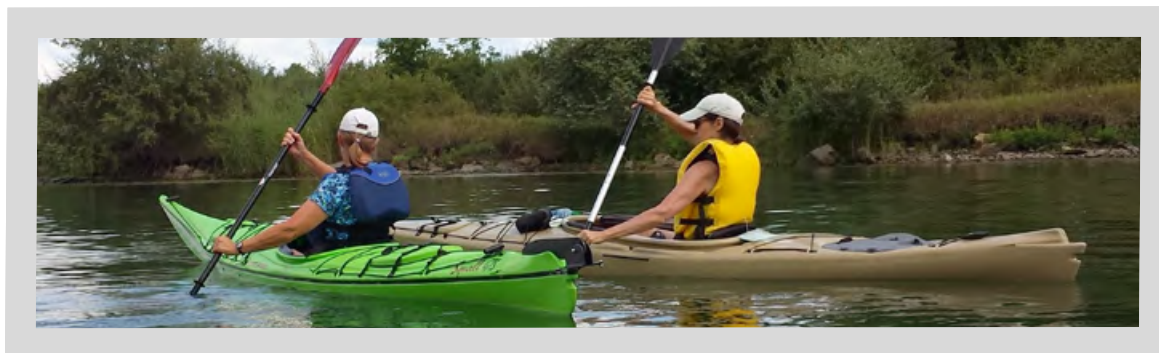




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CHAPTER 3

SCIENCE ASSESSMENT UPDATE

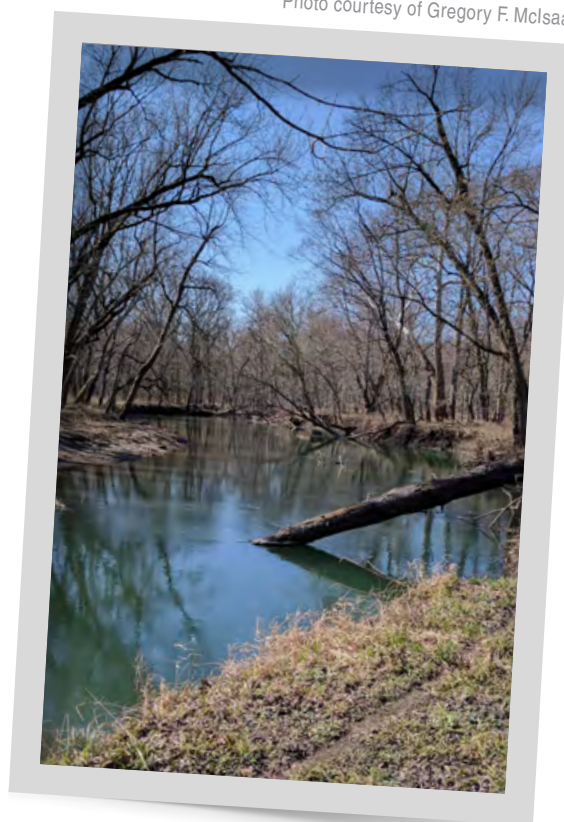
By Gregory F. Mclsaac

Introduction

In 2015, the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) provided estimates of nitrate-nitrogen (N) and total phosphorus (TP) loads in the rivers draining the state from 1980 to 2011 and set a long-term goal of reducing those losses by 45% relative to loads that occurred during the baseline period of 1980–96. Interim goals of 25% reduction in TP losses and 15% reduction in nitrate-N losses by 2025 were also adopted. Variation in nutrient losses across the state was quantified with estimates of 2011 point source loads and 1997–2011 annual average non-point source and total nitrate-N and TP losses for 50 eight-digit Hydrological Unit Codes (HUC8) watersheds that cover most of the state. Priority areas for conservation were identified, in part based on nutrient load estimates for HUC8s.

Illinois NLRS also called for biennial progress reports toward meeting the goals. The 2017 biennial report updated nutrient load estimates through the 2015 water year for the state as a whole, but not for HUC8s. This provides a summary of updates to nutrient load estimates through the 2017 water year for the state as a whole and for HUC8s. The full 68-page report titled "Nitrate and Total Phosphorus Loads in Illinois River: Update Through the 2017 Water Year" provides greater detail on methods and results and is available on the strategy page of the Illinois EPA website (go.illinois.edu/NLRS). The primary aim of this effort was to quantify riverine nutrient loads in Illinois.

Photo courtesy of Gregory F. Mclsaac





Identifying and quantifying why changes happened or did not happen in loads is largely beyond the scope of this study. At a few locations, changes in riverine nutrient loads appear to be related to changes in water flow and/or changes in point source inputs—these associations are noted. Quantifying the causes of changes in riverine loads is recommended for future studies and will involve more detailed accounting of nutrient sources and sinks than can be provided in this study.

Methods

Riverine nitrate and TP loads are the product of nutrient concentration and river flow and often expressed in terms of pounds of nutrient per day or per year.

EQ.1 *Nutrient Load = Concentration x Flow*

Because larger watersheds drain larger areas, they tend to have greater flows and nutrient loads. Comparing nutrient loads across different sized watersheds is problematic because drainage area confounds the comparison. Dividing loads by drainage areas removes the influence of drainage area, and this is referred to as nutrient yield, which is an indicator of the spatial intensity of nutrient losses. Areas with higher nutrient yields typically have higher nutrient concentrations, and these can be compared across watersheds of different sizes. Nitrate and TP yields from watersheds are often expressed as pounds per acre per year, which is the riverine loads divided by the contributing watershed area.

EQ.2 *Nutrient Yield = $\frac{\text{Nutrient Load}}{\text{Drainage Area}}$*

Load and yield estimates for this report were based on daily stream-flow data from USGS with nitrate and TP concentration data from multiple sources. Most of the concentration data came from the Illinois EPA Ambient Water Quality Monitoring Network, with additional data at a few locations from the U.S. Geological Survey, Fox River Study Group, Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), and the University of Illinois, specifically, Lowell Gentry.





Results

Statewide Water, Nitrate-N, and TP Loads

The statewide load values were derived from monitoring data collected on eight major rivers draining the state (Figure 3.1). Rock River nutrient loads draining from Wisconsin were subtracted from the total by using data collected at Rockton, Illinois. Illinois River nutrient load estimates from Wisconsin and Indiana were also deducted from the load estimated at Valley City, based on 15% of the watershed area that originates in those states. Similarly, Vermilion River nutrient loads at Danville were reduced by 7%, the portion of the HUC8 that is in Indiana. Nutrient losses per acre outside of these eight rivers, but within Illinois, were assumed to equal the average value loss per acre derived from the eight rivers, excluding contributions from neighboring states.

The estimated statewide average annual nitrate-N load in Illinois rivers during 2013–17 was 425 million pounds nitrate-N per year, which was approximately 7% greater than the 1980–96 baseline average of 397 million lb N/yr. The estimated statewide average TP load during 2013–17 was 43 million lb P/yr, a 26% increase over the baseline load of 34 million lb P/yr.

Nutrient loads tend to be correlated with water flow, which is highly variable over time, largely due to fluctuation in annual precipitation. The estimated statewide average water flow during 2013–17 was about 13% greater than 1980–96, and this likely facilitated the increase in nutrient loads. Additionally, 2012 was an extreme drought year that reduced corn yields, leaving greater than average unused nitrogen fertilizer in cropland soils. Higher than average nitrate-N loads in rivers have frequently been observed following drought years.

Since the baseline period, changes in water flow and nutrient loads were not uniform across the state. Average water flow increased in all eight major river basins during 2013–17 relative to 1980–96. The greatest percent of increase (34%) occurred in the Illinois portion of the Rock River Basin. This location also had the greatest absolute increase in nitrate-N load (18 million lb N/yr), which is more than half of the 28 million lb N/yr increase for the state as a whole. Smaller nitrate-N load increases of 4.1, 2.2, and 1.1 million lb N/yr occurred for the Embarras, Little Wabash and Green river systems, respectively. Small reductions in nitrate-N load were calculated for the Big Muddy, Kaskaskia, Illinois, and Vermilion river systems.



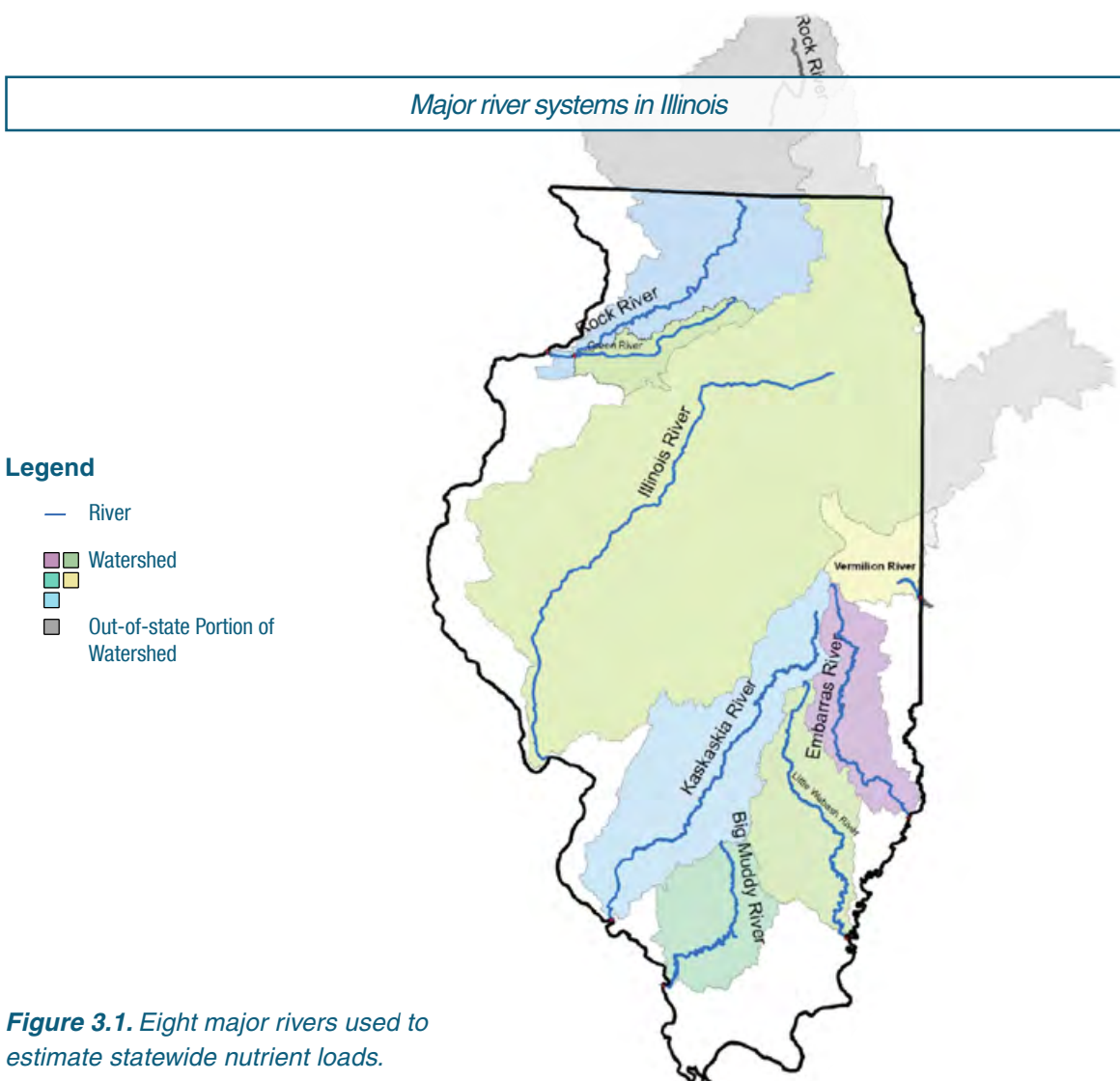


Figure 3.1. Eight major rivers used to estimate statewide nutrient loads.

The greatest increase in TP load (4.12 million lb P /yr) occurred in the Illinois River, followed by the Kaskaskia River (1.64 million lb P/yr). In the Kaskaskia, this is a 68% increase over the average annual load for 1980–96. Increases in other river systems were all less than 1 million lb P/yr, with the exception of the Green River, which had a relatively small reduction in load (0.22 million lb P/yr). However, some of these smaller changes represent large percentage changes for the river system. The 0.22 million lb P/yr reduction in the Green River was 36% lower than in the baseline period and an 0.98 million lb P/yr increase in the Little Wabash was a 51% increase. Causes for these changes deserve further study.

Statewide Point Source Discharges

Estimated total nitrogen (TN) discharge from point sources to rivers in 2017 totaled 75 million lb N/yr



compared to 87.3 million lb N/yr in 2011, a reduction of 14%. (The percent reduction in point source discharge between 2011 and 2017 is not directly comparable to the changes in riverine loads from 1980–96 to 2013–17 discussed above because the changes are evaluated over different time intervals.) The source of the vast majority (93%) of the 2017 TN point source discharge was 213 major publicly-owned treatment works (POTWs) that discharge over one million gallons of treated wastewater per day. Point sources appear to be a relatively small contributor to the 425 million lb nitrate-N/yr statewide loads in rivers.

Estimated TP discharges from point sources in 2017 totaled 14.1 million lb P/yr, which is a 22% reduction from the 18 million lb P/yr estimated in 2011. As with TN, the source of the vast majority (81%) of the 2017 estimated TP point source discharge appears to be major POTWs. Approximately half of the 3.9 million lb P/yr statewide reduction in point source TP discharge was due to 1.9 million lb P/yr reductions across six MWRDGC facilities. Several smaller municipalities reported 2017 TP discharges that were 20–60 thousand lb P/yr lower than 2011 values reported in Illinois NLRS (e.g., Springfield, Champaign-Urbana, and Quincy). Increases in TP discharge on the order of 200 thousand lb P/yr were estimated for the Sanitary District of Decatur and the City of Joliet.

The 14.1 million lb P/yr point source discharge in 2017 represents 33% of the 43 million lb P/yr TP load in the state's rivers in 2013–17. Attributing riverine phosphorus loads to point sources or non-point sources is complicated by phosphorus adsorption to river and lake sediments, which may be retained in a river system for years. Phosphorus measured at a river outlet likely includes considerable amounts of “legacy” phosphorus from both point and non-point sources. Legacy phosphorus deserves further study and may partly explain why riverine TP loads increased, even though point source inputs decreased.

Nitrate-N Yields at River Monitoring Locations and HUC8s

Estimated non-point source nitrate-N loads (Figure 3.2) were calculated by identifying point source discharging facilities upstream of monitoring locations and subtracting 90% of the sum of TN discharges from the nitrate load estimated at monitoring location. Based on point source data from Illinois NLRS, it was assumed that point source TN discharge was 90% nitrate. It was further assumed that the area upstream of the monitoring location was representative of the HUC8 as a whole. The HUC8 load was estimated by multiplying the monitored non-point source load by the ratio of the HUC8 area to the monitored area. For HUC8s with no data or inadequate monitoring data, load estimates were based on yield averages measured in neighboring HUC8s.





Estimated annual average 2012–17 non-point source nitrate-N loads

Non-Point Source Nitrate-N (million lb/yr)

- <5
- 5–9.99
- 10–14.99
- 15–19.99
- 20–24.99
- >25
- No Data (Avg. of nearby HUC8s)

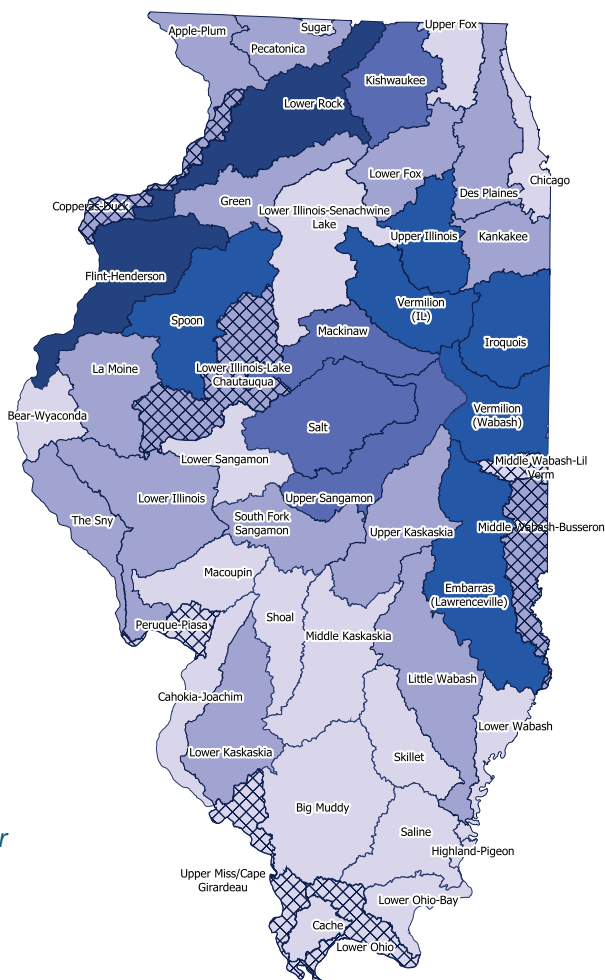


Figure 3.2. Estimated annual average 2012–17 non-point source nitrate-N loads for HUC8s using point source locations relative to monitoring locations.

HUC8 Non-point Source Nitrate-N Yield

In general, the 2012–17 average nitrate-N yields (river load divided by the drainage area) estimated from monitoring station data were greatest in the northeast and east central regions of the state and lowest in the south (Figure 3.3). For larger watersheds with multiple monitoring locations, the incremental yields illustrated in Figure 3.2 are the nitrate yields from drainage areas between monitoring locations. Nutrient yields provide an indication of the spatial intensity of point and non-point source inputs, and will generally be related to concentrations.

High nitrate-N yields in the northeast are mostly a reflection of high point source inputs (Figure 3.4), while central and east-central nitrate yields are largely from tile drained cropland (non-point





sources). Tile drainage moves water rapidly away from the crop root zone to ditches and streams, which allows little time for denitrification, which converts nitrate to gaseous forms of nitrogen. The absence of tile drainage in southern Illinois, and the presence of some large reservoirs and the slow moving Illinois River, allows more residence time for removal of nitrate through denitrification.



Average annual 2012–17 incremental nitrate-N yields

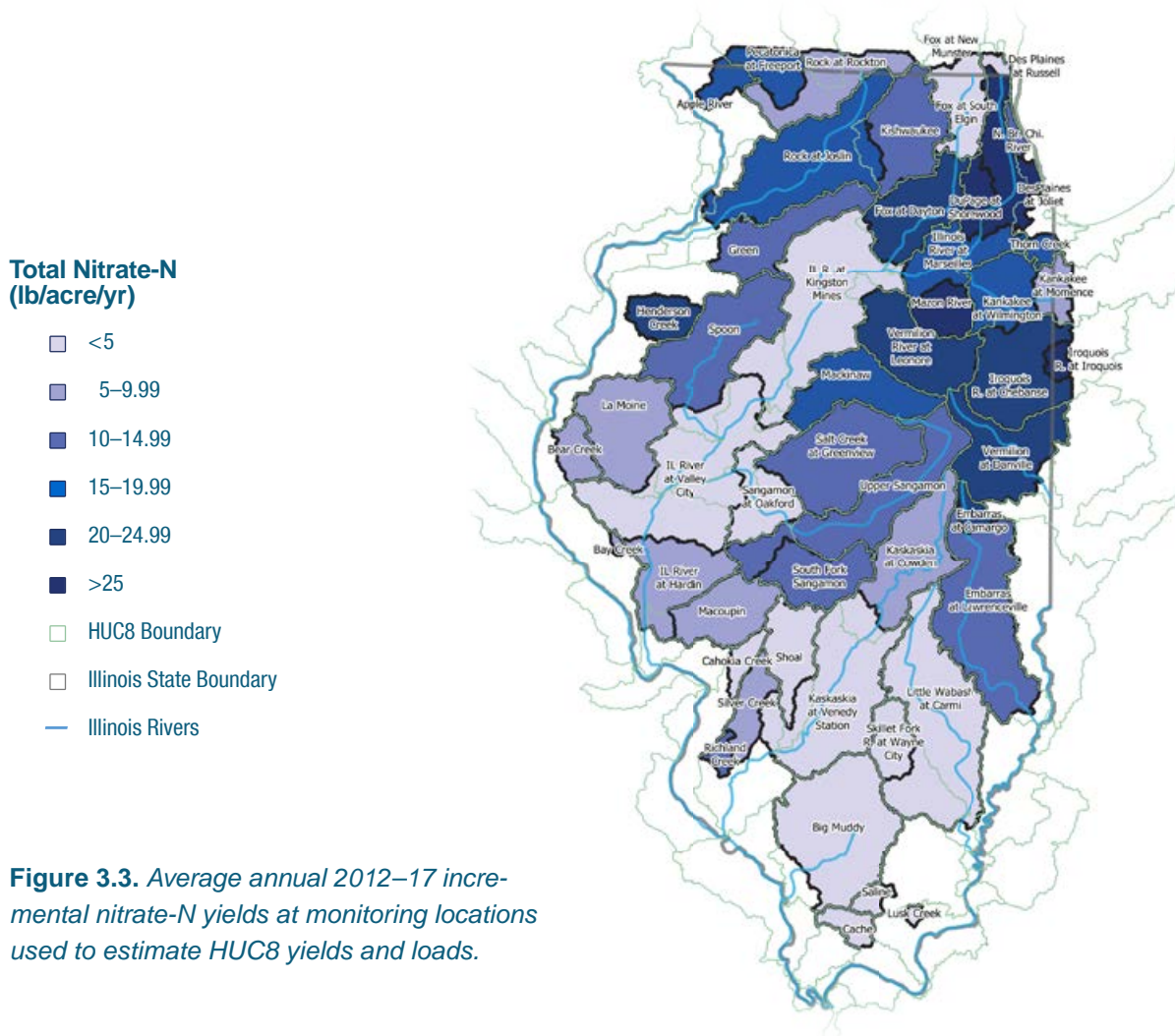


Figure 3.3. Average annual 2012–17 incremental nitrate-N yields at monitoring locations used to estimate HUC8 yields and loads.

For most HUC8s, average nitrate-N yield from 1997–2011 to 2012–17 changed relatively little. For HUC8s with nitrate-N yields greater than 11 lb N/ac-yr, change in nitrate-N yield and change in water yield were positively correlated. However, nitrate yield reductions that deviated from this pattern (the Mackinaw, Spoon, and Flint Henderson HUC8s) deserve further study.



2017 point source TN loads by HUC8

Point Source Total-N (million lb/yr)

- <5
- 5–10
- 10–15
- 15–20
- 20–25
- >25



Figure 3.4. Estimated 2017 point source TN loads by HUC8, based on 2017 discharge data (except for some minor facilities for which 2017 data was not available, but 2011 data from Illinois NLRS was available to estimate 2017 loads).

The greatest non-point nitrate-N loads were from the Lower Rock and Flint Henderson HUC8s in northwestern Illinois. This is partly because these HUC8s are larger (greater than 1,771 square miles) than HUC8s in east central Illinois with equally high or higher nitrate-N yields, for example, the Vermilion River (in Illinois) HUC8, which is 1,330 square miles. Similarly, the Embarras HUC8 has a moderately high load, in part, because it is the largest HUC8 (2,436 square miles). Much of the nitrate-N load in the Embarras River comes from the tile drained northern portion above Camargo.

Non-point source nitrate-N load estimates for the Upper Fox, Lower Illinois Senachwine Lake, and Middle Kaskaskia HUC8s were less than zero, possibly due to the presence of lakes and wetlands, which provide opportunities for nitrate removal through denitrification. This result may also be due to



estimation uncertainties at monitoring locations and for point source inputs.

TP Yields at River Monitoring Locations and HUC8s

Estimated TP yields for 2012–17 at monitoring locations (Figure 3.5) were greatest in HUC8s with large point source inputs (e.g., Des Plaines, Chicago, Upper Sangamon, see Figure 3.6), and in southern Illinois (e.g., Macoupin and Skillet) where rainfall, surface runoff, and land slopes are greater than other regions in the state.

For most HUC8s, the average estimated TP yields during the 2012–17 period were similar to 1997–2011 yields, except for the Des Plaines, Chicago, and Lower Sangamon HUC8s, where reductions were relatively large. Conversely, relatively large increases in yields were estimated for Sny, Skillet, Upper Sangamon, Macoupin, Cahokia-Joachim, and Perouque-Piasa.

The large reductions in riverine TP load from the Chicago and Des Plaines HUC8s and the increase in TP load from the Upper Sangamon HUC8 were associated with changes in point source TP discharges. The reduction in TP yield from the Lower Sangamon HUC8 may be partly due to a reduction in point source inputs and reduced water yield. The TP load coming from the Upper Sangamon increased with little or no change in the TP load downstream at Oakford. From this, it appears that much of the increased TP load from the Upper Sangamon is deposited in the Lower Sangamon. It is not known why this may be occurring, but it is probably facilitated by reduced water yield. This stored TP may become mobilized and transported downstream at some time in the future. The increased TP yields for the Macoupin, Skillet, and Cahokia-Joachim HUC8s were associated with increased water yields.

Photo courtesy of Gregory F.





2012–17 estimated incremental TP yield

Total P (lb/acre/yr)

- <0.5
- 0.5–0.99
- 1.0–4.49
- 1.5–1.99
- >2.0
- HUC8 Boundary
- Illinois State Boundary
- Illinois Rivers

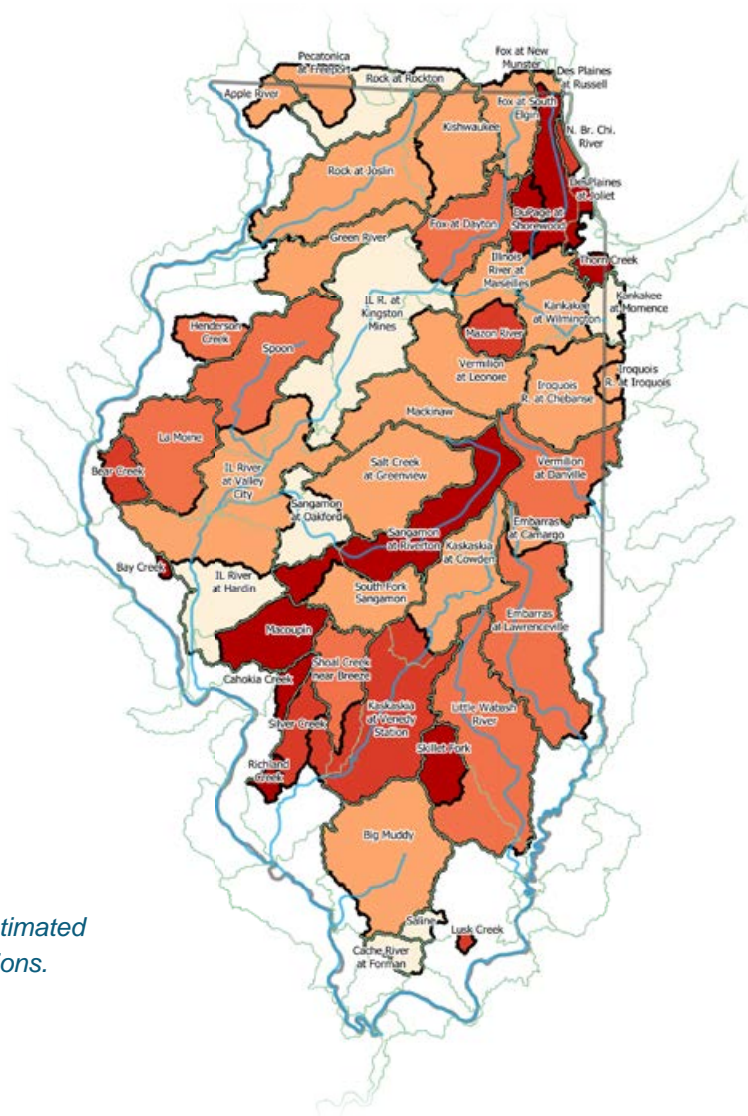


Figure 3.5. Annual average 2012–17 estimated incremental TP yield at monitoring locations.

HUC8 Point Source TP Loads

Estimated point source TP loads were greatest in northeastern Illinois (Chicago and Des Plaines HUC8s), despite the 1.9 million lb P/yr reduction in discharge from MWRDGC facilities (Figure 3.7). TP loads from point sources were considerably less than 0.7 million lb P/yr, except in the Upper Sangamon, where the Sanitary District of Decatur is a major discharger. Decatur has a population of only about 90,000, but much of the wastewater treated by and discharged from the sanitary district comes from large grain processing facilities. This waste stream has increased since the early 2000s and is a source of increased TP load in the Upper Sangamon River.



Point source TP loads by HUC8

Point Source TP (million lb/acre)

- <0
- 0–1
- 1–2
- 2–3
- >3

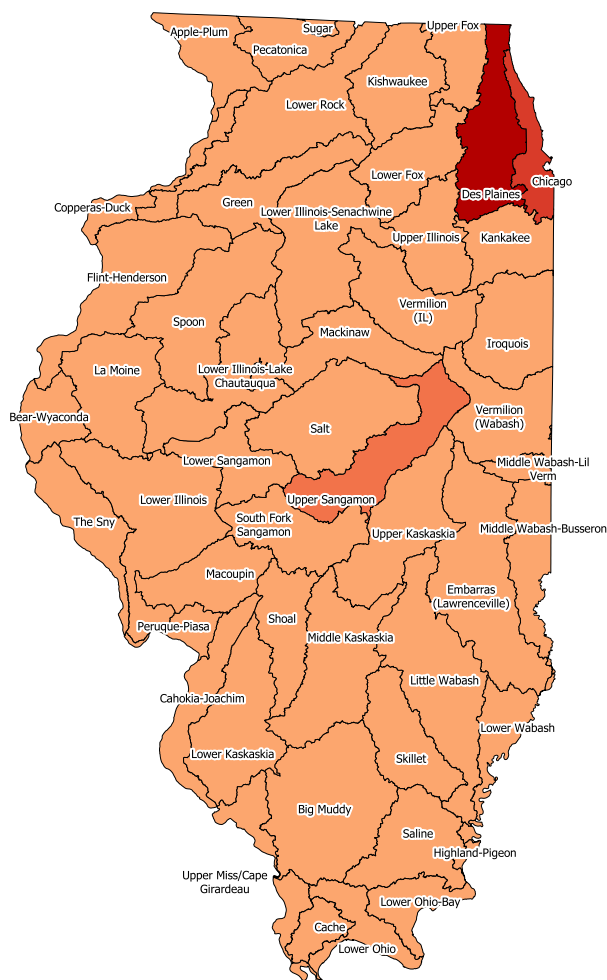


Figure 3.6. Point source TP loads by HUC8, based on 2017 discharge data (except for some minor facilities for which 2017 data was not available, so 2011 data from Illinois NLRS was used).

HUC8 Non-Point Source TP Load Estimates

The greatest estimated non-point source TP loads for 2012–17 were from the Des Plaines and Sny in southwestern Illinois (Figure 3.7), although there is some uncertainty about both estimates. Sny estimates are based on the monitoring of a drainage area that covers only 4% of the HUC8 for water flow and 16% for water quality, and thus may not represent the HUC8 as a whole. The high non-point source phosphorus load from the Des Plaines may be due to underestimating point source inputs, high water yield, and/or load estimation errors.



Estimated annual average 2012–17 non-point source TP loads

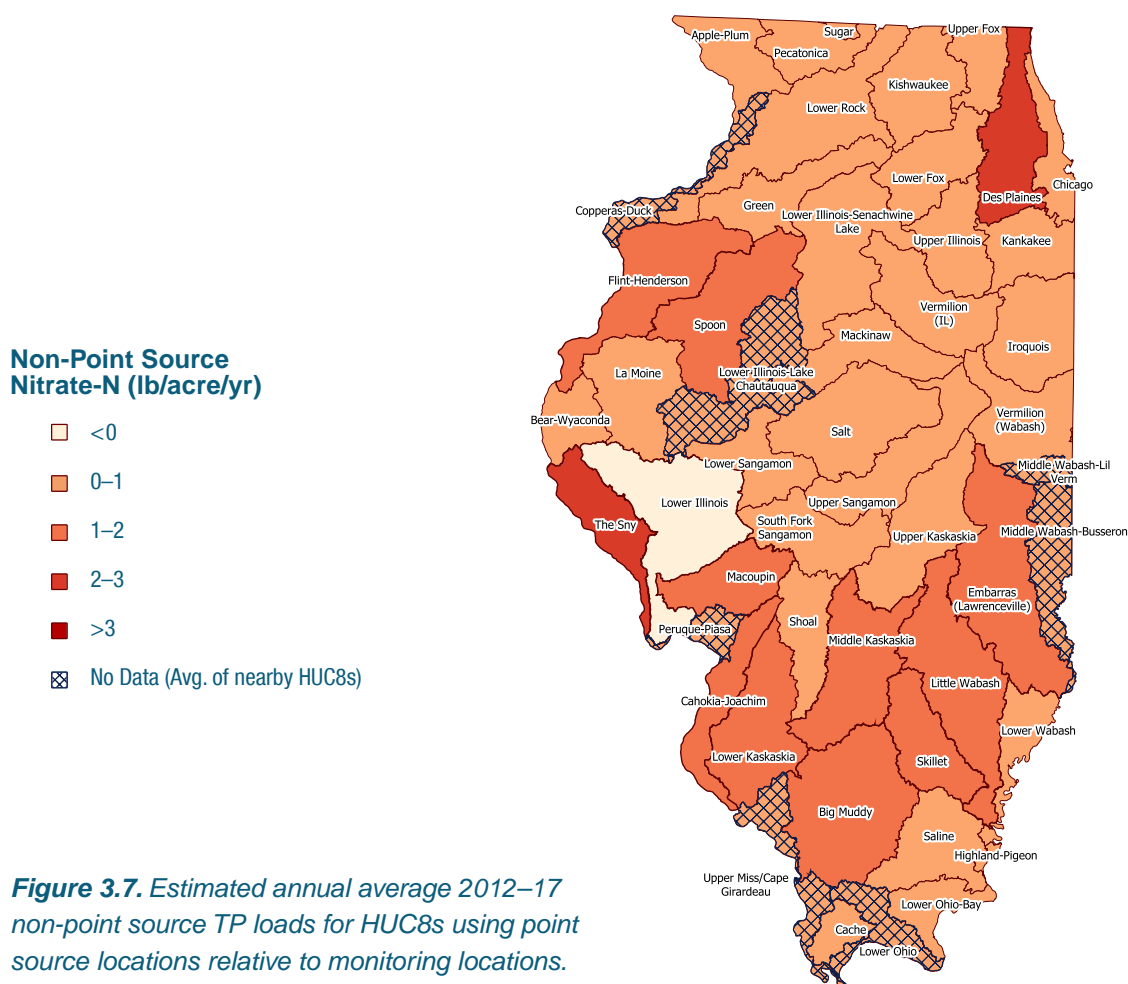


Figure 3.7. Estimated annual average 2012–17 non-point source TP loads for HUC8s using point source locations relative to monitoring locations.

Non-point source TP load estimates were also high in southern and western Illinois HUC8s, where a combination of factors (high rainfall and steeper slopes) may contribute to greater surface runoff and TP transport to streams and rivers. However, the estimates for Skilllet and Cahokia-Joachim are based on monitoring less than half the HUC8 area.

The lowest non-point source TP load of -2.91 million lb P/yr was calculated for the Lower Illinois HUC8. The negative value suggests this HUC8 is a net sink rather than a source of P, but load estimation errors may also be a factor. This segment of the Illinois River between Valley City and Hardin has a very low gradient and is often affected by backwater from the Mississippi River, creating conditions favoring sediment deposition within the river reach. Since much phosphorus is transported attached to



sediment, this may also lead to a reduction of P transport downstream. Additionally, the estimates of riverine loads at Valley City and Hardin are very large and the differences between them are relatively small. Consequently, even small percentage errors in either load estimate can produce large variations in the difference between them, which is the basis for the load estimate for this HUC8. Moreover, water flow is not measured at Hardin but estimated from the additional flow at Macoupin Creek. While considerable uncertainty remains regarding the TP yield from the Lower Illinois HUC8, a small or negative yield seems plausible given the large quantity of TP coming from upstream and the generally sluggish nature of Illinois River flow in this HUC8.

Recommendations for improving future NLRs Science Assessments are found in the Appendix.

Photo courtesy of Gregory F. McIsaac



Background Literature

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CHAPTER 4

AGRICULTURAL SECTOR

Implementation Report

To track the success of the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) implementation through the logic model framework, agricultural organizations reported on their staff and financial resources and their outreach efforts. These data provided the basis for the Resource measures and Outreach measures sections in this chapter. The completed spreadsheets are in the Appendix. The U.S. Department of Agriculture National Agricultural Statistics Service (NASS) provides additional information that supplements the Outreach measures section. Land and Facilities measures were also informed by the survey conducted by NASS and were reported through federal and state agencies.

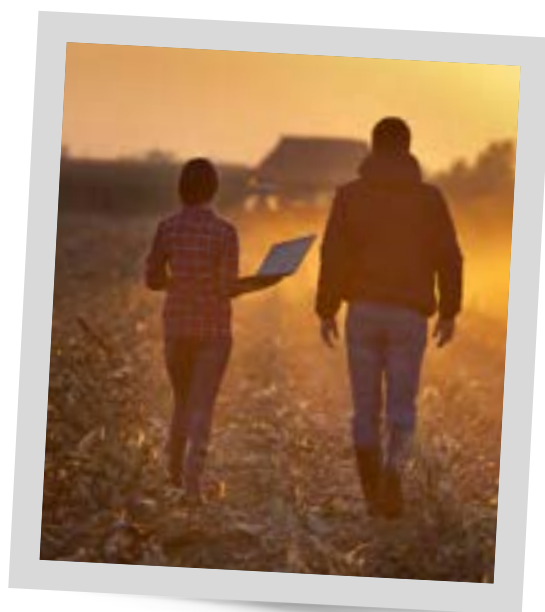
💰 Resource Measures

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 2017, approximately 250 full-time equivalent (FTE) staff members were engaged in Illinois NLRS outreach, implementation, or research for the agricultural sector. In 2018, the number approached 377 FTE. This describes existing agency employees and represents multiple organizations 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 strategy implementation should not be assumed to be comprehen-





sive. Many people are involved in strategy implementation, including farmers and private contractors. However, private contractors who implement nutrient management activities have no tracking mechanism. Efforts are in development to include these significant contributions in future reports.

Funding Resources

The agricultural sector partners reported that in 2017, public and private funds totaled \$25,291,318.50. In 2018, they reported public and private funds totaling \$33,941,940.67 (Figure 4.1).

Although some private contribution information is being tracked, it is difficult to capture all private contracting expenditures outside of state and federal cost-share programs. Therefore, figures reported in this document may significantly underestimate total dollars spent in Illinois.

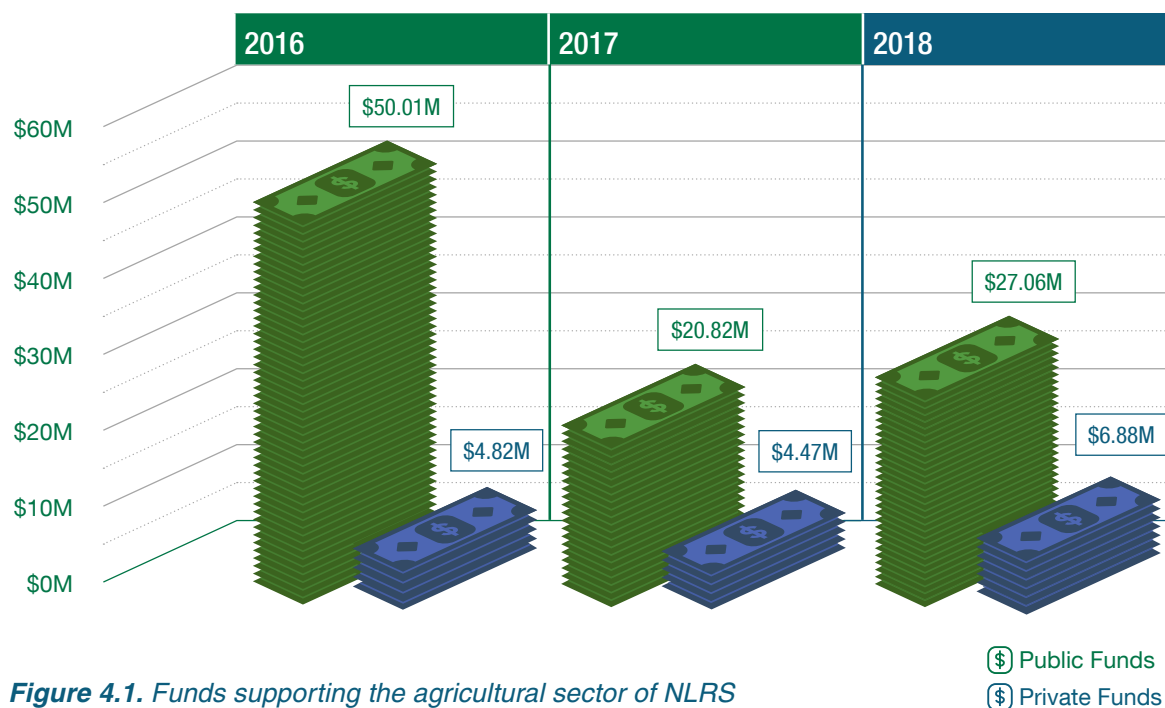


Figure 4.1. Funds supporting the agricultural sector of NLRS



Outreach Measures

The agricultural sector continued a program of active engagement with the Illinois agricultural community to promote best management practices (BMPs) recommended by the strategy. Through face-to-face events, media campaigns, and technical assistance projects, the sector reached a wide audience with information and training in nutrient loss reduction.

Outreach Activities

This summary of outreach activities from 2017 and 2018 is based on (previously mentioned) reports from agricultural organizations. They sponsored hundreds of events for farmers, agricultural retailers, and the public about practices that can reduce nutrient loads in Illinois waters.

Table 4.1 lists outreach activities and associated attendance for the current and previous reporting periods. These events were designed to involve diverse audiences in the agricultural community. For example, agricultural organizations informed the public about the strategy at farm shows and state and county fairs, and also promoted conservation to elementary and high school students. They reported on research about specific BMP impacts on water quality and sponsored field days demonstrating how these practices could be implemented. Organization representatives also participated in watershed planning meetings with community members interested in water quality.

Table 4.1. Outreach activities and associated attendance

Type of Outreach	2015–2016		2017–2018	
	Number of Events	Total Attendance	Number of Events	Total Attendance
Presentations	457	16,000	602	38,155
Field Days	130	3,692	204	18,493
Workshops	607	12,695	423	18,478
Conferences	27	6,935	42	9,355
Total	1,221	39,325	1,271	84,481

In addition to these face-to-face events, agricultural organizations sponsored multi-media campaigns to provide information about the strategy and its implementation in the state. Illinois NLRS was featured





in newsletters, factsheets, newspaper articles, and on radio programs. The University of Illinois Extension produced a podcast series to discuss nutrient loss topics. Agricultural organizations are online with websites and blogs to engage their members—one example is an Illinois Farm Bureau website, Illinois Farmers Conserve (www.ilfarmersconserve.com), which serves as the base for a public education campaign. Finally, many organizations have social media accounts, making use of Twitter and Facebook to advertise events and circulate strategy information.

Agricultural sector members offered specific programs and technical assistance to help farmers implement BMPs. For example, working with county soil and water conservation districts (SWCD), the Illinois Corn Growers Association sponsored programs that promote the use of cover crops, including seed sales, and water-testing events, encouraging farmers to monitor water quality on their land. In addition, SWCDs provided access to equipment through rental programs to help farmers implement these practices. Many organizations also circulated information about cost-share programs that support BMP adoption.

Agricultural organizations conducted more outreach and are reaching wider audiences than documented in the first biennial report. During 2017-18, sponsored events increased in each category, except workshops. Changes in category definitions might be responsible for the decrease in reported workshops numbers. Although there was only a slight increase in the number of events, the audiences more than doubled, from almost 40,000 attendees to almost 85,000.

Topics

In the last report, outreach was focused on the strategy in the context of larger issues regarding conservation and farming operations. While organizations continue to cover general information about the strategy, conservation, and the environment in outreach efforts, they have shifted their emphasis to support the implementation of specific BMPs.

As shown in Table 4.2, members reported that they introduced and described the strategy at 52% of their face-to-face activities and discussed BMPs in general at 43% of those events. Practices that support soil health were the focus 35% of the time and programs supporting the adoption of BMPs were described at 10% of member-sponsored activities. The most frequently discussed BMPs were cover crops and nutrient management, both discussed at 31% of face-to-face events.





Table 4.2. Outreach topics and number of activities where they were discussed

	Topic	Number of Activities	% of Activities
General Topics	NLRS	576	52%
	BMPs	473	43%
	Soil Health	390	35%
	Programs	10	10%
Specific BMPs	Nutrient Management	31	31%
	Cover Crops	31	31%
	Edge-of-Field	19	19%
	Tillage	2	2%

The Illinois NLRS survey conducted by NASS showed that most farmers have at least some information about BMPs that are listed in the strategy. Approximately 80% said that they were knowledgeable about nutrient management or constructed wetlands and 85% knew about cover crops. Cover crop management was clearly the most familiar BMP to farmers, with more than 68% reporting that they were either “somewhat knowledgeable,” “knowledgeable,” or “very knowledgeable” about the practice.

Table 4.3. Illinois NLRS survey result—Farmer BMP knowledge (percent reporting in 2019)

	Not at all Knowledgeable	Slightly Knowledgeable	Somewhat Knowledgeable	Knowledgeable	Very Knowledgeable
Nutrient Loss Reduction Strategy	21.0%	27.0%	38.4%	11.6%	2.0%
MRTN Strategy	20.3%	33.5%	25.5%	14.1%	6.6%
Bioreactors	53.8%	23.0%	15.0%	5.5%	2.7%
Constructed Wetlands	19.7%	29.6%	38.0%	10.2%	2.5%
Cover Crops Management	15.2%	16.7%	35.5%	28.4%	4.2%



Land and Facilities Measures

One of the most significant indicators of progress toward strategy goals is the number of BMPs implemented on the ground. Many farmers who have learned about BMPs through the outreach efforts of agricultural organizations have adopted these practices.

As mentioned, data for Land and Facilities measures for the agricultural sector include the Illinois NLRs survey conducted by NASS and federal and state agency program information. The following section sub-heads are listed by data source.

USDA Farm Service Agency Conservation Reserve Program

To be eligible for some USDA Farm Service Agency (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 voluntary program 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. While the program is funded through FSA, technical services are provided by the USDA Natural Resources Conservation Service (NRCS) with local assistance from county SWCDs.

Acres with CRP buffers nearly doubled from 2011 to 2015, with a slight decline in the years after. Acres with CRP wetlands were at a high point in 2011 and have steadily increased since 2015, with a slight dip in 2017 (Table 4.4 and Figure 4.2).

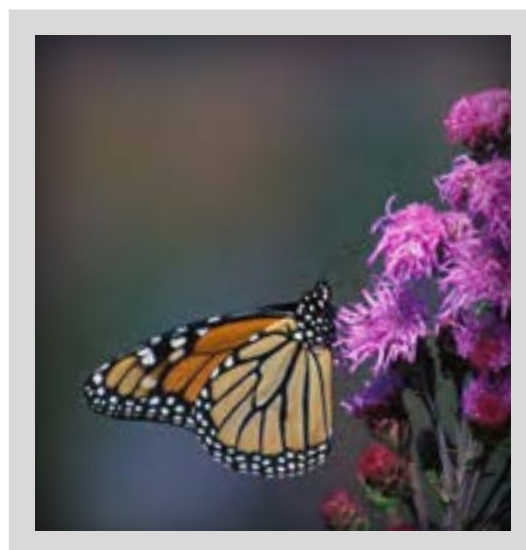




Table 4.4 Acres in CRP Wetlands and Buffers

	2011	2015	2017	2018
CRP Wetlands	57,463	45,790	43,826	55,716
CRP Buffers	145,813	279,534	270,002	265,753

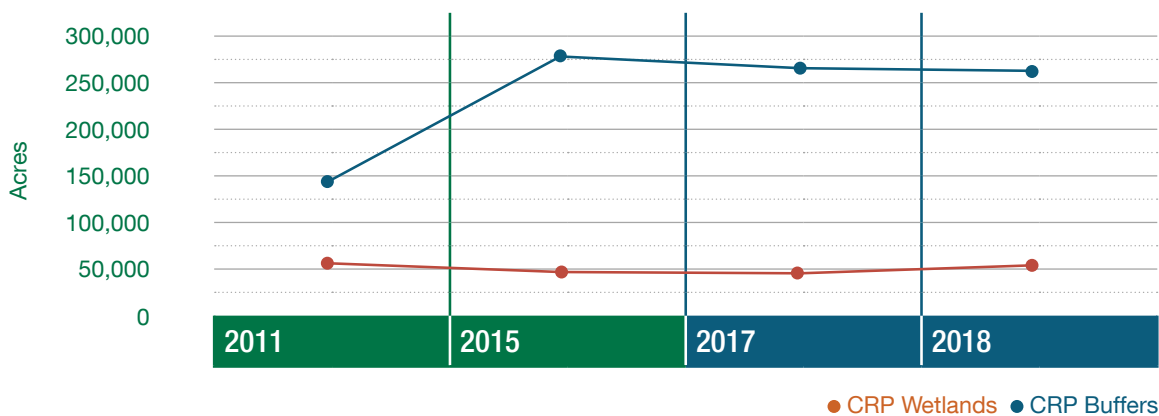


Figure 4.2. Acres in CRP wetlands and buffers.

The number of acres in CRP perennials, energy, and pasture jumped by half a million from 2011 to 2015, maintaining this high point through 2017 before falling back slightly in 2018. (Table 4.5 and Figure 4.3).

Table 4.5. Acres in CRP Perennials/Energy/Pasture

	2011	2015	2017	2018
CRP Perennials/ Energy/Pasture	985,531	1,524,379	1,547,612	1,086,474

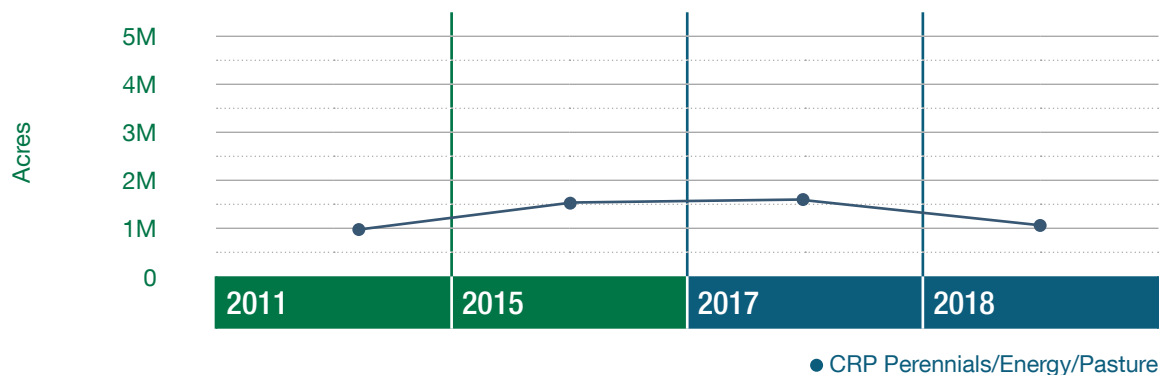


Figure 4.3. Acres in CRP perennials, energy, and pasture.



Cover Crops

Cover crop acres increased more than tenfold from 2011 to 2015 and saw another jump from 2015 to 2017 before growth slowed in 2018 (Table 4.6 and Figure 4.4). Interestingly, the dramatic increases coincide with releases of the strategy in 2015 and the biennial report in 2017.

Table 4.6. Acres in Cover Crops reported by producers to FSA

	2011	2015	2017	2018
Cover crops	768	11,064	83,980	92,970

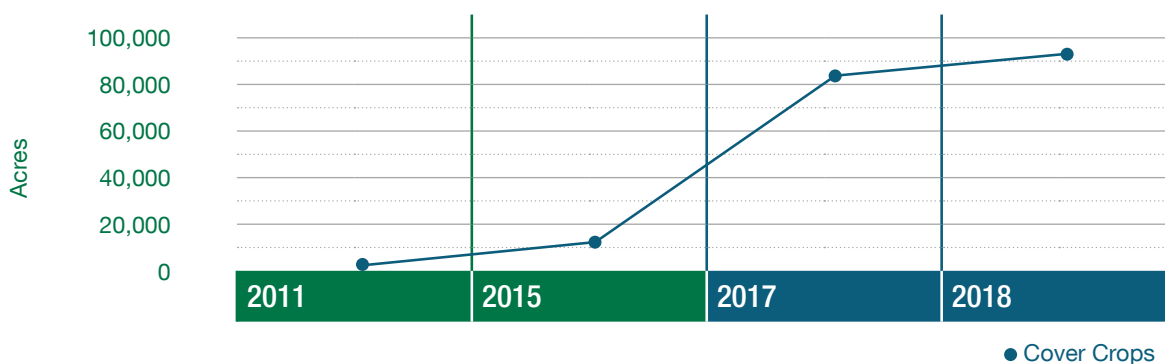


Figure 4.4. Acres in cover crops reported by producers to the Farm Service Agency.

Illinois Department of Natural Resources Conservation Reserve Enhancement Program

The Illinois Department of Natural Resources administers the Conservation Reserve Enhancement Program (CREP), a targeted federal and state incentive program that couples enhanced USDA CRP incentives and payments with state payments (Figure 4.5). Illinois CREP is the second oldest CREP in the nation. Participation is voluntary and is more financially rewarding than other CRP options. Illinois CREP participants may elect to extend the benefits of their CRP contract through a 15-year, 35-year, or permanent CREP state easement, which goes into effect when the federal CRP contract expires or is terminated.

In the Illinois and Kaskaskia River watersheds, producers may enroll up to 232,000 acres using a wide array of conservation practices, including important strategy BMPs such as grass filter strips, riparian forest buffers, and wetland restoration. Illinois CREP achieves long-term benefits by allowing environmentally-



sensitive land in these two watersheds to be restored, enhanced, and protected over periods ranging from 15 years to perpetuity. Currently, over 90,000 acres have been enrolled in the CREP program, most of which are permanent. Table 4.6 lists the acreage enrolled in CREP, which contributes to Illinois NLRS goals.

Several CREP goals correspond with the goals of Illinois NLRS:

- Goal 1: Help meet federal goals to reduce nitrogen loading to the Mississippi River and the Gulf of Mexico, thereby helping to reduce hypoxia in the Gulf of Mexico.
 - > Goal 1a: Reduce the amount of silt and sedimentation entering the main stem of the Illinois and the Kaskaskia Rivers by 20%.
 - > Goal 1b: Reduce the amount of phosphorus and nitrogen in the Illinois River and Kaskaskia River by 10%.

Best management practice acres that are under federal CRP contract are not considered part of the state program until that contract expires. Both Table 4.7 and Figure 4.6 show a dramatic increase in CREP enrollment in 2013 when the first CRP enrollments in 1998 began to expire. Enrollment started to level off after 2016 with fewer CRP contracts expiring.

CREP Eligible Watersheds



**ILLINOIS
DEPARTMENT OF
NATURAL
RESOURCES**

Legend

- State CREP Easements
- Illinois and Kaskaskia Rivers
- Main Tributaries
- Illinois Watershed Boundary
- Kaskaskia Watershed Boundary



Figure 4.5. CREP Eligible Watersheds





Table 4.7. Acres with Illinois DNR Conservation Reserve Enhancement Program Easements

	2011	2012	2013	2014	2015	2016	2017	2018
Wetlands	20	651	3,681	11,976	17,406	19,467	19,523	19,523
Buffers	526	1,324	2,720	5,467	8,768	13,568	13,764	13,850
Perennial/Energy	0	7	84	1,622	2,107	4,395	4,670	4,718

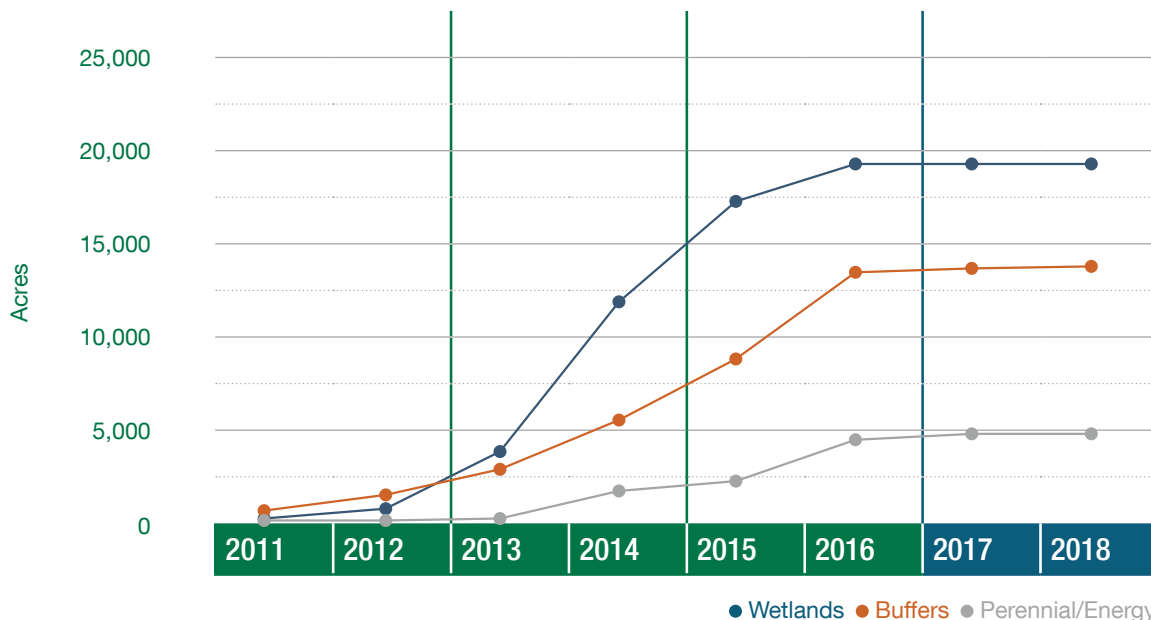


Figure 4.6. Acres with Illinois Department of Natural Resources CREP Easements.

USDA Natural Resources Conservation Service

In Illinois, NRCS administers multiple programs, including the Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), and 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.

Photo courtesy: Abigail Bobrow





Environmental Quality Incentives Program

In 2017 and 2018, NRCS enrolled almost 25,000 certified acres in BMPs recommended in the strategy or conservation practices, including 11,000 acres in cover crops, through the EQIP program. In those same years, NRCS dedicated more than \$1.2 million to implement these BMPs and conservation practices, including over \$600,000 spent on cover crops alone (Table 4.8 and Figure 4.7).

Table 4.8. Enrolled acres and dollars spent on BMPs through the NRCS Environmental Quality Incentives Program

	2017 Acres	2017 Dollars	2018 Acres	2018 Dollars
Filter Strips (buffers)	14	\$7,105	3	\$1,296
Nutrient Management	3,975	\$73,955	4,773	\$181,440
Conservation Tillage	2,326	\$35,740	2,456	\$39,662
Cover Crops	7,614	\$462,344	3,343	\$176,559
Perennial	108	\$77,820	126	\$86,520
Wetlands	0	\$0	1	\$895

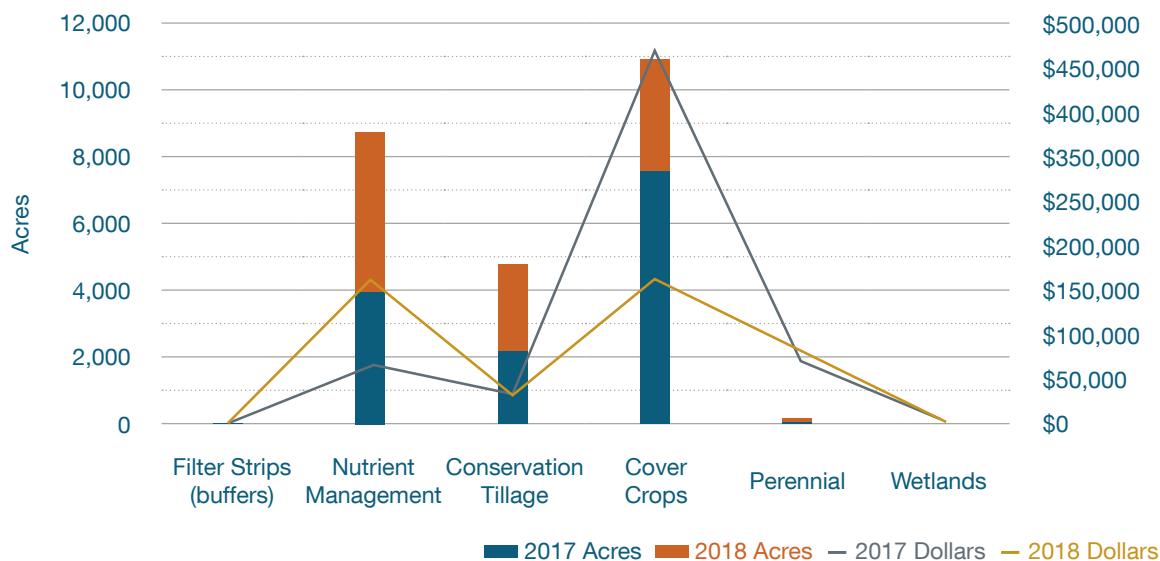


Figure 4.7. Enrolled acres and dollars spent on NLRS recommended BMPs through NRCS EQIP



Conservation Stewardship Program

Between 2011 and 2018, on average, the number of new acres enrolled in CSP increased (Table 4.9 and Figure 4.8). 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. Conservation Stewardship Program projects are funded until the acreage allotment has been met. A total of 1.7 million acres was obligated to CSP contracts from 2011 to 2018. The greatest increase came in 2014 because Illinois requested, and received, additional CSP contract acres from USDA.

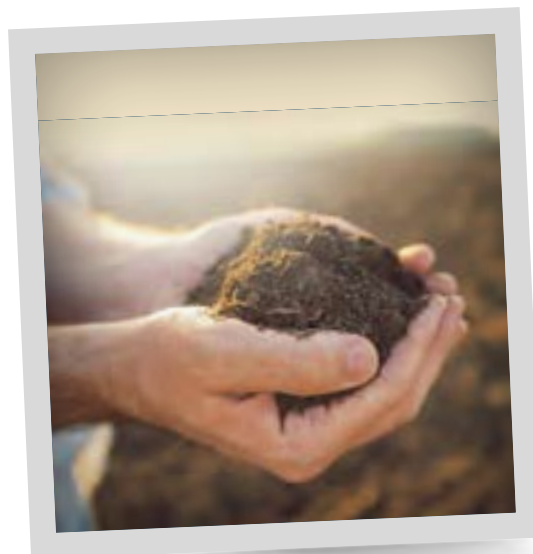


Table 4.9. New acres enrolled in Conservation Stewardship Program

	2011	2012	2013	2014	2015	2016	2017	2018
Acres Per Year	165,416	229,815	188,731	399,024	214,557	160,172	149,844	200,455
Subtracting the 5-year Drop-off	165,416	395,231	583,962	982,986	1,197,543	1,192,299	946,912	563,405
Cumulative Acres	165,416	395,231	583,962	982,986	1,197,543	1,357,715	1,507,559	1,708,014

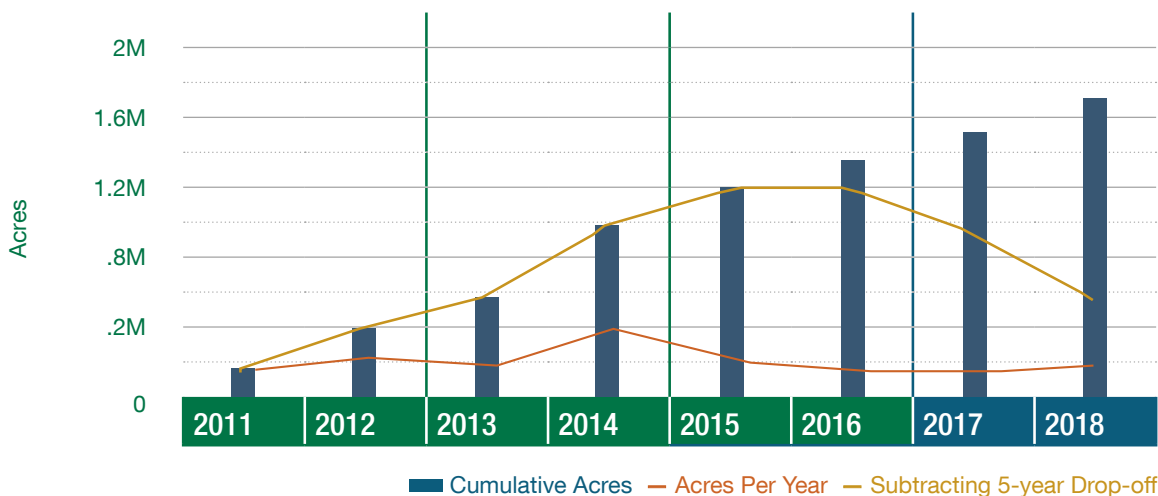


Figure 4.8. New acres enrolled in Conservation Stewardship Program



Wetlands Reserve Easement Program

The number of acres obligated to WREP is determined by a USDA dollar allocation at the beginning of each fiscal year. From 2011 to 2015, reduced funding from USDA resulted in fewer new acres obligated for wetland easements (Table 4.10 and Figure 4.9). However, unlike other BMPs, wetlands are not seasonal or yearly contract-based, so acres enrolled in this program in the past remain on the landscape. In 2016, newly-enrolled wetland acres increased, with increases continuing through 2017 before falling off again in 2018. Since 2011, over 8,500 acres have been enrolled in WREP.



Table 4.10. New wetland acres enrolled in Wetland Reserve Easement Program

	2011	2012	2013	2014	2015	2016	2017	2018
Acres Per Year	1,788	1,420	569	305	396	1,237	2,600	260
Cumulative Acres	1,788	3,208	3,777	4,082	4,478	5,715	8,315	8,575

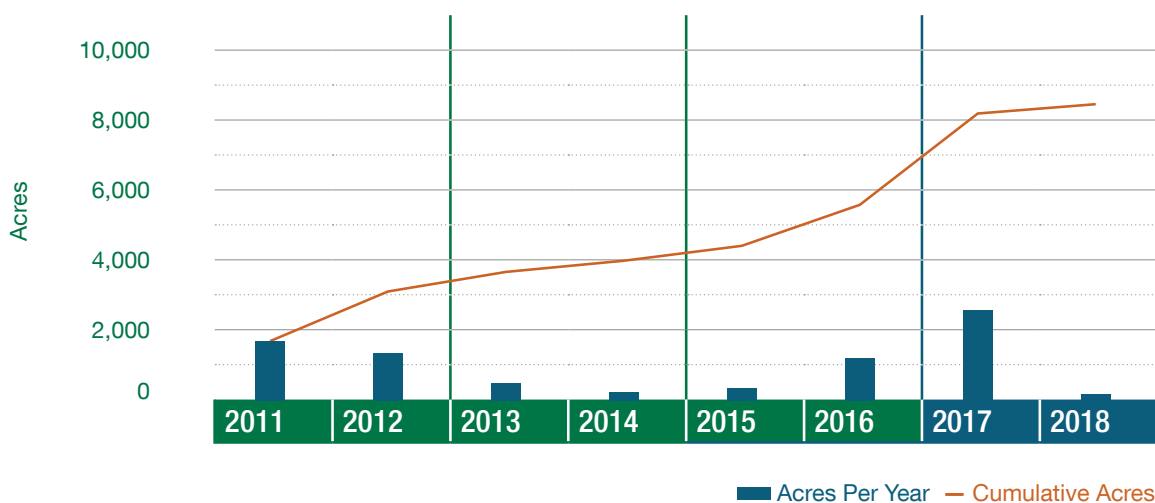


Figure 4.9. New acres enrolled in the Wetland Reserve Easement Program from 2011 to 2018.



University of Illinois Woodchip Bioreactors

Woodchip bioreactors are not a widely adopted practice in Illinois, but their numbers are growing. The first biennial report referenced 20 bioreactors in the state, treating 611 acres. However, in just two years, that number has nearly doubled—37 bioreactors have been identified, treating 1,345 acres, most of which are university research and demonstration projects (Figure 4.10). The University of Illinois, which conducts research at most of these sites, provided location information. One site was identified by Lincoln Land Community College in Springfield. Other bioreactors may have been installed in the state, but information on their locations is not readily available. Per the survey conducted by NASS, strategy activities have increased farmer awareness regarding bioreactors and additional installations are expected in coming years.



Bioreactors in Illinois

ILLINOIS

Extension
COLLEGE OF AGRICULTURAL, CONSUMER
& ENVIRONMENTAL SCIENCES

Legend

- Bioreactors
- Counters
- NP3 Phosphorus
- NPS Nitrate
- Keep it for the crop
- Point Sources: Nitrate and Phosphorus

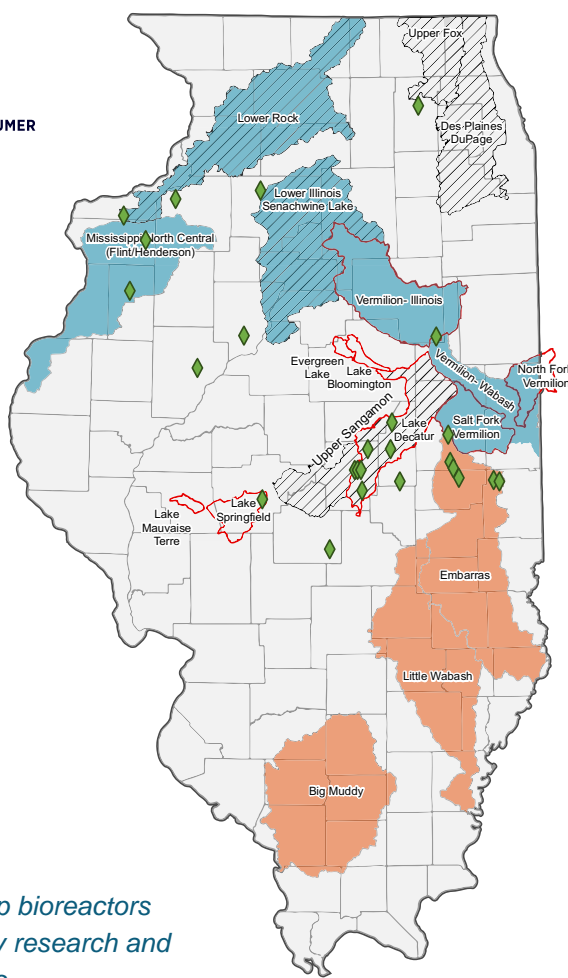


Figure 4.10. Woodchip bioreactors identified via university research and demonstration projects.



2X



*In just two years, the number of
woodchip bioreactors in Illinois has
nearly doubled*

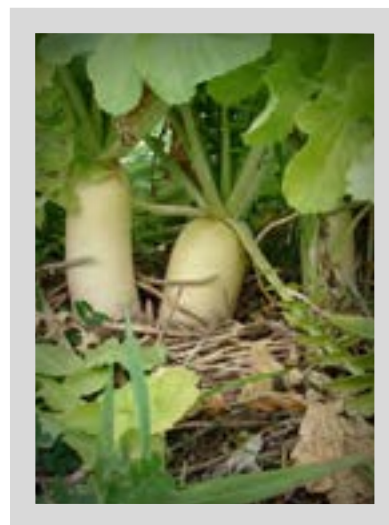
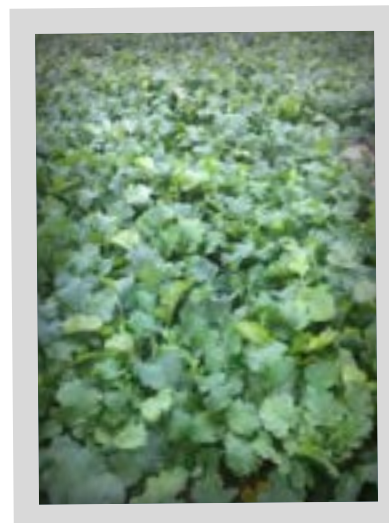


Illinois Department of Agriculture *Partners for Conservation Program*

The Illinois Department of Agriculture (IDOA), with assistance from Illinois SWCDs, administers several initiatives through the Partners for Conservation (PFC) cost-share program, which promotes advanced nutrient management, conservation tillage, and the use of cover crops. In 2017, PFC targeted its \$1 million allocation to Illinois NLRs priority watersheds and, in 2018, \$1 million was directed to statewide purposes. Altogether, in 2017 and 2018, the PFC program covered approximately 52% of conservation practice costs with the remainder paid by landowners or applicants.

Conservation practices that are eligible for PFC cost-share assistance include terraces, grassed waterways, water and sediment control basins, grade stabilization structures, crop residue management, cover crops, and nutrient management plans. From 2017 to 2018, landowners completed 749 projects. The most common PFC conservation practice during this time was cover crops (Table 4.11 and Figure 4.11).

Through PFC and landowner investments and activities, soil erosion was reduced on 30,321 cropland acres. These practices also reduced nutrient loading to streams throughout the state by an estimated 26,975 pounds of nitrate-nitrogen and 13,459 pounds of total phosphorus. Sediment loads were reduced by 16,475 tons—translating to an estimated 823 semi-trailer loads of sediment that did not end up in Illinois waterways.



*Through PFC and landowner
investments and activities
Sediment loads were reduced by*
16,475 tons





Table 4.11. Partners for Conservation FY17 and FY18

	2017 Acres	2018 Acres	2017 Cost-Share Dollars	2017 Landowner Dollars	2018 Cost-Share Dollars	2018 Landowner Dollars
Bioreactors	75	-	\$8,000	\$2,667	-	-
Wetlands	24	-	\$6,021	\$4,429	-	-
Filter Strips	22	-	\$304	\$481	-	-
Tillage	1,124	95	\$9,934	\$17,817	\$4,132	\$8,380
Perennial	89	36	\$12,980	\$7,950	\$6,406	\$2,717
Cover Crops	13,293	5,555	\$249,524	\$230,848	\$104,021	\$120,001

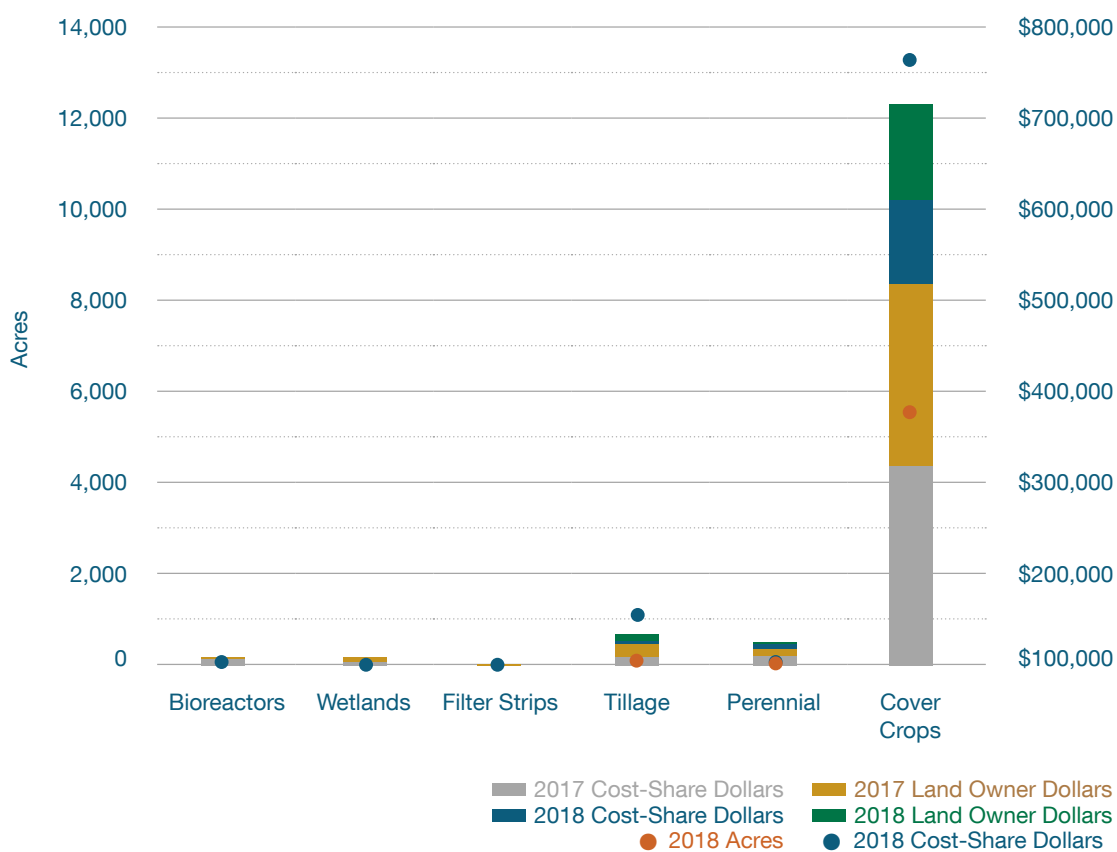


Figure 4.11. Acres treated by and dollars spent on Partners for Conservation best management practices.



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 non-point source pollution in rural and urban areas. This program, administered by the Illinois Environmental Protection Agency (EPA), 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. The number of acres treated by agricultural BMPs funded through Section 319 has increased since 2011, with a high point in 2012 due to an influx of conservation tillage acres (Table 4.12 and Figure 4.12). New acres dedicated to wetland restoration have declined considerably since 2015; nonetheless, once a wetland has been restored, it exists until it is deliberately removed.

Photo courtesy of Jack Pizzo

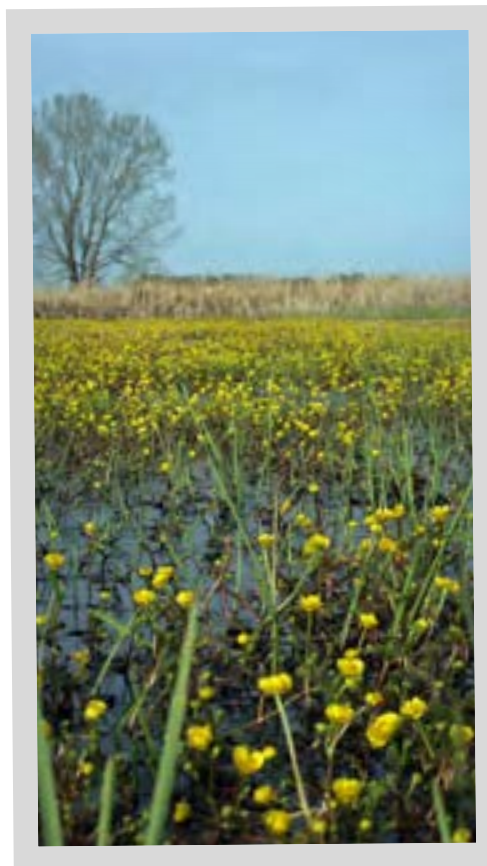


Photo courtesy of Jack Pizzo





Table 4.12. Acres treated by agricultural practices installed under Section 319 Grant Program 2011–18

	2011	2012	2013	2014	2015	2016	2017	2018
Cover and Green Manure Crop	-	-	-	453	2,544	2,583	3,978	1,570
Conservation Tillage	-	9,998	-	-	-	-	151	-
Filter Strip	-	-	-	-	8	8	3	9
Nutrient Management	-	-	-	-	-	3,062	-	5,713
Wetland Restoration	24	255	380	116	164	1	1	1
Total	24	10,253	380	569	2,716	5,654	4,133	7,293

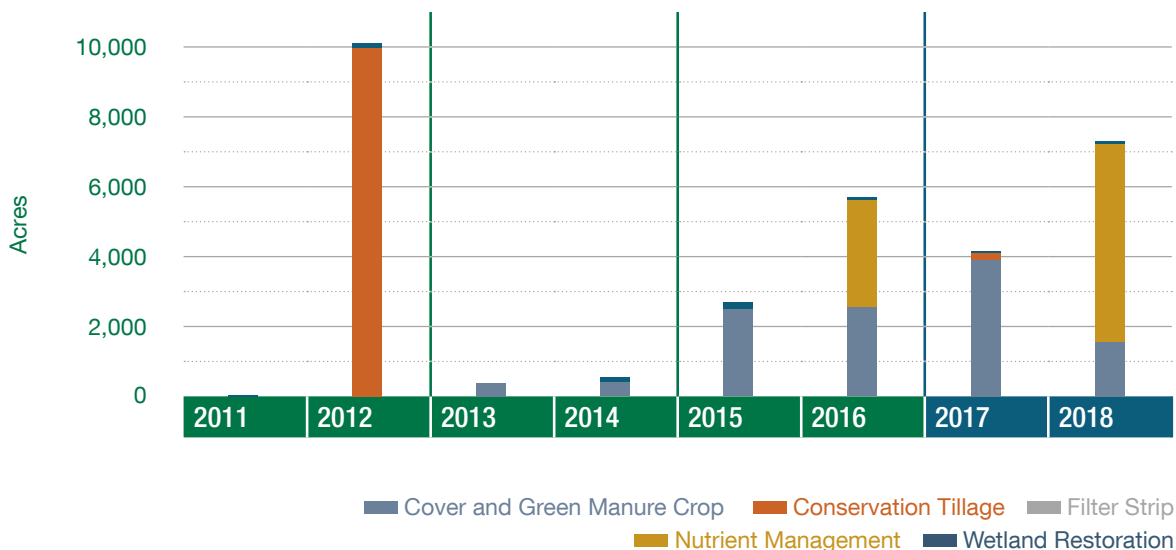


Figure 4.12. Acres treated by agricultural practices installed under Section 319 Grant Program 2011–18

These shifts 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.



The Illinois EPA Section 319 grant program is unique in that BMP-associated load reductions are calculated using U.S. EPA Region 5 Load Estimation Spreadsheets as part of the process. These calculations indicate that BMPs have significantly reduced the impact of nutrients in Illinois waters. Since 2011, Section 319 funding led to a reduction of nitrogen loads of over 70,000 pounds. Years with greater nitrogen reduction correspond with years with more acres. The greatest nitrogen reduction comes from conservation tillage acres, which accounted for about 47,000 pounds of nitrogen load reductions in 2012 (Table 4.13 and Figure 4.13).

Table 4.13. Calculated nitrogen load reduction (lb/yr) from Section 319 Grant Program agricultural practices 2011–18

	2011	2012	2013	2014	2015	2016	2017	2018
Cover and Green Manure Crop	-	-	-	700	600	13,700	15,006	1,500
Conservation Tillage	-	47,200	-	-	-	-	300	-
Filter Strip	-	-	-	-	1,400	100	100	200
Nutrient Management	-	-	-	-	-	-	-	-
Wetland Restoration	94	1,500	1,700	700	500	600	600	0
Total	94	48,700	1,700	1,400	2,500	14,400	2,500	1,700

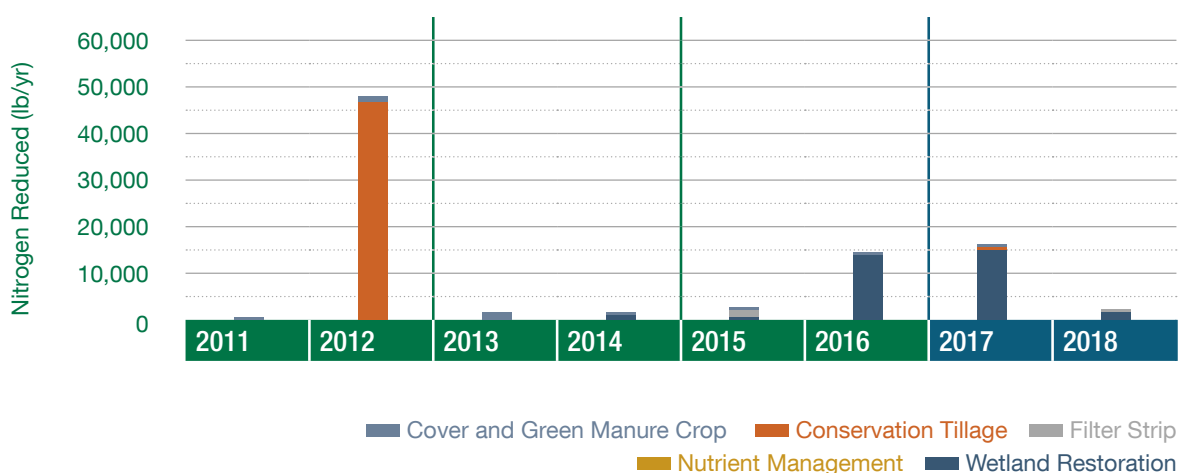


Figure 4.13. Calculated nitrogen load reduction (lb/yr) from Section 319 Grant Program agricultural practices 2011–18



Phosphorus reductions have been a bit more modest. Since 2011, Section 319 funding led to a reduction in phosphorus loads of just under 30,000 pounds. Similar to nitrogen reductions, years with greater phosphorus reduction correspond to years with more acres. The greatest phosphorus reduction occurs through conservation tillage acres, which accounted for over 20,000 pounds of phosphorus load reductions in 2012 (Table 4.14 and Figure 4.14).

Table 4.14. Calculated total phosphorus load reduction (lb/yr) from Section 319 Grant Program agricultural practices 2011–18

	2011	2012	2013	2014	2015	2016	2017	2018
Cover and Green Manure Crop	-	-	-	400	300	600	500	700
Conservation Tillage	-	23,700	-	-	-	-	100	-
Filter Strip	-	-	-	-	700	0	100	0
Nutrient Management	-	-	-	-	-	-	-	-
Wetland Restoration	47	700	600	300	300	200	100	0
Total	47	24,400	600	700	1,300	800	800	700

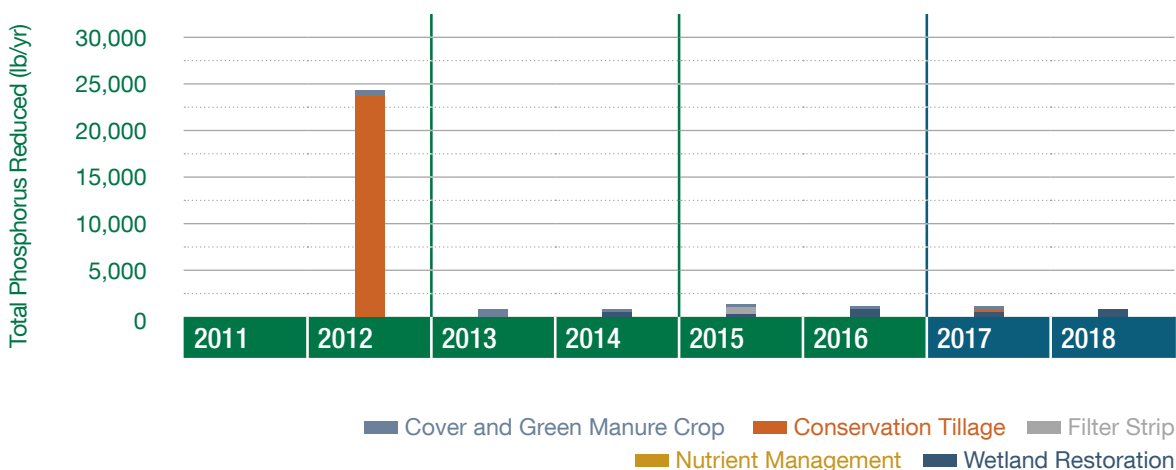


Figure 4.14. Calculated total phosphorus load reduction (lb/yr) from Section 319 Grant Program agricultural practices 2011–18



Illinois Department of Agriculture

Illinois Soil Conservation Transect Survey

Illinois NLRs recommends the adoption of reduced tillage methods as a conservation practice for reducing total phosphorus loss from crop fields. The strategy science assessment estimates that when conventionally tilled fields that are eroding greater than “T” are converted to reduced, mulch, or no-till, this will result in a 50% reduction in total phosphorus on those acres. The T value is “tolerable soil loss,” or the amount (tons/acre) of soil loss that can theoretically occur and be replaced by natural soil-building processes.

Photo courtesy of Illinois Fertilizer and Chemical Association



The 2017 biennial report only reported on the number of reduced tillage acres that were cost-shared through state and federal programs, but this 2019 report incorporates data from the Soil Conservation Transect Survey.

Since 1982, the Illinois Department of Agriculture has conducted a soil survey of tillage practices and in 1994, it was updated to use a county transect survey method, which continues today. The survey provides a snapshot of the status of soil conservation efforts on agricultural land in Illinois. It serves to measure and track the types of tillage practices used on Illinois farms, as well as an estimate of remaining land treatment needs. It also calculates the amount of acres meeting or exceeding T.

Soil and Water Conservation Districts, with assistance from NRCS, collect data from approximately 450 fields along a random route that intersects each township in the county twice. The survey is done on an annual or biennial basis after the crops are planted in the spring. Some counties with a significant amount of small grains conduct an additional survey in the fall to collect data on fall planted crops.

Information on tillage systems, crop residue amounts, and other measures is collected at more than 51,000 points covering 99 counties across the state. Data are aggregated for each county and the entire state on soil loss relative to T, the presence of ephemeral erosion, and tillage systems used to plant crops. The data provide an opportunity to analyze trends in tillage systems, crop residue cover, sheet/rill erosion, and ephemeral erosion.





Survey data are reported statewide, by county, and since 2017, by eight-digit Hydrological Unit Code (HUC8) watersheds. In 2018, cover crops data were collected for the first time. The graphs below present aggregated data showing trends from 1994–2018.

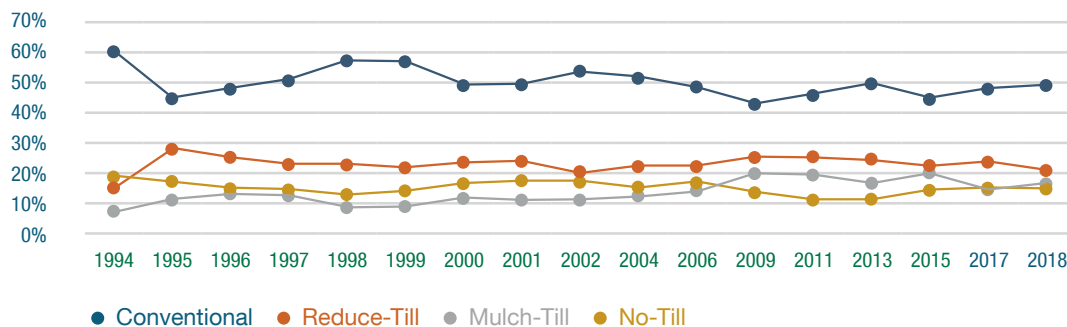


Figure 4.15. Statewide corn tillage from the Soil Transect Survey

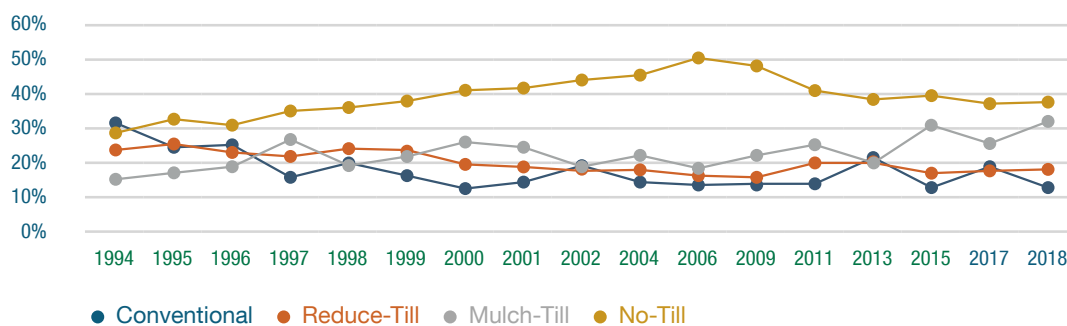


Figure 4.16. Statewide soybean tillage from the Soil Transect Survey

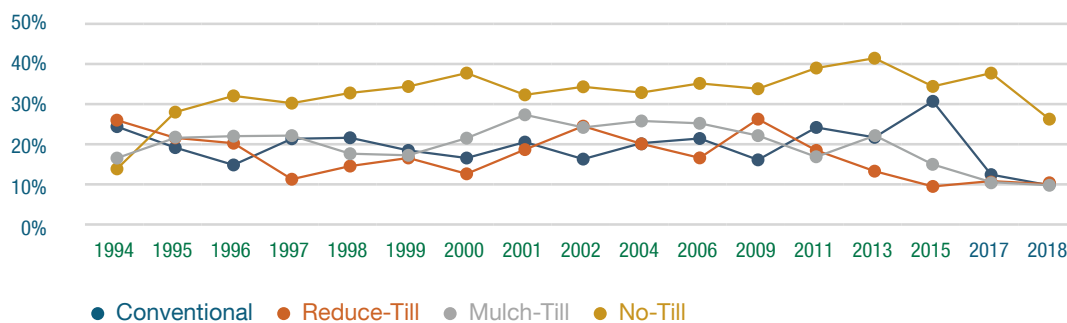


Figure 4.17. Statewide small grains tillage from the Soil Transect Survey

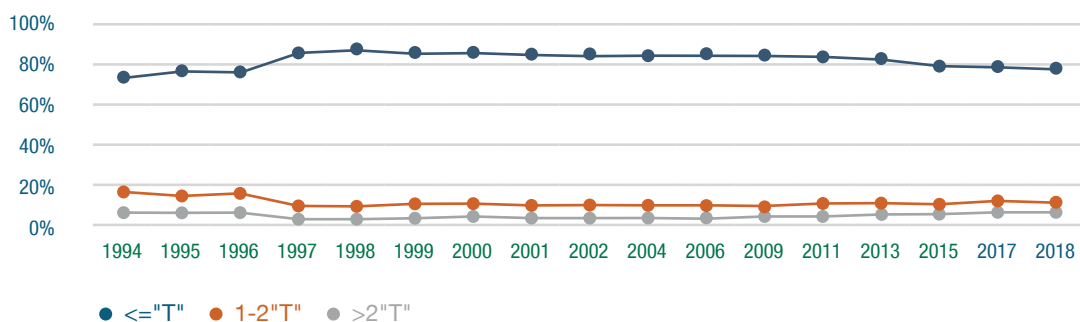


Figure 4.18. Soil loss relative to "T" from the Soil Tract Survey

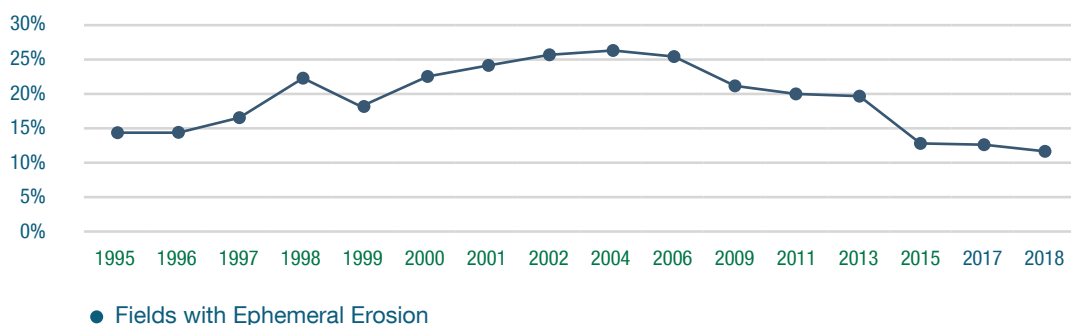


Figure 4.19. Percent of fields with ephemeral erosion from the Soil Tract Survey

The 2018 results showed that 78.8% of the points surveyed were at or below T. This figure represents a drop of about 5.2% from 2011 records and is 7.7% lower than the highest amount recorded in 1998. In 1994, the first Soil Conservation Tract Survey estimated that 74.1% of the points surveyed were meeting T. Previous surveys indicated that 59.4% of the total cropland acres were at T or less in 1982, 67.7% were at T or less in 1987, 73.6% were at T or less in 1992, and 78.4% of the state's cropland was at, or less than, the tolerable soil loss level in 1997.

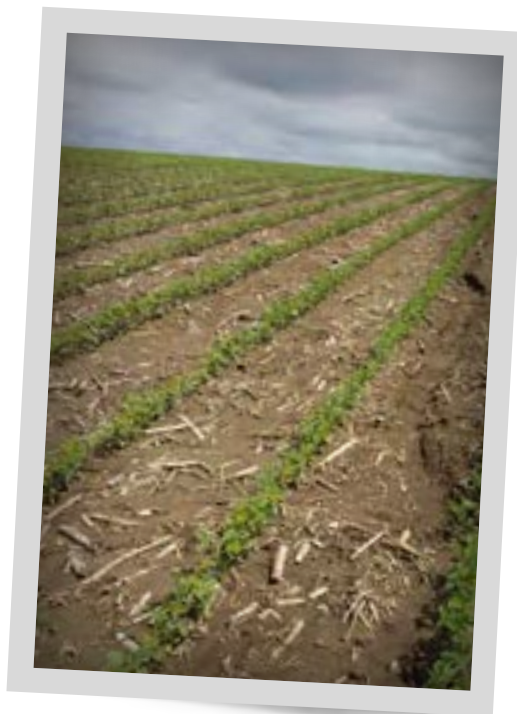
The 2018 results indicate that about 18.1% of points surveyed were still exceeding tolerable soil loss levels. In fact, about 6.7% of the points surveyed exceeded 2T. In many cases, with a slight adjustment in management systems to retain more crop residue, soil loss on these acres could meet T or below. The survey showed that 24% of all fields planted to corn, soybean, and small grain were farmed using no-till practices, which leave the soil virtually undisturbed from harvest through



planting. For these crops, the all-time high number of fields planted by no-till occurred in 2006 when the practice was at 33.2%. It appears a large portion of the decrease in no-till was a shift to mulch-till—the percent of mulch-till increased 7% since 2006. The 2017 mulch-till survey result was 20.1%. Statewide, 29.2% of crop fields surveyed in 2018 were planted conventionally, which leaves less than 15% of the soil surface covered with crop residue after planting.

The following figures present maps reflecting the percentage of transect points being at or below 1T, 1 to 2T, and above 2T by HUC8 watersheds for 2018.

Photo courtesy of USDA



HUC8 watersheds percent of transect points <=1T



Legend

- 85.0–100.0
- 80.0–85.0
- 75.0–80.0
- 60.0–75.0
- 48.4–60.0

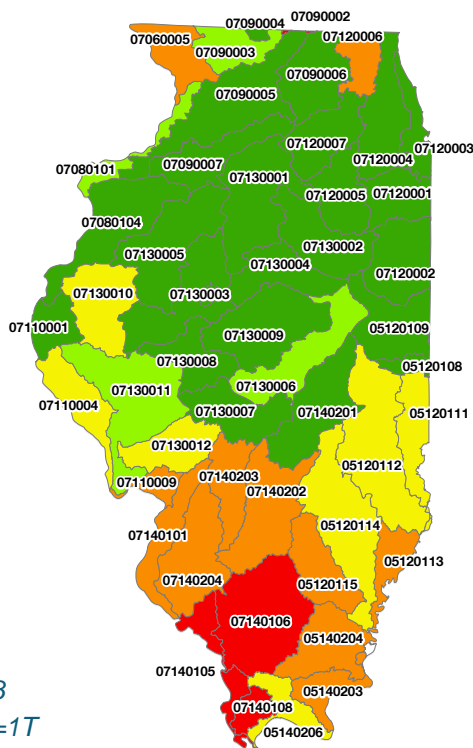


Figure 4.20. Percent of HUC8 watersheds transect points <=1T



Percent of HUC8 watershed transect points 1-2T



Legend

- 0.0–7.0
- 7.0–12.5
- 12.5–17.8
- 17.8–24.1
- 24.1–50.0

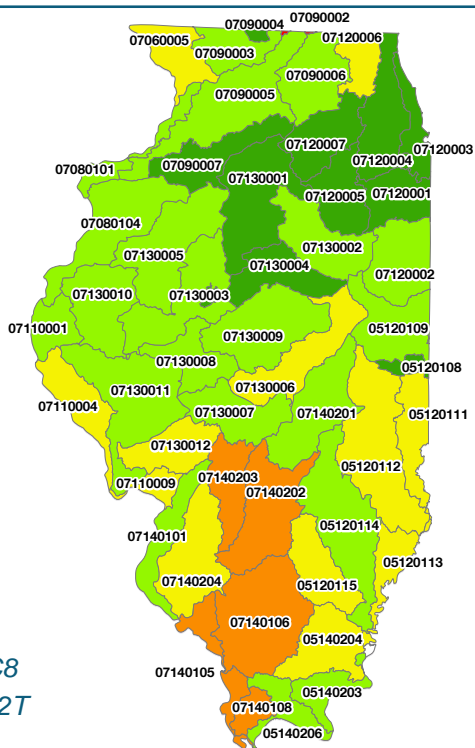


Figure 4.21. Percent of HUC8 watershed transect points 1-2T

Percent of HUC8 watershed transect points >2T



Legend

- 0.0–2.1
- 2.1–5.0
- 5.0–9.5
- 9.5–15.7
- 15.7–27.9

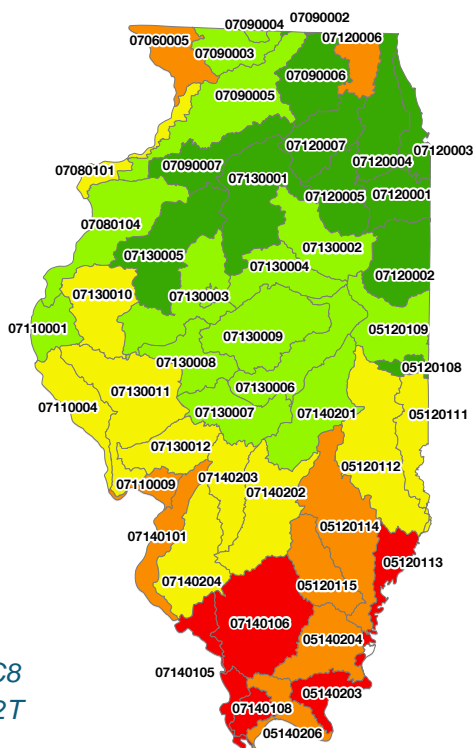


Figure 4.22. Percent of HUC8 watershed transect points >2T





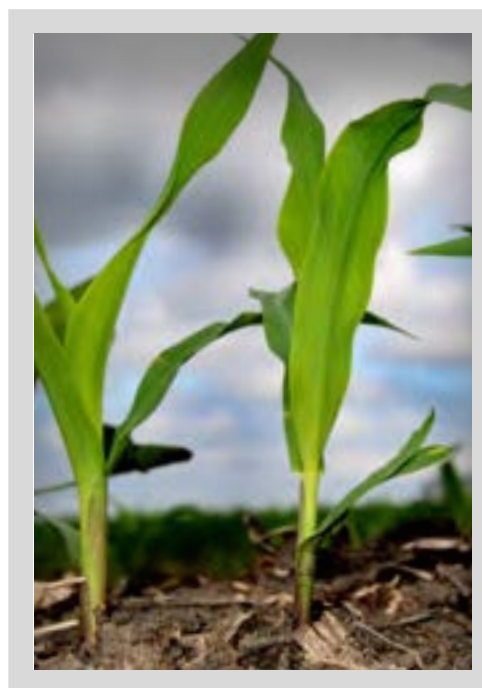
Figure 4.20 shows that for approximately the upper two-thirds of the state, 85–100% of the fields surveyed are at or below T. This area corresponds to the more recently glaciated areas of the state with flatter topography, where a majority of tile-drained land is located. Figure 4.22 shows HUC8 watersheds where fields surveyed were greater than 2T. The most severe areas, shaded in red, have between 15.7–27.9% of surveyed fields exceeding 2T. These watersheds include the Lower Wabash River, the Lower Ohio-Bay, the Upper Mississippi-Cape Girardeau, the Big Muddy River, and the Cache River. Of these five HUC8 watersheds, the Big Muddy River is a priority watershed for total phosphorus loss as designated in the strategy. Outreach, financial, and technical assistance should be a priority for landowners in these five watersheds with rates higher than 2T to increase residue management and the adoption of conservation practices that reduce soil erosion.



USDA National Agricultural Statistics Service

Illinois NLRS Survey

While it has been a straightforward process to document BMPs put in place through federal and state programs explained in this report, data on the number of practices implemented by farmers not engaged in incentive programs were not readily available. A statistically significant survey of Illinois farmers conducted by NASS, and funded by the Illinois Nutrient Research and Education Council, helped shed some light on farmer knowledge and BMP adoption in support of Illinois NLRS goals. The first survey took place in 2017 and covered 2015 and the benchmark/baseline year of 2011. Plans are to continue conducting the survey biennially as resources allow.



Nitrogen Management

Many producers are using professional recommendations as they decide how much nitrogen to



apply on their corn acres. The survey results in Table 4.15 and Figure 4.23 show that for one-third of their 2017 corn acres, producers used the Maximum Return to Nitrogen (MRTN) strategy to help determine the amount of nitrogen to apply. In addition, producers used other industry-recommended techniques on 69% of their corn acres. Many producers considered two or more strategies before applying nitrogen to some corn acres in 2017, therefore, the sum of percentages in Table 4.15 is greater than 100.

Table 4.15. Acres with a nitrogen management strategy

	Acres in 2011	Acres in 2015	Acres in 2017
Acres of corn planted	12,600,000	11,700,000	11,200,000
Acres where an MRTN strategy was used to determine application rates	8,820,000 or 70% of planted acres	9,430,000 or 81% of planted acres	3,730,000 or 33% of planted acres
Other industry-approved technique	Not asked	Not asked	7,750,000 or 69% of planted acres

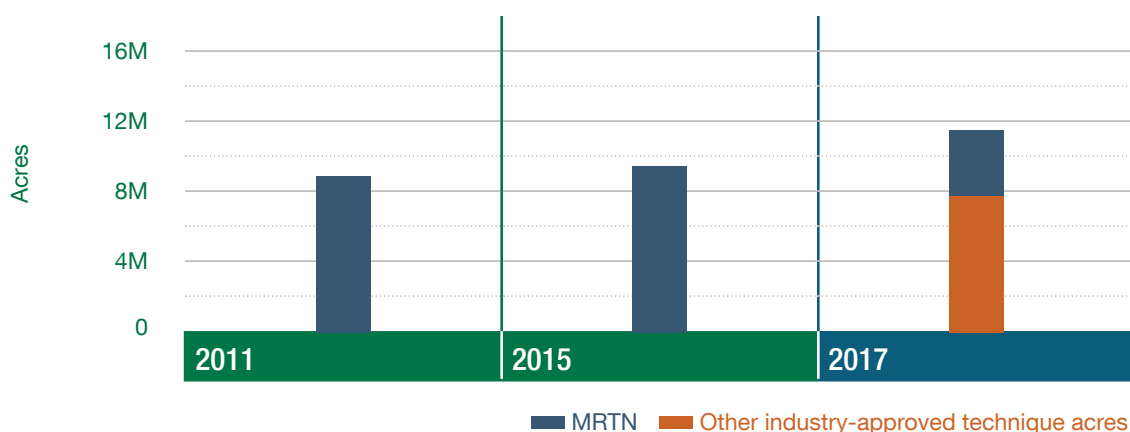


Figure 4.23. Acres where a nitrogen management strategy was used to determine application rates.

Nitrification Inhibitors

Table 4.16 shows that in 2017, nearly one-third of tilled corn acres were fertilized in the fall or winter with a nitrification inhibitor. For non-tilled acres, that number is 9%.



Table 4.16. Tiled acres with fertilizer application strategies for corn

	Acres in 2011	Acres in 2015	Acres in 2017
Acres of corn planted	12,600,000	11,700,000	11,200,000
Fall/winter nitrogen was applied with a nitrification inhibitor	3,240,000 or 26% of planted acres	2,970,000 or 25% of planted acres	3,550,000 or 32% of planted acres
Spring nitrogen was applied with a nitrification inhibitor	Not asked	Not asked	2,790,000 Or 25% of planted acres

Producers also used nitrification inhibitors when applying fertilizer in the spring. Tables 4.16 and 4.17 show that 25% of tiled corn acres were fertilized in the spring with a nitrification inhibitor and 9% of non-tiled acres were fertilized in the spring with a nitrification inhibitor. Figure 4.24 summarizes fall/winter nitrogen application with a nitrification inhibitor for tile drained and non-tile drained corn.

Table 4.17. Non-tiled acres with fertilizer application strategies for corn

	Acres in 2011	Acres in 2015	Acres in 2017
Acres of corn planted	12,600,000	11,700,000	11,200,000
Fall/winter nitrogen was applied with a nitrification inhibitor	Not asked	Not asked	1,040,000 or 9% of planted acres
Spring nitrogen was applied with a nitrification inhibitor	Not asked	Not asked	1,020,000 or 9% of planted acres

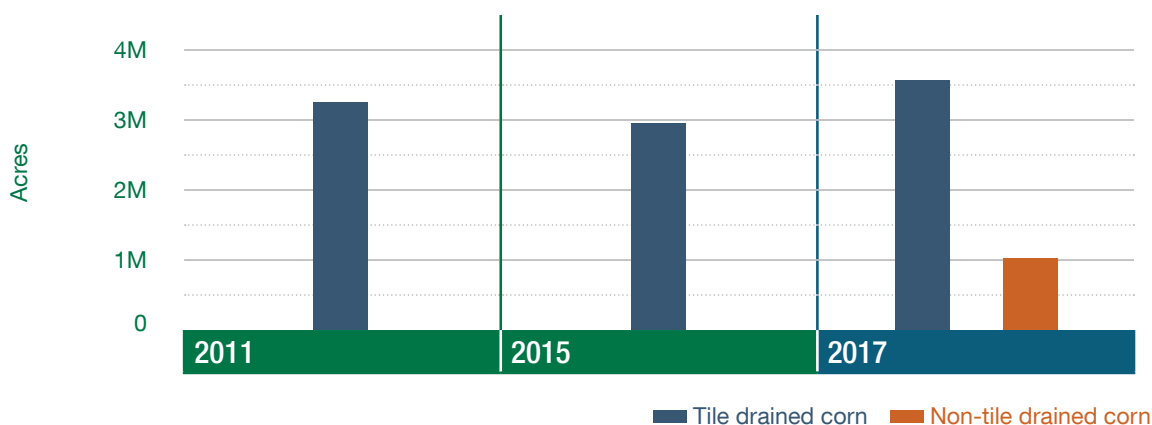


Figure 4.24. Acres where fall/winter nitrogen was applied with a nitrification inhibitor.



Fertilizer Application Strategies

For the timing of fertilizer applications, Illinois NLRS recommends several strategies. The survey queried producers about which strategy they used, if any, in preparation for the 2017 corn crop.



For tilled corn acres:

- Strategy 1** Fall and winter nitrogen was less than 50% of total nitrogen: 7% of corn acres in 2017.
- Strategy 2** Fall and winter nitrogen was 0% of total nitrogen (all spring applications): 17% of corn acres in 2017.
- Strategy 3** Less than 50% fall/winter applications, with remaining nitrogen applications split between pre-plant and side-dress applications: 16% of corn acres in 2017.

Table 4.18. Tiled acres with fertilizer application strategies for corn

	Acres in 2011	Acres in 2015	Acres in 2017
Acres of corn planted	12,600,000	11,700,000	11,200,000
Fall/winter nitrogen was 50% or less of total nitrogen	940,000 or 7% of planted acres	950,000 or 8% of planted acres	780,000 or 7% of planted acres
Fall/winter nitrogen was 0% of total nitrogen (all spring applications)	2,480,000 or 20% of planted acres	2,660,000 or 23% of planted acres	1,850,000 or 17% of planted acres
Less than 50% fall/winter applications, with remaining nitrogen applications split between pre-plant and side-dress applications	1,730,000 or 14% of planted acres	2,220,000 or 19% of planted acres	1,790,000 or 16% of planted acres

The most recent survey, for the first time, questioned farmers about non-tiled acres. Those results are presented in Table 4.19. Figures 4.25, 4.26, and 4.27 summarize fall/winter nitrogen application strategies for tile drained and non-tile drained corn.





Table 4.19. Non-tiled acres with fertilizer application strategies for corn

	Acres in 2011	Acres in 2015	Acres in 2017
Acres of corn planted	Not asked	Not asked	11,200,000
Fall/winter nitrogen was 50% or less of total nitrogen	Not asked	Not asked	340,000 or 3% of planted acres
Fall/winter nitrogen was 0% of total nitrogen (all spring applications)	Not asked	Not asked	1,250,000 or 11% of planted acres
Less than 50% fall/winter applications, with remaining nitrogen applications split between pre-plant and side-dress applications	Not asked	Not asked	930,000 or 8% of planted acres

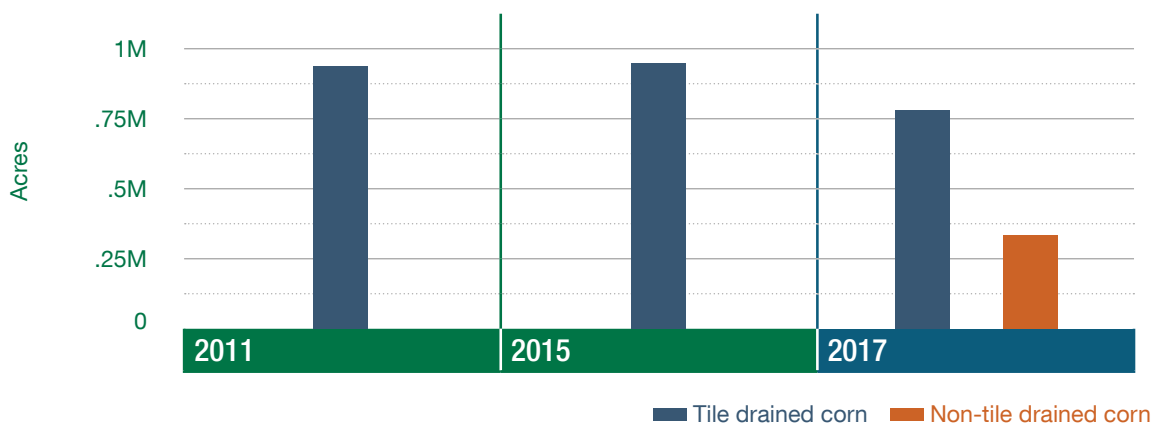


Figure 4.25. Acres in which fall/winter nitrogen was 50% or less of total nitrogen.

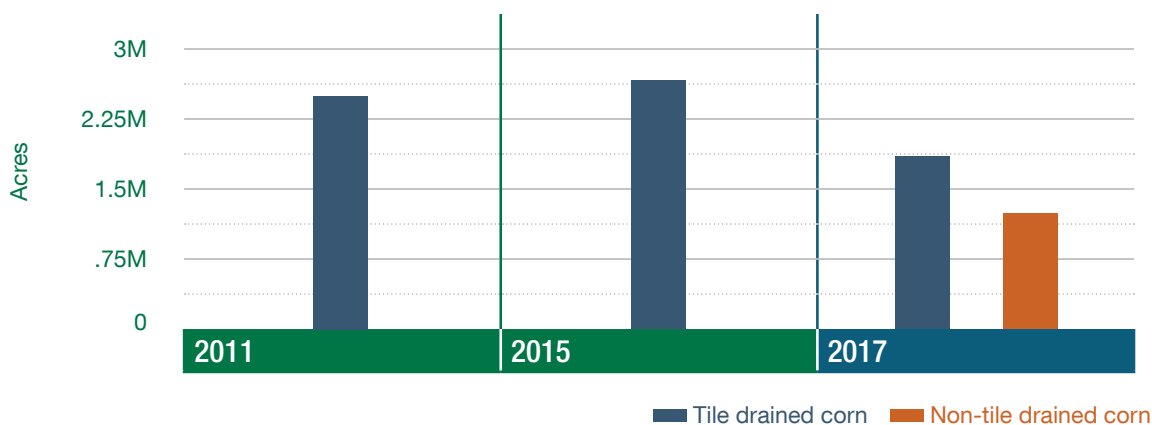


Figure 4.26. Acres in which fall/winter nitrogen was 0% of total nitrogen (all spring applications)

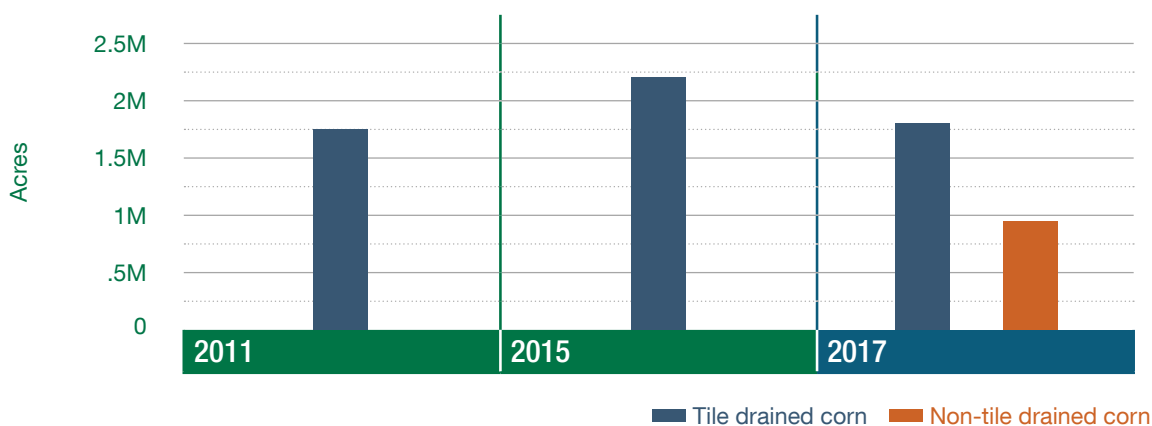


Figure 4.27. Acres in which less than 50% of fall/winter applications, with remaining nitrogen applications split between pre-plant and side-dress applications.

Phosphorus Management

Since 2011, many producers have reduced the amount of phosphorus they apply. Survey results in Table 4.20 show that producers reduced applications on 4.44 million acres of tilled cropland and 2.15 million acres of non-tilled cropland. Many producers have also changed their phosphorus application methods from broadcast to subsurface or banding. The survey shows that those changes took place on 1.53 million tilled acres and 280,000 non-tilled acres.

Table 4.20. Acres with reduction in phosphorus applications

		Acres
Tiled acres	Acres where phosphorus application rates were reduced since 2011	4,440,000
Non-tilled acres	Acres where phosphorus application rates were reduced since 2011	2,150,000
Tiled acres	Acres where placement of phosphorus applications were moved from broadcast to subsurface or banding	1,530,000
Non-tilled acres	Acres where placement of phosphorus applications were moved from broadcast to subsurface or banding	280,000

Table 4.21 shows reported reasons (and associated acres) for reducing phosphorus applications—producers were most frequently motivated as a response to soil test results. Other reasons included costs, followed closely by updates to Illinois Agronomy Handbook phosphorus removal rates. It is important to note that several different reasons may be cited as evidence to reduce phosphorus applications on the same acres.



Table 4.21. Reasons cited for reducing phosphorus applications

	Acres
Soil test information	4,520,000
Other, including cost	2,420,000
Updates to the Illinois Agronomy Handbook phosphorus removal rates	2,390,000

Cover Crops

The survey included questions on cover crop seeding in 2017 on both tilled and non-tilled acres. The questions were phrased to capture both cover crops seeded into standing crops that year or after the crop was harvested. Cover crops include oats, radishes, winter wheat, rye, and many others. Table 4.22 shows that 290,000 acres were seeded to cover crops on tilled acres and 420,000 acres were seeded to cover crops on non-tilled acres.

Table 4.22. Cover crop questions for tilled and non-tilled acres

	Acres
Corn/soybean acres planted to cover crops after the 2011 crop season on tilled ground.	220,000
Corn/soybean acres planted to cover crops after the 2011 crop season on non-tilled ground.	380,000
Corn/soybean acres planted to cover crops after the 2015 crop season on tilled ground.	490,000
Corn/soybean acres planted to cover crops after the 2015 crop season on non-tilled ground.	630,000
Corn/soybean acres planted to cover crops after the 2017 crop season on tilled ground.	290,000
Corn/soybean acres planted to cover crops after the 2017 crop season on non-tilled ground.	420,000

The graph in Figure 4.28 displays the total acres of cover crop data for 2011, 2015 and 2017 regardless of whether they are tilled or not. The graph also includes data from the national Census of Agriculture for 2012 and 2017, which demonstrates increases in cover crop adoption.



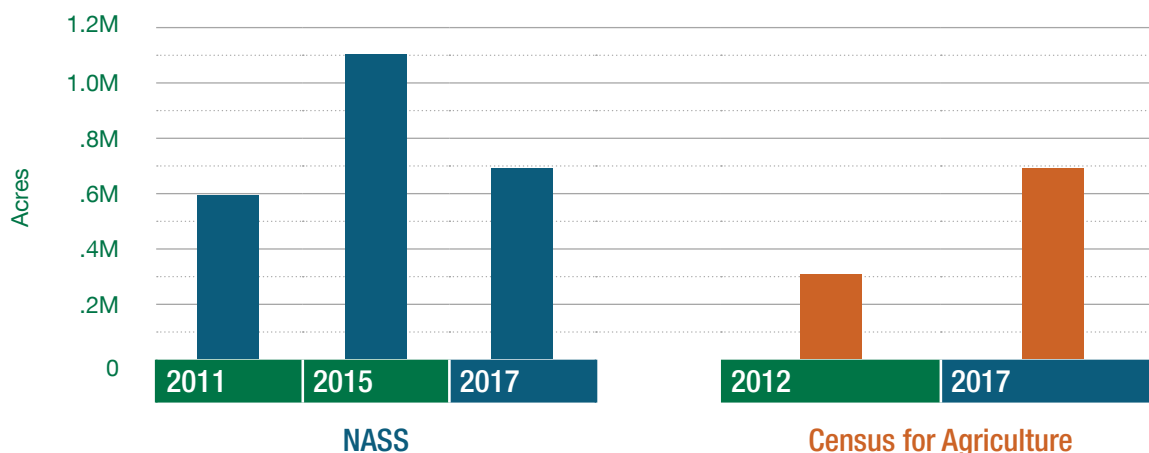


Figure 4.28. Cover crop acres in Illinois, with data from NASS and the Census for Agriculture.

Edge-of-Field Questions

The survey included questions on edge-of-field practices like bioreactors, constructed wetlands, and saturated buffers. Farmers were asked how many of their tilled acres drain into each practice. The results are in Table 4.23 and Figure 4.29.

While the survey results for bioreactors cannot be published due to confidentiality constraints—denoted as (D) in Table 4.23—it can be inferred that very few tile-drainage systems in Illinois have bioreactors installed. Numbers for constructed wetlands are similar to previous survey results. Data for saturated buffers are only available for 2017. No saturated buffer information exists for 2011.

Table 4.23. Acres with edge-of-field practices.

	Acres in 2015	Acres in 2017
Tiled acres draining into bioreactors	(D)	(D)
Tiled acres draining into constructed wetlands	160,000	160,000
Tiled acres draining into saturated buffers	Not asked	390,000
Tiled acres planted to perennial crops, including CRP plantings, hay, and miscanthus	230,000	Not asked

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

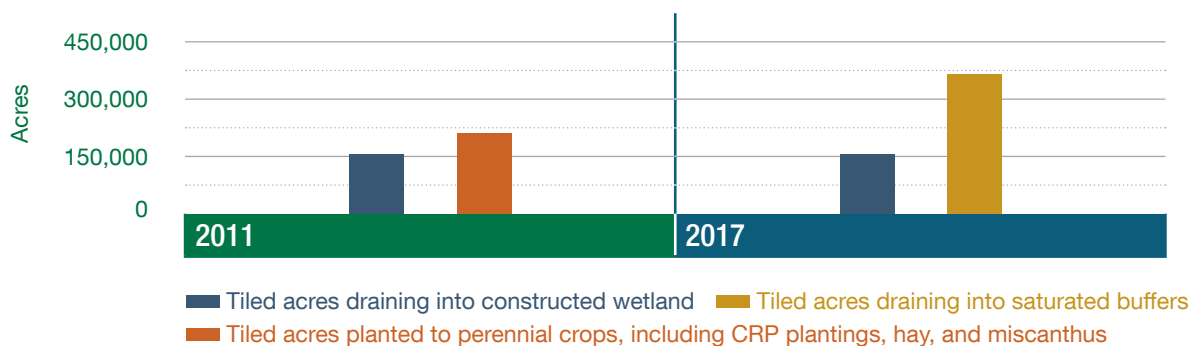


Figure 4.29. Acres with edge-of-field practices and perennial crops.

NRCS: Regional Conservation Partnership Program

In addition to through cost-share programs, NRCS also funds projects in Illinois through the Regional Conservation Partnership Program. The following section is an overview of the program, including associated maps. The Programs and Projects section and the Appendix include more detail on some of these.

Conservation Cropping Systems—Improving Soil Health: Assessment, Comprehensive Planning, and Implementation on Illinois Target Farms

This project addresses soil health, water quality, and soil erosion. The Illinois Department of Agriculture, along with the Illinois Association of Soil and Water Conservation Districts, 97 local SWCDs, and other agricultural entities are developing approximately 100 Soil Health Model Farms throughout Illinois (See Figure 4.30). The conservation districts provide technical assistance, recruit farmers, hold regional or small group orientation meetings, conduct transect surveys, collect data, and more. Through NRCS, this project was awarded \$1.6 million in EQIP financial and technical assistance over a 5-year period.

BMP Implementation for Nutrient and Sediment Loss Reduction in Macon County

This project addresses nutrient and sediment loss on agricultural lands in the Sangamon River Watershed (See Figure 4.30). Through this project, the Macon County SWCD and its partners measure outcomes, document the number of practices installed on the land, and estimate pollutant load reductions for each site using the U.S. EPA Region 5 Model. They also determine the effectiveness of newer edge-of-field practices and their ability to reduce nitrate loss through subsurface drainage. The Natural Resources Conservation Service awarded this project with \$600,000 in EQIP financial and technical assistance over a 5-year period.





Shorebird Conservation Acreage via Drainage Water Runoff Control

This project, led by the University of Illinois, installs drainage water management (DWM) in agricultural fields across portions of central Illinois. This area, a primary stopover location for migrating shorebirds and waterfowl, hosts nearly the entire population of American golden plover (*Pluvialis dominica*), a bird species of conservation concern. Through this project, DWM fields are established to provide temporary habitat for these migrating species in Champaign, Christian, Clark, Coles, Cumberland, Douglas, Edgar, Macon, Moultrie, Piatt, Shelby, and, Vermilion counties (See Figure 4.30). The Natural Resources Conservation Service awarded this project with \$500,000 in EQIP financial and technical assistance over a 5-year period.



Regional Conservation Partnership Program (RCPP)



Legend

-  Illinois Department of Agriculture area
-  University of Illinois CC area
-  Macon SWCD area

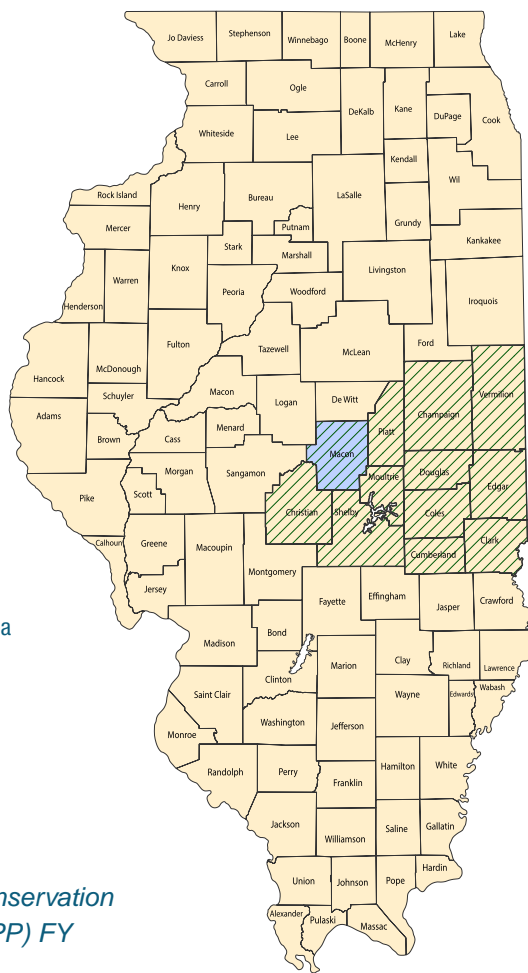


Figure 4.30. Regional Conservation Partnership Program (RCPP) FY 2014-2015



Upper Macoupin Creek Watershed Partnership

Through the new Upper Macoupin Creek Watershed Partnership with NRCS, the American Farmland Trust (AFT) and 11 partners address a major barrier to BMP implementation—the need for expensive new equipment—by offering reduced rate custom application with a new tillage tool, the “SoilWarrior,” allowing for strip tillage, nutrient placement, and cover crop seeding all in one pass. The project partners, in partnership with Blackburn College, also raise awareness of soil loss from unmanaged forestlands by establishing a forest management demonstration site. This effort is in response to requests from a traditionally underserved community in the watershed to help with sedimentation issues. See the Partner Project Update section for more.



Upper Macoupin Creek Watershed Partnership

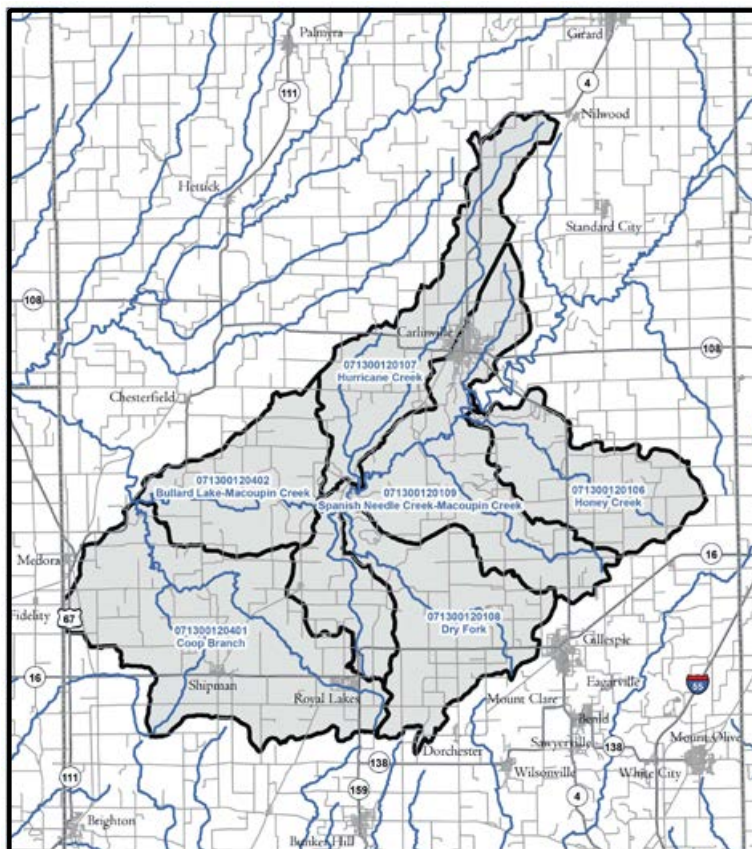


Figure 4.31. Upper Macoupin Creek Watershed Partnership



Precision Conservation Management

In response to Illinois NLRs, the Illinois Corn Growers Association developed Precision Conservation Management (PCM), a service program helping farmers adopt conservation practices in a financially responsible way. The program helps farmers identify the best conservation practices for their specific farming operations, as well as their conservation interests and business goals.

Through collaborations with more than 30 partners and the development of a farmer-friendly data collection platform, PCM offers: one-on-one technical support; confidential yearly reports of each farmer's environmental and financial strengths and weaknesses; data summaries demonstrating average financial and environmental metrics for different management systems; and opportunities to receive financial and technical assistance for adopting new conservation practices. To learn more about PCM, see the program summary and 4-year data highlights in the Non-Governmental Organization Programs and Projects section.



Precision Conservation Management

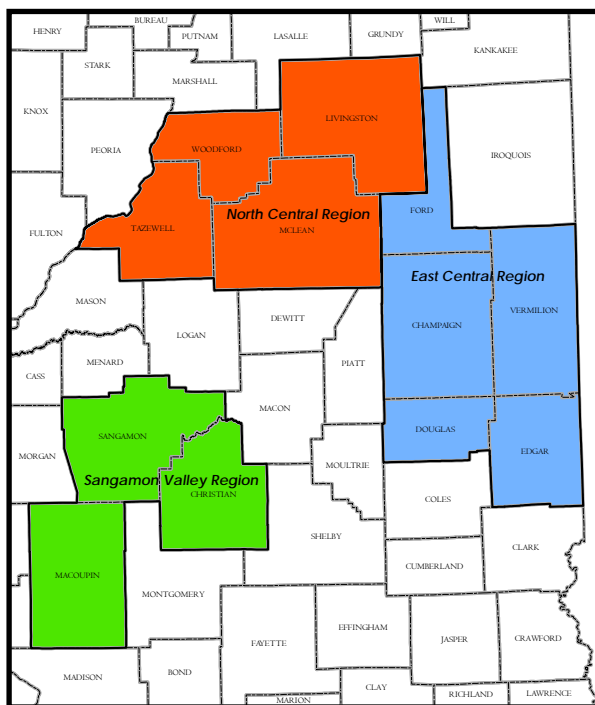


Figure 4.32. Precision Conservation Management



Improving Oak-Hickory Forest Health in Illinois

The Illinois Forestry Partnership addresses the decline of tree species diversity, specifically, the lack of oak regeneration, in Illinois forests. The oak-hickory forest type has been reduced by 16% since 1962—this reduction will continue if oaks remain underrepresented in younger-age classes. This decline is the result of 1) fire suppression, 2) the impacts of exotic and invasive herbs, shrubs, vines, and trees, and 3) a lack of applied management strategies to address soil health, water quality, and soil erosion resource concerns and to restore the appropriate forest cover in the oak-hickory ecosystem on nonindustrial private forest land. The project focuses on four target areas covering 37 counties in the state and representing 1.1 million acres of oak-hickory forest type—about half of the remaining ecosystem.



Illinois Forestry Partnership

Legend

- Northwest area
- Lower Illinois River
- Wabash River area
- River to River area

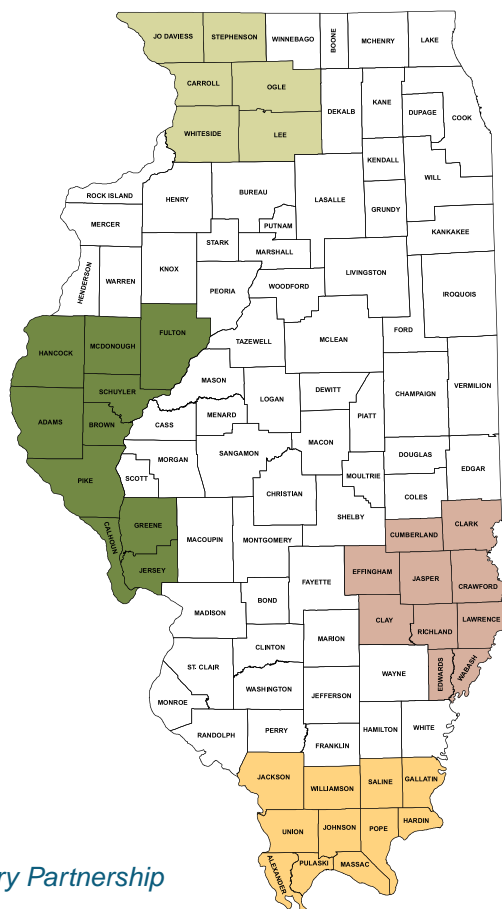


Figure 4.33. Illinois Forestry Partnership



Other NRCS Initiatives

Mississippi River Basin Healthy Watersheds Initiative

Through the Mississippi River Basin Healthy Watersheds Initiative, NRCS and partners work with producers and landowners to implement voluntary conservation practices that improve water quality, restore wetlands, enhance wildlife habitat, and sustain agricultural profitability in the Mississippi River Basin. (See map.)

Photo courtesy of C. Eliana Brown



Mississippi River Basin Healthy Watersheds Initiative

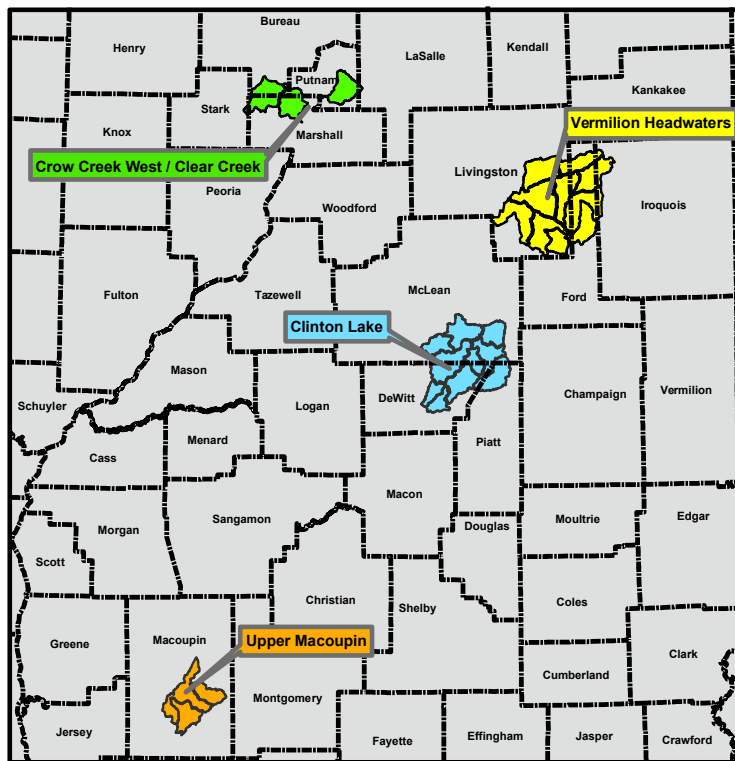


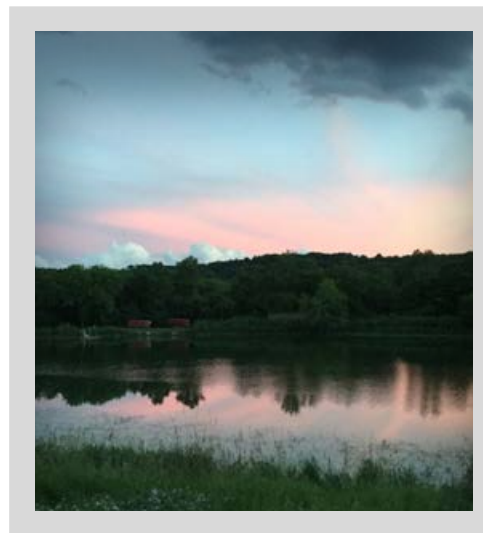
Figure 4.34. Mississippi River Basin Healthy Watersheds Initiative (FY 2017)



National Water Quality Initiative

Through the National Water Quality Initiative, eligible producers invest in voluntary conservation practices to contribute to cleaner water for their neighbors in impaired watersheds where federal investments can improve water quality. Using EQIP funds, NRCS provides financial and technical assistance to producers to implement cover crops, grassed waterways, terraces, and water and sediment control basins.

Photo courtesy of Katrina Widholm



National Water Quality Initiative Watersheds

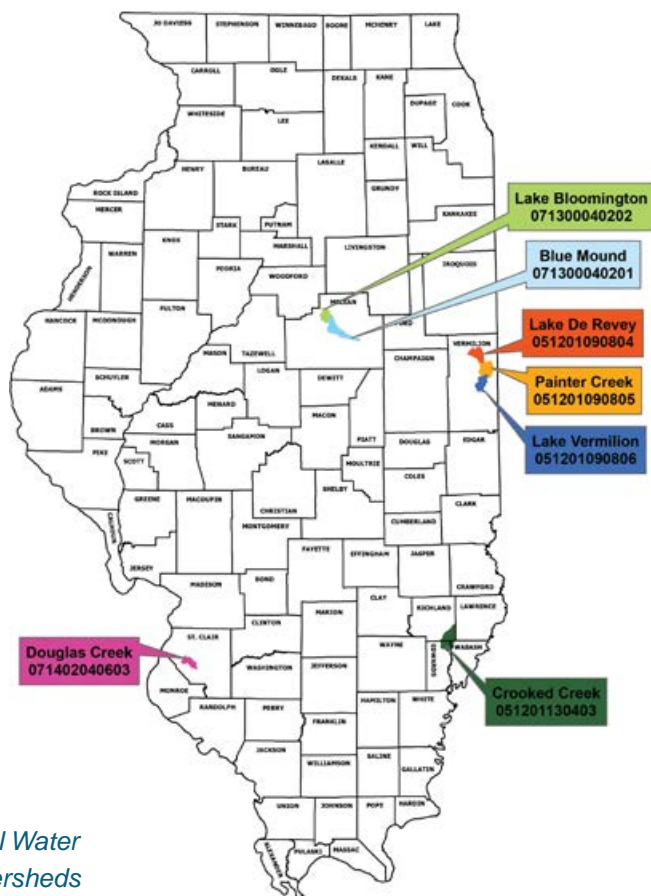


Figure 4.35. National Water Quality Initiative Watersheds



Metric Collection

Collecting agriculture metrics is challenging. The data do 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 all cases, the best obtainable information was used for this report.



Photo courtesy of The Nature Conservancy





Current Programs and Projects Supporting Nutrient Loss Reduction Goals

In Illinois NLRS, there were 39 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. Below is a list of all programs referenced in the strategy. The following section highlights programs that have undergone significant changes or have noteworthy updates, and it describes three new efforts that have been initiated since the 2017 biennial report.

During a time of restricted state funding, Illinois was able to make substantial progress on these initiatives thanks to numerous partnerships that leveraged resources.

Table 4.24. Agriculture programs and projects working toward Illinois NLRS goals

State Programs and Projects

Conservation Reserve Enhancement Program	p.34
Partners for Conservation Cost-Share Program	p.41
Section 319	p.43
State Revolving Fund	Illinois NLRS p.6-3
Streambank Stabilization and Restoration Program	p.70

Federal Programs and Projects

Conservation Stewardship Program	p.38
Cost-Share and Technical Assistance Funding.....	Illinois NLRS p.6-7
Easement Programs.....	Illinois NLRS p.6-6
Environmental Quality Incentives Program	p.37
Driftless Area Landscape Conservation Initiative.....	Illinois NLRS p.6-8
Mississippi River Basin Initiative	p.65
National Water Quality Initiative	p.66
Regional Conservation Partnership Program	p.60

Non-Governmental Organization Programs and Projects

4R Metrics	p.79
4R4U: A Nutrient Stewardship Partnership	p.70
5-Year Soil Health Transition	p.74





Advanced Conservation Drainage Training	p.73
Advanced Soil Health Training	p.73
Building Connections with Absentee Farmland Owners.....	2017 Biennial Report p.42
Cover Crop Training Initiative	Illinois NLRS p.6-10
Crop Grower Satellite Imagery Analysis	p.76
Demonstration Farm Partnership	Illinois NLRS p.6-11
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The Franklin Demonstration and Research Farm	p.71
Free, Confidential Water Testing Program.....	2017 Biennial Report p.44
Illinois Alphabet Soup Group	p.75
Illinois Buffer Partnership	p.71
Illinois Cover Crop Programs	p.72
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The S.T.A.R. Farmer Recognition Program	p.74
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New Initiatives Supporting Nutrient Reduction Goals

Edge-of-Field Partnerships for Saturated Buffers	88
Edge-of-Field Partnerships for Woodchip Bioreactors	89
Fall Covers for Spring Savings	89
Illinois Extension Watershed Outreach Associates	90

(Bold type and page number indicate an update in this report. Details about programs listed in non-bold type and page number can be found in the listed document.)





State Programs and Projects

Streambank Stabilization and Restoration Program

Severely eroding streambanks can contribute as much as 30–50% of the sediment entering waterways. To stabilize and restore streambanks that would otherwise contribute sediment to the state’s rivers and tributaries, IDOA, with assistance from SWCDs, administers the Streambank Stabilization and Restoration Program. Funded through Partners for Conservation, this program provides support for using low-cost techniques to stabilize eroding streambanks, including rock riffles, stone toe protection, and bend weirs (www2.illinois.gov/sites/agr/Resources/Conservation/Pages/default.aspx).

The program is funded at \$100,000 per year; it covers approximately 40% of the cost, with the remainder paid by landowners or applicants.

From 2017 to 2018, through 12 projects altogether, 1.13 miles of eroding streambank was stabilized, resulting in a 1,406-ton reduction in sediment loss. These efforts reduced nitrate-nitrogen loading by 2,811 pounds and total phosphorus by 1,406 pounds.

Non-Governmental Organization Programs and Projects

4R4U

The Illinois Farm Bureau and GROWMARK continue to collaborate on the 4R4U program to demonstrate and investigate 4R nutrient stewardship practices at the local level. This statewide partnership, which includes County Farm Bureaus and FS Companies, aims to bring awareness to nutrient stewardship through the 4R approach: right source, right rate, right time, and right place (www.4r4u.com/). Local test plots are 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 include nitrogen-rates, multiple nitrogen applications, stabilizers, no-till planting, cover crops, soil samples, and a new approach—saturated buffers.

Field Laboratories

The Illinois Corn Growers Association and University of Illinois have established a 160-acre field laboratory in Macon County to assess conservation practices from agronomic, economic, and environmental perspectives. The field lab provides 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 field laboratory currently serves three teams of University of Illinois researchers studying the impacts of nutrient management, soil health, and sensor technologies on water quality, crop production, and net farm financial returns.

The Franklin Demonstration and Research Farm

The Franklin Demonstration and Research Farm in McLean County is a model of sustainable agriculture. It demonstrates first-hand how nature and agriculture can coexist to produce benefits for crop production, water quality, and habitat preservation (www.nature.org/en-us/get-involved/how-to-help/places-we-protect/the-mackinaw-river-watershed/).

Seven constructed wetlands were installed more than ten years ago to intercept tile drain flow before it reaches the larger watershed. Researchers from The Nature Conservancy, University of Illinois, and Illinois State University have been investigating the effectiveness of these constructed wetlands since 2007 by quantifying nutrient reductions, retention times, denitrification potentials, and groundwater interactions.

The farm also provides an opportunity to engage in outreach through more than 150 tours for landowners, producers, university students, scientists, partners, staff members, and elected officials.

Illinois Buffer Partnership

The Illinois Buffer Partnership is a statewide Trees Forever program that promotes and showcases (through partnerships) the voluntary efforts of farmers, landowners, and communities in the planting, maintenance, and enhancement of conservation buffers to reduce soil erosion, improve water and soil quality, and provide wildlife and pollinator habitat (www.treesforever.org/Illinois_Buffer_Partnership).

Annually, between 10 and 20 Illinois Buffer Partnership participants are eligible to receive the following: cost-share assistance, on-site technical assistance from Trees Forever, project signs, and the opportunity to host a field day to highlight their project. Eligible conservation projects include riparian buffers, livestock buffers, streambank stabilization projects, wetland development, pollinator habitat, rain gardens, and agroforestry.





In 2017 and 2018, Trees Forever provided \$60,000 and technical assistance to 40 landowners across Illinois to plant native trees, shrubs, forbs, and grasses to improve water quality, reduce erosion, and provide wildlife and pollinator habitat. Through 64 presentations throughout the state, Trees Forever reached 5,907 people, covering a range of subjects—soil health, riparian buffers, native plants, pollinators, agroforestry, forest and pest management, tree care, improved water and air quality, species diversity, invasive species management, erosion reduction, establishing and maintaining BMPs, energy efficiency, and plant identification. In addition, Trees Forever hosted six workshops and field days with 124 attendees as well as hosted a display at 11 conferences, reaching 8,575 people.

Illinois Cover Crop Programs

In the fall of 2015, Beck's Hybrids began offering Illinois Corn Growers Association (ICGA) members opportunities to share expenses that are associated with the initial adoption of cover crops. The programs 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 (www.ilcorn.org/covercrops):

- ☑ **1st Time Cover Croppers:** through ICGA and Beck's Hybrids partnership, 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 an ICGA and Beck's Hybrids partnership, 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.

Illinois Corn Growers Association is an ardent supporter of cover crops, developing and leading programs for ICGA members that have resulted in the planting of more than 80,000 cover crop acres over the past four growing seasons in Illinois.





Illinois Sustainable Agriculture Partnership

The Illinois Sustainable Ag Partnership (ISAP) is a coalition of organizations working collaboratively on programs that promote whole system conservation with a focus on soil health and water management to reduce nutrient losses and meet sustainability goals (ilsustainableag.org/). The partnership is providing coordination across sustainable agriculture programs and with other partners in the state.

Experts and scientists provide technical advice for farmers, retailers, and advisors through online and printed materials and through online forums around soil health and conservation drainage. Efforts will focus on translating technical information and designing programs to reach average farmers and their advisors. Members of ISAP include American Farmland Trust, Association of Illinois Soil and Water Conservation Districts, Illinois Central College, Illinois Corn Growers Association, Illinois Land Improvement Contractors Association, Precision Conservation Management, Soil Health Partnership, The Nature Conservancy (TNC), The Wetlands Initiative, University of Illinois Extension, and The Zea Mays Foundation.

Advanced Conservation Drainage Training

Through intensive classroom and hands-on training, drainage designers, contractors, farmers, farmer advisors, retailers, and conservation practitioners can better understand the implementation and functioning of edge-of-field practices. This project, led by TNC, helps streamline the process for farmers and make conservation drainage a standard part of tile installation and farm management. The training series covers various parts of the state with a focus on local resource concerns, conditions, and partners. A primary goal of this training is to create a strong network of professionals to interact with farmers about improved water management and to support that network through ongoing communication, resources, and discussion forums. In 2018, 20 trainees from across the state completed three sessions and the steering committee already has plans for 2019 (ilsustainableag.org/programs/advanced-conservation-drainage-training/).

Advanced Soil Health Training

Led by TNC, this training project addresses the need to increase the number of Illinois farmers, retailers, certified crop advisors, and conservation practitioners who understand the science of soil health and related production management changes. This intensive, classroom and in-field training model creates a cadre of conservation practitioners and farmer advisors as well as resources for implementing soil





health systems. The focus is on the technical details of shifting to improved soil health practices, the science behind why they work, and implementation programs as well as messaging, communication, and outreach to farmers on benefits to their farm and the environment. In 2018, 25 trainees in the Upper Sangamon Watershed completed four two-day sessions. The Nature Conservancy also helped launch the program in the tri-state area—a region that encompasses where Illinois, Indiana, and Kentucky meet—in partnership with University of Illinois Extension and the Zea Mays Foundation (ilsustainableag.org/programs/advanced-soil-health-training/).

5-Year Soil Health Transition

Through this joint effort of the Precision Conservation Management program and the Soil Health Partnership, soil health specialists guide producers through intensive management changes that come with switching from a conventional to a healthy soil focused conservation cropping system (cover crops, reduced tillage, and improved nutrient management). The specialists develop a 5-year transition plan and provide continuing one-on-one technical advice—from cover crop selection to planting and termination. The specialists help farmers with production management decisions that support the adoption of a more sustainable system, including enrolling in the Soil Health Partnership Associate Program to track soil quality changes through the transition period.

Farmers begin the program in year one with cover crops on a 40-acre field, with a goal of sustained system change at the whole farm level by the end of year five. A localized, peer-to-peer network of program participants and interested neighbors sharing results and experiences serves as the amplifying mechanism to influence changes at a broader scale (ilsustainableag.org/programs/five-year-farmer-transition-program/).

The S.T.A.R. Farmer Recognition Program

The Saving Tomorrow's Agriculture Resources (S.T.A.R.) program gives interested farmers a long-term plan and clear expectations of how to adopt new practices that improve soil health and sustainability (ilsustainableag.org/programs/five-star/). It provides encouragement, recognition, and peer acceptance as well as a mechanism for tracking and verifying practice





changes at a county level. The Illinois Sustainable Ag Partnership (ISAP) is working with the Association of Illinois SWCDs and Champaign County SWCD to expand the S.T.A.R. Program, which awards points for adopting nutrient loss reduction practices.

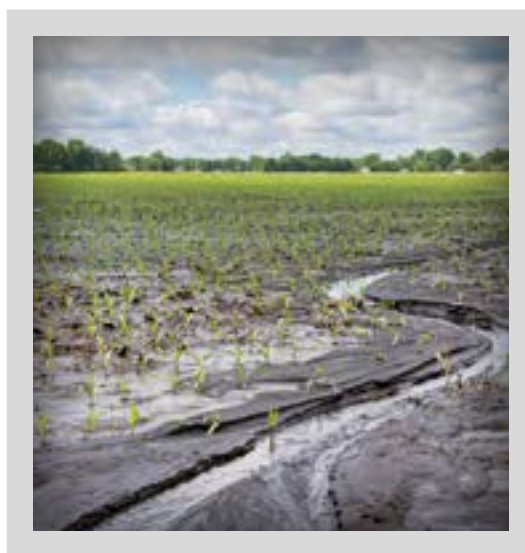
From improved nutrient management to cover crops, to edge-of-field water treatment, and even crop rotation or inclusion of livestock, a suite of practices can result in one to five stars. After the evaluation process using the S.T.A.R. tool, farmers receive field signs with their earned stars, which can be increased as they adopt additional practices. The signs provide farmers with recognition of their good work and create awareness in the farming community. The ratings are county specific and vetted by a local technical advisory committee.

Illinois Alphabet Soup Group

In partnership with the Illinois Soybean Association, ISAP members are providing leadership for the Illinois Alphabet Soup Group. This group of agriculture professionals, conservation practitioners, farmer advisors, and industry partners gathers quarterly to learn about issues, strategies, programs, and resources to encourage farmers to implement nutrient reduction and conservation practices. Meetings are hosted at various locations across the state to provide regionally focused information and networking opportunities. The group comes together annually for a statewide meeting that brings in national partners and perspectives on sustainable agriculture.

Risk Management Conference

This annual conference brings together farmers and their advisors to talk about soil health and water management from a risk management perspective, addressing weather, production resiliency, economics, business drivers, and sustainability. Conference organizers focus on farmers' concerns about productivity, profitability, and changing climate and market forces. They present soil health systems as a promising solution for both farm and environmental sustainability (ilsustainableag.org/event/isap-risk-management-conference/).





Local Farmer-Led Networks

These networks build on the capacity created through ISAP advanced training programs. Local farmer or advisor networks recruit and incentivize graduates to continue learning about, and supporting, the long-term transition to more sustainable production systems. The networks will connect participants from the Precision Conservation Management, Soil Health Partnership Associate, and S.T.A.R. programs through consistent information and messaging. The networks are a mechanism for encouraging social change, recruiting new farmer participants, creating peer pressure, and prioritizing soil health, improved nutrient management, and conservation drainage systems (ilsustainableag.org/homepage/isap-seeks-facilitators-lead-farmer-farmer-peer-networks/).

Crop Grower Satellite Imagery Analysis

This project allows ISAP to measure on-the-ground progress toward the adoption of conservation practices and soil health systems in Illinois (ilsustainableag.org). The Illinois Corn Growers Association and TNC are working together to complete a biannual assessment of buffers, cover crops, and tillage practices across the state using analysis of high-resolution satellite imagery. Initial results were completed at the end of 2018 and the report will be shared on the ISAP website.

Keep it 4R Crop

The Illinois Fertilizer & Chemical Association's Keep it 4R Crop program is based on the principles of 4R nutrient stewardship described earlier as: right source, right rate, right time, and right place (www.ifca.com/4R). The association works closely with members, including fertilizer manufacturers, distributors, and agriculture retailers, to promote the 4Rs and uphold the IFCA 4R Code of Practice, which promotes education and voluntary adoption of specific fertilizer management practices designed to reduce nutrient losses and assure nutrient use by the crop.

Nitrogen Rate Trials

For nitrate-nitrogen reduction, the strategy presents a scenario in which MRTN adoption for applied nitrogen could reduce losses by 10% per acre. The Illinois Fertilizer & Chemical Association's (IFCA) program is focused on identifying farmers to place nitrogen rate trials in their fields and ensuring proper implementation using University of Illinois protocols to ensure quality data collection. The Illinois

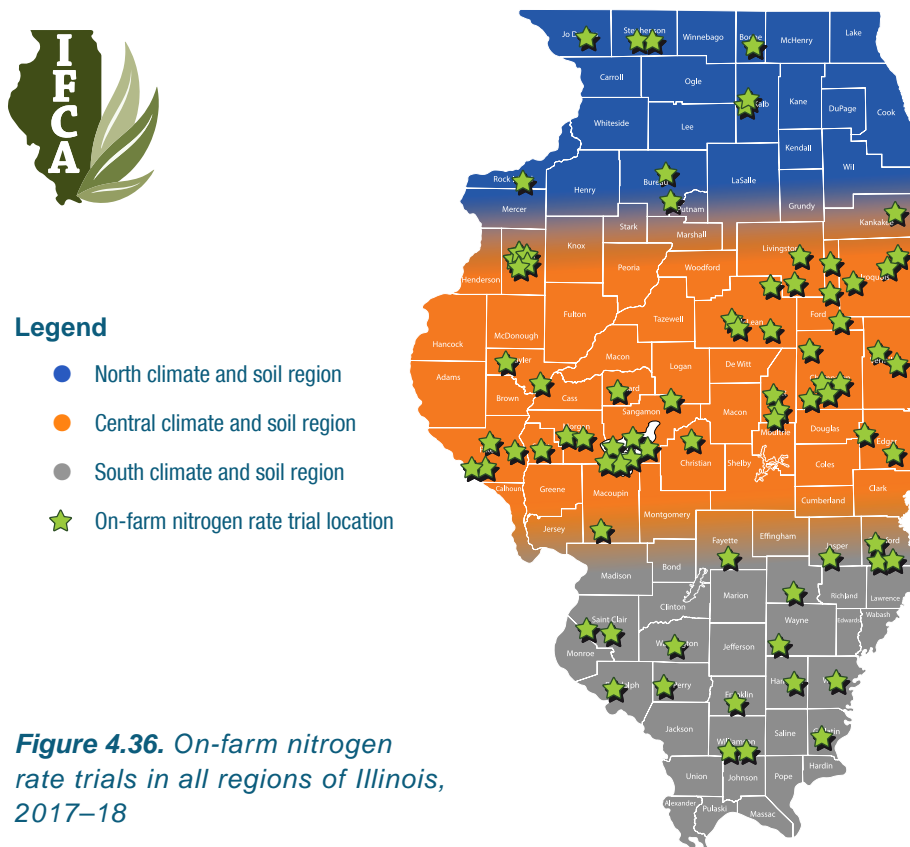


Nutrient Research & Education Council (NREC) funds IFCA and the University of Illinois to manage the trials. Nitrogen rates of 0, 50, 100, 150, 200, and 250 pounds per acre are replicated three times in each field, and data collected at harvest determines the corn response to different applied nitrogen rates, timing, and sources. The U of I Department of Crop Sciences analyzes harvest data, which is uploaded online each year to the North Central Region Land Grant University Nitrogen Rate Calculator (cnrc.agron.iastate.edu). Individual field trial results from 2014–18 are also available (ifca.com/4R/Trials).

The map (Figure 4.36) illustrates locations of on-farm nitrogen rate trials performed in 2017–18 in all regions of the state. This map illustrates the north, central, and south climate and soil regions in the Nitrogen Rate Calculator. The central region also includes a rate recommendation for the Lake Springfield Watershed. Farmers can access the Nitrogen Rate Calculator online or as a free app to determine optimum economic and agronomic nitrogen rates.



On-farm Nitrogen Rate Trials 2017–18





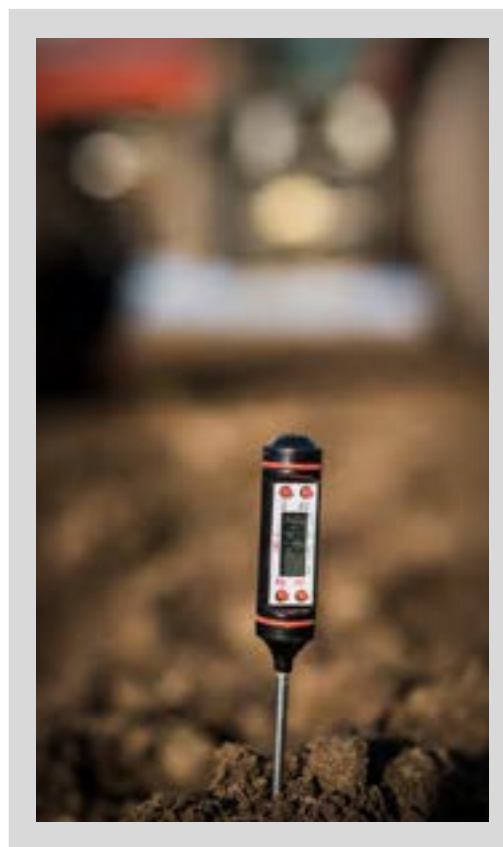
The Illinois Fertilizer & Chemical Association also worked with NREC to develop a written guide for growers to explain how the MRTN system works, the science behind the recommended nitrogen rates, and myths about nitrogen use and loss (www.ifca.com/4R/Trials).

N-WATCH™

In 2018, N-WATCH™, a nitrate soil-testing program, was incorporated into the nitrogen rate trials to provide a better scientific assessment of nitrogen uptake under various timings, rates, and environmental conditions. The program continues to provide a method for IFCA to quickly assess soil nitrogen levels when questions arise about how weather might affect applied nitrogen.

Water Supply & Industry Partnerships

The Illinois Fertilizer & Chemical Association works in concert with water supply officials for Lake Springfield, Lake Decatur, Lake Vermilion, and Lake Bloomington/Evergreen to assess nitrate levels on a monthly basis and evaluate how nitrogen management practices can help keep levels well below 10 ppm. Along with IFCA, the Sangamon County SWCD and Springfield's City Water, Light, and Power are partners on a 319 project to conduct N WATCH™ soil nitrogen sampling and to continue nitrogen rate trials with cooperating farmers, ensuring that the MRTN watershed recommendation is current and that farmers are using it. In 2018, nitrate levels in Lake Springfield were particularly low (below 2 ppm) all season long. The association also develops and distributes timely bulletins and other communication pieces focused on specific 4R practices in





these watersheds.

4R Metrics Survey

In February 2019, IFCA surveyed its retail members about fertilizer application practices based on the 4R Code of Practice. This survey captured fall fertilizer application practices for 2018, including the percentage of acres treated with 4R practices. Going forward, IFCA will survey its members every winter and summer to capture fall and spring fertilizer-application practices. The 4R metric survey results can be combined with results from the survey conducted by NASS to get a better understanding of the adoption of voluntary practices over time to reduce nutrient losses.



The results from the first 4R metric survey in the fall of 2018 (for the 2019 crop year) are as follows:

Nitrogen

- 29% of corn acres received an application of fall ammonia.
- Of the corn acres that received fall ammonia, 89% was applied after October 24.
- Of the corn acres that received fall ammonia, 92% included a labeled nitrification inhibitor.
- Of the corn acres that received fall ammonia, 78% received a rate of applied nitrogen less than the MRTN for corn-corn or corn-soybean rotation. This is an indication of a planned split nitrogen application.

Phosphorus

- 46% of acres receive variable rate application of phosphorus.
- 57% of acres received fall applied phosphorus.

Soil Test

- 79% of acres are soil tested at least once every four years.
- 31% of acres are above critical phosphorus soil test values based on crop removal rates.



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 (sandcounty-foundation.org/our-work/soil-and-water-conservation/leadership-for-midwestern-watersheds).

In addition to AFT, the 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 agricultural watersheds of the Upper Mississippi River Basin. For the last two years, the meetings were 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. When it meets, the group tackles topics that are essential to successful watershed projects, and presentations support facilitated discussions that are the meetings' core. The focus has been on engaging farmers, targeting conservation practices for the greatest impact, measuring results, governing projects, and scaling up lessons learned. Watershed practitioners from Illinois consistently comprise about 20% of LMW meeting attendees.

Nutrient Research & Education Council

The Nutrient Research & Education Council (NREC) was created in 2012 by the State of Illinois and is managed by representatives from farmer organizations, commercial fertilizer, specialty fertilizer, certified crop advisors, and IDOA. The council is a public-private partnership that assures a sustainable source of funding for nutrient research and education programs (illinoisnrec.org/). The partnership between NREC and IDOA ensures that an assessment of \$0.75/ton on all bulk fertilizer sold in Illinois is allocated to research and educational programs focused on nutrient use and water quality. From 2012 to 2018, NREC invested \$16 million in nutrient efficiency research. In 2019, an additional \$4 million will be directed towards applied research with another \$50,000 for outreach and education activities.





The Nutrient Research & Education Council funds research projects in four main categories with specific issues identified in each of the categories.

- ☑ Applying and understanding the 4Rs—identifying BMPs and expanding the understanding of these practices related to more efficient fertilizer applications and using those nutrients for crop production.
- ☑ Capturing excess nutrients in the field, primarily using cover crops, with a focus on finding the most economical methods for adopting these methods on a wide scale.
- ☑ Mitigating the loss of excess nutrients to water supplies through edge-of-field practices—woodchip bioreactors, wetlands, saturated buffers, water and sediment control basins, and other practices designed to capture nutrients before they enter water supplies.
- ☑ Studying other nutrient management issues, including the impact of tile depth and spacing, the use of gypsum, and drainage water management, as well as emerging topics such as dissimilatory nitrate reduction to ammonium for nitrate retention and the use of biochar to remove phosphorus from drainage water.

The Nutrient Research & Education Council also encourages education-based projects that incorporate research findings and effectively promote BMP implementation to farmers and crop advisers.

The group works with industry stakeholders to identify needs and prioritize areas of research. Annually, NREC requests proposals for projects that examine, test, and measure the effectiveness and economic viability of farming practices that reduce nitrogen and phosphorus losses to water and are not detrimental to agricultural production or yield.

In 2018, NREC hired a full-time research manager who is engaged in soliciting and reviewing comprehensive research projects and is connecting researchers working in similar fields across the state and region.





NREC Project Priorities

In 2019, based on the goals outlined in the strategy, NREC is focusing on needs identified by farmers and those that have emerged from previous project results. The council has asked that all projects also contain a cost-benefit analysis of adopting of these practices in a farming operation. All submitted proposals are subject to an external peer review as well as internal review by the council research committee. The committee ranks and evaluates proposals for full council review.

Nitrogen and Phosphorus Management Projects

1. Continue testing the impact of nitrogen management systems on nitrogen use efficiency.
 - a. Scale the work on the optimum nitrogen rate to include more Illinois soil types, especially in southern Illinois.
 - b. Evaluate the efficacy of combinations of 4R practices on nitrogen efficiency. Evaluate the potential for nitrogen loss from surface applied UAN.
 - c. Evaluate the BMPs, feasibility, economics, water quality, and crop productivity impacts of growing cover crops to address nitrogen and phosphorus loss. Best practices should encompass all cover crop aspects, from crop selection, seeding, and grazing, through crop termination. Plus, research should address factors that influence the time and rate of nitrogen release by cover crop residue.
2. Cover Crops: Evaluate the feasibility, economics, water quality impacts, and BMPs of growing cover crops to address nitrogen and phosphorus loss as well as crop productivity. Best management practices should examine all aspects of cover crops—from crop selection, seeding and grazing, through crop termination. There is particular interest in understanding the factors that influence the timing and rate of nitrogen release by cover crop residue.
3. Evaluate the agronomic and environmental benefits of tillage or erosion control and the placement and timing of phosphorus applications throughout the state, but with special emphasis on southern Illinois soils.

Tile and Conservation Systems

4. Evaluate drainage water management and erosion control practices (i.e. sediment basins) from both a nutrient management and an agronomic standpoint.
5. Evaluate edge-of-field practices, including bioreactors, buffers, saturated buffers, and constructed





wetlands. Further evaluation should include practical approaches to installing these systems in areas where drainage ditches are the conduit for tile drainage. Focus should be on ways to use these systems to provide the most practical benefit, while limiting land taken out of production.

Innovative Approaches to Nutrient Management

6. Push beyond the known and into innovative, forward-looking research.

In addition to detailed mid-year and year-end project reports, NREC also requires that at year-end, each project identify any new critical observations that can be shared with the industry and the public. The council also works closely with industry partners to disseminate research findings through social media feeds, in-person meetings, quarterly newsletters, and other venues.

Finally, the Nutrient Research & Education Council funded the last two Illinois NLRS surveys conducted by NASS.

Nutrient Stewardship Grant Program

The Illinois Farm Bureau (IFB) Nutrient Stewardship Grant Program continues to demonstrate success in farmer-led, local projects addressing nutrient loss. Each year, the IFB Board of Directors commits \$100,000 to this four-year old program. From this, County Farm Bureaus receive grants to work with local partners to address farmer needs and answer their questions regarding best practices for nutrient loss reduction (www.ilfb.org/take-action/current-priorities/protecting-our-environment/water-quality/).

In 2017, 18 projects in 22 counties were awarded funding, including partnerships with university researchers (some funded by the Nutrient Research and Education Council), agricultural retailers, SWCDs, local USDA offices, and many others. In



Photo courtesy of Illinois Farm Bureau





2018, 17 projects in 20 counties were funded; they included partnerships with private consultants, community colleges, and many others.

Projects vary depending on local needs. For example, funding might support meetings and educational seminars as well as field day implementation and BMP demonstrations for reducing nutrient loss. Funded research includes data collection and analysis on the long-term impacts of practices. Project partners implement practices featured in Illinois NLRs, ranging from in-field ones like nitrogen management and cover crops to edge-of-field practices like woodchip bioreactors.

Since 2017, IFB and the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) have collaborated in many ways, including several farmer leader tours, meetings with MWRDGC leadership at the Stickney Plant, field days, and research collaboration at the MWRDGC Fulton County site.

Illinois Farm Bureau has also collaborated with several researchers at University of Illinois and Southern Illinois University Carbondale to identify farmers across the state interested in hosting on-farm research on saturated buffers, woodchip bioreactors, drainage water management, gypsum application, cover crops, struvite, and water and sediment control basins. The Illinois Farm Bureau also connects researchers with farmer audiences for education and outreach opportunities regard-



Photo courtesy: Laura Christianson





ing ongoing research projects and findings.

Precision Conservation Management

As mentioned earlier in this chapter, Precision Conservation Management is the Illinois Corn Growers Association's premiere nutrient loss reduction program (www.precisionconservation.org/).



As a farmer-led agricultural service program, PCM provides one-on-one consultations with farmers to help identify BMPs for their specific operations, conservation interests, and business goals. The program correlates conservation practices with financial outcomes, providing Illinois farmers with the profitability information they need to make conservation practice adoption decisions. Since farmers began enrolling in PCM in 2016, the program has expanded in scope and scale. In fact, almost 300 farmers are enrolled, representing over 250,000 acres of farmland. Five full-time PCM specialists work directly with these farmers in 16 Illinois counties and 10 western Kentucky counties.

Every year, the primary deliverable to PCM farmers is the Resource Analysis and Assessment Plan (RAAP), a highly individualized report that is hand-delivered by a PCM specialist. Each RAAP provides sustainability and financial assessments, financial assistance opportunities, and local resource concerns for every farmer. Every RAAP and all data collected by PCM is held in the strictest confidence, protected by the Heartland Science and Technology Group. Data is only shared in an aggregated and anonymized format.

As a result of its success in reaching farmers and initiating demonstrable change, the program is attracting new partners who offer PCM farmers financial assistance for on-the-ground conservation practices. For example, in 2018, PCM funded 12,000 acres of cover crop cost share with assistance from Mars Pet Food, PepsiCo, The Nature Conservancy, and the Council for Best Management Practices. Precision Conservation Management and the Illinois Corn Growers Association are partners in the Illinois Sustainable Ag Partnership, also highlighted in this report.

The following tables highlight examples of PCM findings.





Nitrogen: The program’s financial analysis of nitrogen fertilizer management demonstrates that corn-fields receiving more than 40% of the total nitrogen application in the fall (>40% Fall in Table 4.25) produced the same or lower corn yields and also received higher nitrogen fertilizer application rates relative to other nitrogen management strategies, resulting in reduced net financial return.

The most profitable nitrogen application system was less than 40% of the total nitrogen application in the fall with the balance approximately split between pre-plant and side-dress applications (referred to as the “3-way split”).

Table 4.25. Economic returns resulting from various nitrogen management program practices.

PCM Nitrogen Management Program	>40% Fall	Mostly Pre-plant	Mostly Side-dress	50% Pre/50% Side-dress	3-Way Split
Gross Revenue	\$766	\$742	\$760	\$762	\$814
Total Non-Land Costs	\$520	\$482	\$512	\$521	\$516
Operator & Land Return	\$246	\$260	\$248	\$240	\$298

Tillage: Precision Conservation Management tillage analysis summarized the results of more than 3,600 corn and soybean fields in Illinois from 2015–18. The most meaningful analysis resulted from segregating the data according to soil productivity ratings (SPR). In the table below, we summarize economic costs and income from corn production on higher soil productivity levels (SPR>136).

Reduced tillage systems (strip tillage and 1-pass) are consistently higher yielding systems than more numerous (and more intense) tillage passes on higher productivity soils.

Table 4.26. Economic returns resulting from various tillage practices for corn production in central Illinois from 2015-18. High soil productivity rating soils (SPR>136).

PCM Tillage Standard	No-Till	Strip Till	1-PASS LIGHT	2-PASS LIGHT	2-PASS MODERATE	2+ TILLAGE PASSES
Gross Revenue	\$772	\$797	\$781	\$801	\$790	\$735
Total Non-Land Costs	\$510	\$521	\$505	\$533	\$542	\$510
Operator & Land Return	\$262	\$276	\$276	\$267	\$248	\$224





Upper Macoupin Creek Watershed Partnership

More than 20 agricultural and environmental partners in Illinois are implementing a Regional Conservation Partnership Program Project (RCPP) in the Upper Macoupin Creek (UMC) area. The project encourages farmer adoption of soil-health conservation practices that improves both farm profitability and water quality in the creek (farmland.org/project/upper-macoupin-creek-watershed-partnership/). In addition, RCPP aims to set and measure the environmental, social, and economic outcomes associated with implementing these practices. American Farmland Trust leads RCPP and is guided by the UMC Steering Committee, a 17-member group of farmers, agricultural retailers, and national and local conservation agency representatives.

American Farmland Trust has been developing the measurement and evaluation plan since 2017 to help the partnership set outcome goals; establish baseline indicators for those goals; identify partners, tools, and techniques to track indicator change over time; and regularly report on progress. The evaluation plan is continually updated, streamlined, and simplified as the project team moves closer to selecting the implementation methods and tools to quantify project outcomes. The evaluation plan changes and becomes more robust over time as more data are collected, analyzed, and interpreted. Additionally, the plan provides an opportunity to develop strategies to address new information and adaptively manage through mid-course corrections, if needed.

The Spatial Watershed Assessment and Management Model completed for the UMC project area will allow for targeting in-field and edge-of-field nutrient and sediment reduction strategies for specific sites. The model will be used to quantify current conditions, including topography, land use, and type of farming, as well to estimate sediment and nutrient load reductions from proposed BMPs on a field-by-field basis.

A new conservation technician targets and promotes conservation cropping systems and provides one-on-one conservation planning to all landowners in the project area, not just those who qualify for NRCS programs. The technician provides landowners with maps highlighting the right practices at the right places on their farms.





Women for the Land

American Farmland Trust’s national Women for the Land initiative addresses the obstacles women landowners face in accessing conservation programs and resources (farmland.org/project/women-for-the-land/). In part, the initiative hosts “learning circles” that empower women landowners to adopt environmentally sound farming practices, protect farmland, and improve the viability of their farms. Common topics discussed at learning circles include soil health and water quality.

Research shows many women farmers and landowners have a strong conservation and stewardship ethic. They are deeply committed to healthy farmland, farm families, and farm communities. However, women face gender-related barriers to managing their land for long-term sustainability. Women for the Land learning circles were created to help mend this barrier and provide them with the technical assistance they might need. Recent research confirms that learning circles work. Women in Illinois and Indiana who attended these activities from 2014–17 took part in follow up interviews—74% reported engaging in conservation action after attending. Interviews also reveal that 23% had taken an action that resulted in immediate change on the land, including the implementation of cover crops, a key practice identified by Illinois NLRs.

Many of the women expressed that they found these circles to be great for building a community, finding and knowing what resources are available, and continuing to learn about conservation in agriculture.

New Initiatives Supporting Nutrient Loss Reduction Goals

Edge-of-Field Partnership for Saturated Buffers

A new partnership kicked off in 2018 to study the saturated buffer practice. A saturated buffer connects a drainage tile outlet with an edge-of-field buffer using denitrification and vegetative uptake to remove nutrients from drainage water. The Edge-of-Field Partnership includes the Illinois Farm Bureau, Illinois Chapter of the Land Improvement Contractors of America, USDA NRCS, and Southern Illinois University (www.illica.net/2019-saturated-buffer-partnership).

The group will see the first installation in early 2019. The partners plan to establish a new saturated buffer site each year, for five years, in different counties, starting in Moultrie County. By studying sites with a saturated buffer, researchers can develop a better understanding of the benefits of this practice.





The partners are working to expand the suite of nutrient loss reduction practices practices to meet the diverse needs of farmers across Illinois.

Edge-of-Field Partnership for Woodchip Bioreactors

As part of the Edge-of-Field Partnership, the Illinois Farm Bureau, Illinois Chapter of the Land Improvement Contractors of America, USDA NRCS, and the University of Illinois College of Agricultural, Consumer and Environmental Sciences joined together in 2017 to install a woodchip bioreactor to improve water quality and implement Illinois NLRs (www.illica.net/2017-edge-of-field-partnership-bior). The purpose of the partnership is to study the effectiveness of woodchip bioreactors designed to NRCS standards on farms in the tile-drained areas of Illinois. The partners intend to install 5–10 woodchip bioreactors over five years with at least one installed each year.

University researchers will monitor the bioreactors to collect data and study water-quality improvements, and other partners will focus on education, outreach, and demonstrations targeted to government agency personnel, contractors, farmers, landowners, and the public. The intent is for these activities to continue for a minimum of five years after each woodchip bioreactor is installed. The farm sites are also expected to serve as tour settings for elected officials, regulators, and reporters.

In 2017, the first woodchip bioreactor was built on a farm near Geneseo in Henry County. The second was installed in 2018 on a farm near Walnut in Bureau County.

Fall Covers for Spring Savings

This project was previously called Crop Insurance Reward Program for Cover Crops. Cover crops are increasingly used as a conservation and crop production practice to reduce nutrient leaching, soil loss, and runoff, while also improving soil health. The strategy shows that cover cropping can be one of the most effective in-field strategies for reducing both nitrate-nitrogen and total phosphorus loss from corn and soybean fields.

Crop insurance is an integral part of the farm safety net that provides protection for farmers when adverse weather affects crop yields. Cover crops can improve the resiliency of Illinois farm operations by improving the soil's ability to absorb and hold water. Cover crops help prevent erosion and can reduce leaching of nitrate-nitrogen through tile water. Because more resilient soil





results in less yield variation from year to year, another benefit may be fewer insurance claims over time.

American Farmland Trust is leading a coalition of Illinois partners to offer a crop insurance reward program to farmers who plant cover crops and do not receive funding from other sources. The \$5-per-acre reward will be deducted from the farmer's crop insurance bill through the USDA Risk Management Agency. Applications will be prioritized based on Illinois NLRs priority watersheds. To meet water quality and soil health goals, cover crop acres must continue to increase.

This pilot program is testing whether a small crop insurance reward applied to fields planted in cover crops will incentivize more use of the practice across Illinois.

Illinois Extension Watershed Outreach Associates

As part of the Illinois Nutrient Loss Reduction Strategy implementation grant, funded by Illinois EPA, University of Illinois Extension conducted a national search to hire two watershed outreach associates. The work conducted under this grant supports the strategy through the development and delivery of education, outreach, and technical assistance centered in and focused on selected priority watershed basins.

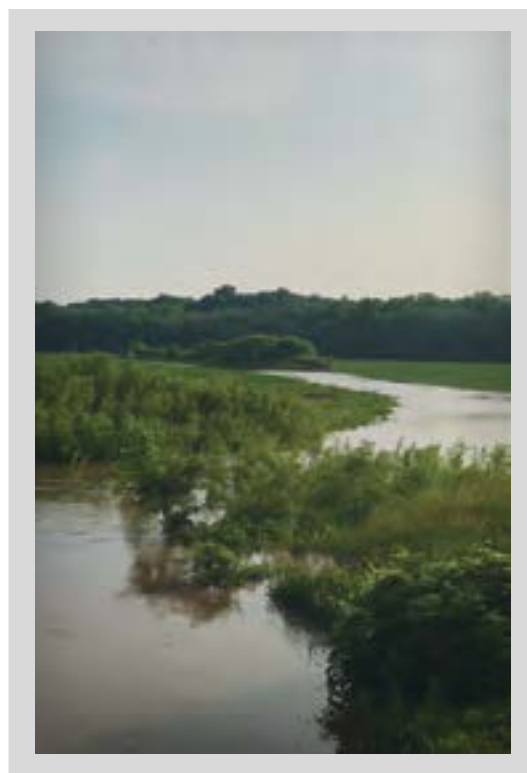


Photo courtesy of Jennifer Woodyard



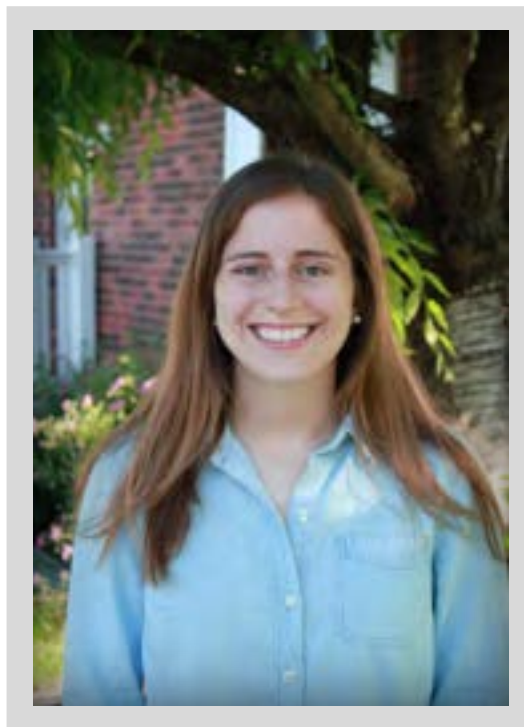


Jennifer Woodyard is a watershed outreach associate who focuses on phosphorus-priority watersheds—Little Wabash River and Embarras River. She started in April of 2018 and is located in the Illinois Extension office in Effingham.

Haley Haverback is the watershed outreach associate who works with nitrogen-priority watersheds—Mississippi Central/Henderson Creek and Lower Rock River. She started in May of 2018 and is located in the Illinois Extension office in Galva.

Their initial year focused on grant startup activities working with Illinois EPA staff members, the grant’s science team, and other project personnel. The watershed outreach associates began by learning about nutrient loss reduction issues and related local conditions, as well as developing relationships to facilitate collaborative partnerships. In addition, the associates began conducting education and outreach, including presentations about the strategy.

To address local issues, in the Lower Rock River Watershed, the associate has facilitated conversations with SWCDs to identify areas to lead watershed planning efforts—opportunities are available in sub-watersheds across the Lower Rock. The associate is working with stakeholders in Mill Creek, a subwatershed in the Lower Rock to develop a watershed management plan.



Jennifer Woodyard



Haley Haverback





In the Embarras River Watershed, the associate is leading ongoing efforts to update the current watershed management plan prior to its 2021 expiration. Multiple stakeholders are investing in the issue with time and monetary support. When the updated plan is approved, the watershed associates' efforts will shift to implementation. Multiple opportunities exist in the Little Wabash Watershed to conduct planning in upcoming years.

The watershed outreach associates produce the Illinois NLRs podcast series in collaboration with Illinois Extension's farm broadcaster. Each episode features BMPs to reduce nutrient loss, such as cover crops, woodchip bioreactors, MRTN, and manure management. Researchers, Extension educators, agricultural professionals, government employees, and farmers have all been featured guests discussing how and why to implement BMPs, as well as the challenges and successes that go along with it. Listen at will.illinois.edu/agriculture/note/illinois-nutrient-loss-reduction-podcast.

Future Strategic Actions

Agriculture Water Quality Partnership Forum

In 2015, Illinois NLRs called for the creation of the Agriculture Water Quality Partnership Forum (AWQPF) to “steer, coordinate, and assign responsibilities for delivering outreach and education required to involve individual farmers in addressing nutrient losses” and to accomplish the objectives listed in the strategy and in Chapter 7. The Agriculture Water Quality Partnership Forum continues to meet to make progress and learn about the latest nutrient research. At these meetings, AWQPF can adopt additional actions and collaborative efforts. They also have a technical subgroup that tracks strategy implementation. For a discussion of AWQPF and its technical subgroup's activities in 2017–18, see Chapter 7.





Photo courtesy of Michael Firman



CHAPTER 5 POINT SOURCE SECTOR

Implementation Report

To track the success of the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) implementation for the point source sector, wastewater treatment agencies and watershed groups reported on their staff, their financial resources, and their outreach efforts via the strategy’s tracking spreadsheet. These data inform the following Resource Measures and Outreach Measures sections in this chapter. Land and Facilities Measures were reported through federal and state agencies and watershed groups.

During quarterly technical meetings, the Illinois Association of Wastewater Agencies (IAWA) encouraged its members to participate in the reporting spreadsheet. Still, the responses represents only a fraction of the number of point source facilities in Illinois. Nonetheless, because of the size of these facilities, a majority of Illinois’ effluent flow was represented. The completed spreadsheets are in the Appendix.

💰 Resource Measures

The point source sector has contributed significant resources toward nutrient reduction feasibility studies and capital improvements. As Figure 5.1 shows, total spending reported in 2017—\$30,330,704—was slightly lower compared to \$37,417,442 in 2016. However, the 2018 reported spending of \$193,740,661 was markedly higher. A significant portion of this represented capital improvements at the Fox Metro Water Reclamation District.

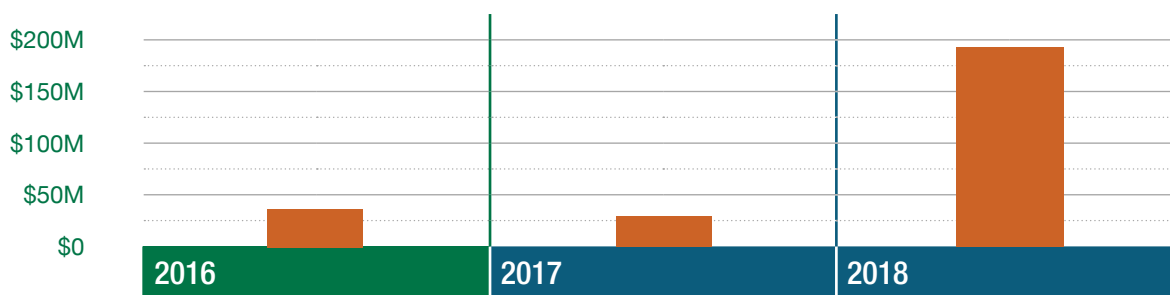


Figure 5.1. Point source spending comparison for 2016, 2017, and 2018 reported by IAWA member wastewater treatment agencies





Table 5.1 reflects information from IAWA efforts and from reporting watershed groups, and includes the following 2017 and 2018 investments:

- The Bartlett Public Works Department invested \$488,000 in 2017 and 2018 for projects, including \$330,000 on the Devon Excess Flow Feasibility Study, Phosphorus Discharge Optimization Plan for Wastewater Treatment Plants (WWTP) under Special Conditions, and Phosphorus Feasibility Study for WWTP.
- The Bloomington-Normal Water Reclamation District spent \$51,507 in 2017 for nutrient studies at its west and southeast plants and increased its contribution to \$363,279 in 2018, which covered a range of capital improvements.
- The Downers Grove Sanitary District invested \$176,700 over 2017 and 2018 on a wide range of investments and maintenance, including the installation of an anaerobic tank mixer.
- The Fox Metro Water Reclamation District, which services Aurora and several surrounding communities, invested \$82,538,920 in 2018 on facility improvements at both of its north and south wastewater treatment facilities.
- The Fox River Water Reclamation District (FRWRD) invested \$1,244,580 in 2018 for a range of projects and workshops as well as phosphorus removal improvements at multiple FRWRD buildings.
- The Glenbard Wastewater Authority invested \$138,625 in 2017 and 2018, with a majority of those funds focused on a detailed BPR feasibility study and preliminary design.
- The Greater Peoria Sanitary District invested \$9,588,000 in 2018, which included the construction of an enhanced BPR system at its Division 26 wastewater treatment plant.

Table 5.1. Funds supporting 2017–18 nutrient reduction-related activities in the point source sector for IAWA reporting agencies and reporting watershed groups

Nutrient reduction-related activity	2017 Totals	2018 Totals
Capital improvement	\$26,025,314	\$186,175,448
Operations and maintenance	\$934,474	\$2,398,542
Feasibility studies or permit required projects	\$1,255,866	\$2,328,001
Staff	\$1,979,250	\$2,283,170
Other	\$135,800	\$555,500
Total	\$30,330,704	\$193,740,661



Outreach Measures

Members of the point source sector have engaged in numerous public information outreach campaigns on water treatment and water quality issues. They delivered presentations and workshops about new technologies and target goals set by Illinois NLRS. They also offered facility tours to students and the public. As Table 5.2 shows, the point source sector reached an audience of nearly 3,000 in 2017–18.

Table 5.2. 2017-18 Point source outreach activities reported by IAWA facilities and reporting watershed groups

Type of Activity	Number of Events	Attendance
Conferences	2	140
Field Days	2	160
Presentations	23	2467
Workshops	2	160
Totals	29	2927



Photo courtesy of MWRDGC





Point source sector members also circulated information about their facilities and projects using press releases, while local newspapers covered the implementation of new technologies.

The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) has been particularly proactive in forging collaboration with the agricultural community, including maintaining a research demonstration program at its agricultural site in Fulton County. This program fosters collaboration between the point source and agricultural sectors to develop and demonstrate best management practices (BMPs) for reducing nutrient loss from agricultural fields. During 2017–18, MWRDGC sponsored field days in collaboration with the Illinois Farm Bureau and other partners, showcasing research and demonstration projects on the site. More information about this effort is later in this chapter.



Photo courtesy of MWRDGC



Land and Facilities Measures

Progress Across Illinois

Illinois has made great progress regarding phosphorus since Illinois NLRS was published in 2015. Annual statewide total phosphorus loads from point sources have been reduced by 4.3 million pounds, when comparing 2018 discharges with the levels from the baseline year of 2011. This represents a 24% reduction in phosphorus from point sources.

The interim goal in the strategy is that point sources will reduce phosphorus discharges by 25% by 2025. The expectation was that, due to ongoing work at several significant treatment plants across the state, reductions were imminent. This proved to be true. As construction projects were completed, in particular at MWRDGC, the Sangamon County Water Reclamation District (serving the greater Springfield area), Greater Peoria Sanitary District, and other facilities across Illinois, the point source sector achieved over 90% toward the interim goal by the end of 2018.

With more facility improvements in progress, additional reductions will occur in the future. There is every reason to anticipate Illinois will achieve this interim goal very soon and years ahead of schedule.



These near-term reductions will occur primarily in northeastern Illinois where watershed workgroups have been working intensively for many years.

Finally, the National Pollution Discharge Elimination System (NPDES) permit language is in place, laying the groundwork so that reductions will continue after 2025. Treatment plants that do not currently have phosphorus limits will achieve reductions, and the 45% reduction goal in phosphorus discharges from point sources should be met.

Statewide Total Phosphorus Reductions for 2018

The Illinois NLRs Science Assessment estimated that point sources contributed 18.1 million pounds of total phosphorus annually, which represented 48% of the total statewide phosphorus baseline load. A majority of the 24% reduction seen in 2018 is due to major municipal wastewater treatment facilities (facilities with a design average flow equal to or greater than one million gallons per day) implementing total phosphorus reduction technologies to meet stringent permit limits of 1 mg/L. Some of the reductions are attributed to optimized treatment operations.

For 2018, the estimated annual statewide total phosphorus load was 13.8 million pounds. It is estimated that 11.1 million pounds are attributed to the 213 major municipal facilities. In addition, loads of 2.4 million pounds are attributed to minor municipal facilities, and less than 0.3 million from industrial facilities, as show in Table 5.3 and Figure 5.2.

Table 5.3. Statewide total phosphorus loads by the point source sector in 2018

Point Source Sector	Total Phosphorus Load (million lb/yr)
2011 Baseline	18.1
2018 Total Phosphorus Load	13.8
> 213 Major Municipals	11.1
> Minor Municipals	2.4
> Major and Minor Industrials	0.3
Reductions from 2011 Baseline	4.3 (24%)

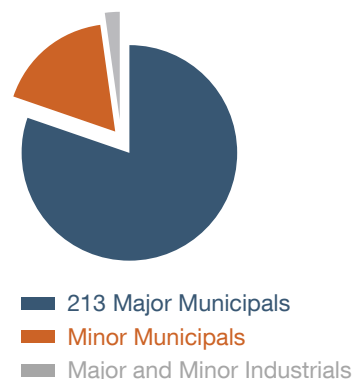


Figure 5.2 Statewide total phosphorus loads by the point source sector in 2018





Photo courtesy of MWRDGC



Total Phosphorus Reductions from Individual Dischargers

The Illinois NLRs states “The implementation of a 1 mg/L total phosphorus limit in the NPDES permits of major municipal dischargers in the highest loading watersheds, which is already in progress, will address the bulk of the point source total phosphorus reductions needed to reach the national hypoxia goal.” The largest total phosphorus load reductions will be achieved by the largest wastewater treatment facilities, including MWRDGC facilities.

This proved to be true. Table 5.4 shows a selection of major municipal facilities that have already documented substantial reductions in total phosphorus loads from the 2011 baseline year to 2018. Most of the facilities shown have achieved total phosphorus reductions greater than 50%, with some showing more than 80% reductions from their 2011 loads. While this table only shows facilities that have achieved the largest reductions, many more municipal facilities have also realized enhanced total phosphorus removal by either meeting specific numeric permit limits or by optimizing existing equipment—as is now required for all major municipal NPDES permits.

Table 5.5 shows the average annual flow and total phosphorus concentrations in 2018 for these same facilities. All but two facilities are discharging wastewater with a concentration less than 1 mg/L, with a few well below 0.5 mg/L. Again, this table does not reflect all major municipal facilities that are discharging less than 1 mg/L.



Table 5.4. Total Phosphorus reductions from Selected Municipal Facilities

Facility Name	NPDES Permit	2011 TP Load (lb/yr)	2018 TP Load (lb/yr)	Reduction (lb/yr)	Percent Reduction
MWRDGC-Stickney	IL0028053	2,344,030	707,230	1,636,800	70
MWRDGC-Kirie	IL0047741	141,985	40,012	101,973	72
MWRDGC-Calumet	IL0028061	2,058,425	1,990,902	67,523	3
Sangamon County Water Reclamation District-Spring Creek	IL0021989	113,296	49,419	63,877	56
North Shore Sanitary District-Gurnee	IL0035092	116,070	52,700	63,370	55
Village of Fox Lake	IL0020958	76,657	17,808	58,849	77
City of Belleville	IL0021873	67,701	11,040	56,661	84
DuPage County Public Works	IL0065188	73,625	17,683	55,942	76
Village of Plainfield	IL0074373	63,469	7,918	55,551	88
Greater Peoria Sanitary and Sewage District	IL0021288	96,827	42,477	54,350	56

Table 5.5. 2018 Annual Average Flows and Total Phosphorus Concentrations from Selected from Major Municipal Facilities

Facility Name	NPDES Permit	Average Flow	Average TP Concentration (mg/L)
MWRDGC-Stickney	IL0028053	775	0.31
MWRDGC-Kirie	IL0047741	38.48	0.27
MWRDGC-Calumet	IL0028061	247	2.6
Sangamon County Water Reclamation District-Spring Creek	IL0021989	34.98	0.48
North Shore Sanitary District-Gurnee	IL0035092	15.4	1.11
Village of Fox Lake	IL0020958	9.19	0.63
City of Belleville	IL0021873	5.32	0.65
DuPage County Public Works	IL0065188	7.59	0.72
Village of Plainfield	IL0074373	4.59	0.58
Greater Peoria Sanitary and Sewage District	IL0021288	22.4	0.64



The data in Table 5.5 demonstrate that facilities with a total phosphorus limit of 1 mg/L often generate effluent levels that are distinctly below 1 mg/L. In 2015, as the strategy was developed, it was assumed that the larger publicly owned treatment works (POTWs) could be expected to average total phosphorus concentrations of 0.7 mg/L if a 1 mg/L limit was imposed. As the data illustrate, treatment plant operators optimize their facilities and obtain exceptional compliance. On average, discharge total phosphorus concentrations for many major municipal facilities are less than the 0.7 mg/L target in Illinois NLRs.

The facilities listed in Tables 5.4 and 5.5 are known to be proactive regarding nutrient reduction. Documented reductions from these facilities alone total 2.2 million pounds of the 4.3 million pounds reduced statewide from 2011 to 2018. These numbers are based on direct measures of flow and phosphorus concentrations from these facilities. This demonstrates how a statewide reduction of millions of pounds is due to massive reductions from key dischargers, plus additional reductions across the state.

New Nutrient Reduction Special Conditions

New special conditions will be included in all major municipal NPDES permits to ensure further reductions in phosphorus loads beyond 2025. All major municipal facilities will be required to optimize their existing facilities for nutrient removal and all major municipal facilities will be required to develop a feasibility report to meet 0.5 mg/L and 0.1 mg/L for phosphorus. Most significantly, IAWA, Illinois EPA, and a coalition of environmental groups concluded two years of discussion by entering into an agreement that requires additional nutrient reductions from major municipal facility NPDES permits.

Through this agreement, all major municipal facilities that do not have phosphorus limits will be expected to remove phosphorus to levels currently achieved at biological phosphorus removal (BPR) treatment plants, unless unusual circumstances prevent it. This level of performance was set at 0.5 mg/L as an annual geometric mean. This language also defers to the work of watershed groups, allowing them to generate locally applicable limits as needed. In particular, if lower limits are considered necessary for a local watershed, then they will be applied. In addition, facilities that recently installed phosphorus removal facilities are expected to achieve design limits.

The NPDES special conditions calls for the development of a Nutrient Assessment Reduction Plan (NARP) if a facility is located upstream of a waterbody or stream segment that has been determined to have a phosphorus-related impairment or has been determined to be at risk of eutrophication. A summary of the agreement is below. All the special condition language that details these





requirements is in the Appendix.

NARP Special Condition Language Summary

All NPDES renewals after January 25, 2018 for major municipal facilities, which are defined as 1 million gallons per day (MGD) or greater, are subject to the following:

- If the permittee has already installed chemical addition for phosphorus removal instead of BPR, and has a 1 mg/L total phosphorus monthly average effluent limit in its permit, or the permittee is planning to install chemical addition with an Illinois EPA construction permit that is issued on or before July 31, 2018, the 1 mg/L total phosphorus monthly average effluent limit (and associated compliance schedule) shall apply, and the 0.5 mg/L total phosphorus limit shall not be applicable.
- If the treatment method is chemical phosphorus removal, the facility must meet a twelve-month rolling geometric mean phosphorus limit of 0.5 mg/L by 2025.
- If the treatment method is BPR, the facility must meet a twelve-month rolling geometric mean phosphorus limit of 0.5 mg/L by 2030.
- If the treatment plant requires extensive modifications or if the treatment method is biological nutrient removal (both phosphorus and nitrogen), the facility must meet a twelve-month rolling geometric mean phosphorus limit of 0.5 mg/L by 2035.
- A NARP may be required in some cases:
 - > A NARP will be required for all major municipal facilities that are upstream of a segment that is impaired for aquatic algae, aquatic plants (macrophytes), or dissolved oxygen (DO) that has the signature of excess algae (above 100% DO saturation and below the DO water quality standards in a 24-hour period).
 - > A NARP will also be required for all major municipal facilities that indicate a potential risk of eutrophication downstream of the discharge. A “risk of eutrophication” will include one of the following situations using monitoring data downstream of the discharge:
 - > Exceeds the upper standard for pH (pH > 9.0).
 - > Median sestonic chlorophyll a > 26 ug/L.
 - > pH > 8.35 and daily maximum DO saturation > 110% on two or more days.
 - > If a NARP is required and determines a lower limit is needed, the lower limit is applied.

The long-term statewide total phosphorus reductions that will be achieved by this agreement are discussed in Chapter 8. Illinois NLRS includes estimated total phosphorus reductions that could be achieved if major municipal wastewater treatment facilities discharge effluent with a concentration





of 0.7 mg/L limit. This agreement goes beyond that by requiring a 0.5 mg/L concentration limit as a twelve-month rolling geometric mean.

Statewide Total Nitrogen Reductions for 2018

Although the strategy mostly focuses on reducing total phosphorus loads in the point source sector, reductions in total nitrogen have been realized as well. The annual statewide total nitrogen baseline load in 2011 from point sources was estimated to be 87.3 million pounds. Page 3-3 of Illinois NLRs explains how the nitrogen baseline was established. Because it did not include minor municipal and industrial facilities, the total nitrogen load was underestimated.

For 2018, the annual statewide total nitrogen load from point sources was estimated to be 78.5 million pounds, a 10% decrease from the 2011 baseline load (see Table 5.6). This value includes estimates from minor municipals and calculated loads for industrial facilities. Of the 78.5 millions pounds, 74 million pounds were discharged by the 213 major municipal facilities.

Table 5.6 Comparison of statewide total nitrogen loads 2011–18

Point Source Sector	Total Nitrogen Load (million lb/yr)
2011 Baseline	87.3
Total Nitrogen Load	78.5
Reductions from 2011 Baseline	8.8 (10%)

The NPDES permit language that encourages BPR and biological nutrient removal technologies will have some beneficial impact regarding total nitrogen. Facilities using BPR typically operate under anaerobic or anoxic conditions, resulting in denitrification. This converts nitrate into nitrogen gas, thereby removing that fraction of nitrogen from the water.

Method for Calculating Point Source Nutrient Loads

In 2016, the Hypoxia Task Force released its first Report on Point Source Progress in Hypoxia Task





Force States. The reports provide estimates of each state’s annual point source nitrogen and phosphorus loads. Although tracking and reporting is limited to the contributions of major municipal facilities, they represent most of the point source nutrient loads in the state. U.S. EPA intends to publish these reports approximately every two years.

For each major municipal facility, nutrient loads are estimated using the U.S. EPA Water Pollutant Loading Tool, which accesses NPDES permit data from the U.S. EPA Integrated Compliance Information System. Each state has the opportunity to review output from the tool for accuracy. Annual nutrient loads for 2017 are presented in the 2019 hypoxia task force report and were also used to estimate point source contributions in this report’s Science Assessment Update (Chapter 3).

To calculate nutrient loads from all point sources in the state, contributions from more than the 213 major municipal facilities need to be considered. In Illinois NLRS, the Science Assessment estimated loads from both major and minor municipal wastewater treatment facilities, in addition to industrial facilities that report nutrient concentrations in their monthly Discharge Monitoring Reports (DMR). Since 2011, the number of facilities required to monitor and report nutrient concentrations has increased, so more facilities were included in the Science Assessment Update analysis in this report. For example, contributions from additional major and minor industrial facilities that have monitoring requirements in their NPDES permits were added to the 2017 and 2018 annual loads.

To calculate loads, the Water Pollution Search in the DMR data component of the U.S. EPA Water Pollutant Loading Tool was used. The search criteria are included below:

Reporting Year: 2017/2018

State: Illinois

Pollutant Category: Phosphorus (All phosphorus and phosphate pollutant parameters) for phosphorus loading

Nitrogen (All parameters for total nitrogen, organic nitrogen, total Kjeldahl nitrogen, nitrite, nitrate, and ammonia) for nitrogen loading

Industry: POTWs and some non-POTWs

Facility: Major





After the criteria is set, the search is performed and all facility data are downloaded to an Excel spreadsheet. The following links further explain the data sources and hierarchy of loading calculations:

The Loading Tool Data: echo.epa.gov/trends/loading-tool/resources/about-the-data

Hierarchy of Loading Calculations: echo.epa.gov/trends/loading-tool/resources/loading-calculations.

The same approach was used for calculating nutrient loads from major and minor industrial non-POTWs. The nutrient loads for non-POTW facilities that discharge industrial process wastewater were retrieved from the Water Pollutant Loading Tool. These facilities were separated by Standard Industrial Classification codes to only include those with nutrient monitoring requirements. Nutrient loads from power plants were not included, as it is difficult to differentiate between nutrients added along with process wastewater and nutrients already present in source water influent.

Further analysis of major municipal facilities, revealed that the Water Pollutant Loading Tool did not capture correct outfalls for some facilities, including those that have a “B01” or “B02” outfall included in their permit and those with a main effluent outfall other than “001.” For these facilities, the monthly reported flow, as well as both total phosphorus and nitrogen concentration data, were retrieved from the Integrated Compliance Information System. The monthly loads were calculated and then summed to determine annual loads for each facility. Illinois EPA intends to work with U.S. EPA to enhance the Water Pollutant Loading Tool to recognize data from these outfalls—this will establish a more efficient and streamlined process and improve confidence in the calculated results.

NPDES Permits Issued with Nutrient Criteria

By the end of 2018, Illinois EPA had issued 65 permits that required each facility to meet a total-phosphorus concentration limit of 1 mg/L. Eight facilities are on a compliance schedule to meet future total-phosphorus limits of 1 mg/L. Currently, 124 facilities are required to monitor for total phosphorus and total nitrogen. Additionally, Illinois EPA has issued 17 NPDES permits with a goal of total nitrogen removal.

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 possible total phosphorus effluent levels 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.

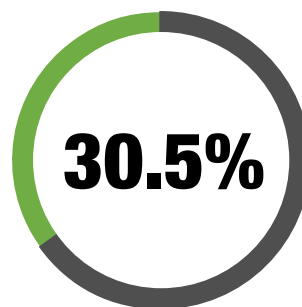


Figure 5.3 Percentage of major municipal NPDES permits with total phosphorus limits statewide



As of 2018, 84 feasibility studies and 72 optimization studies have been submitted to Illinois EPA (Table 5.7). The 2017 biennial report incorrectly stated that as of 2016, Illinois EPA had issued 128 permits with phosphorus limits. In fact, Illinois EPA issued 128 permits with phosphorus limits or phosphorus monitoring requirements.

Table 5.7. Feasibility studies and optimization studies submitted by major facilities (222 total)

Optimization	146 Permits to be issued requiring optimization study	122 Issued permits awaiting optimization study	72 Optimization studies submitted
	146 Permits to be issued requiring feasibility study	111 Issued permits awaiting feasibility study	84 Feasibility studies submitted

Watershed Approach

Illinois EPA continues to encourage and work with local watershed groups to meet the nutrient loss reduction objectives in the strategy, including non-point source, stormwater, and point source nutrient loading. Where practical, as part of this effort, the agency is using permit conditions to require nutrient reduction feasibility reports, cost-effective implementation of control technologies using existing



infrastructure, and improved nutrient removal technologies. Facilities will employ improvements to meet the Illinois NLR objectives. Illinois EPA continues to work with the Fox River Study Group, DuPage River Salt Creek Workgroup, Hickory Creek Watershed Workgroup, Lower Des Plaines Watershed Group, Lower DuPage River Watershed Coalition, North Branch Chicago River Watershed Workgroup, and Des Plaines Watershed Workgroup.

Fox River Study Group

The Fox River Study Group (FRSG) 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, FRSG completed the Fox River Implementation Plan (FRIP), which is the community's road map to eliminate water quality impairments due to low dissolved oxygen (DO) levels, high total phosphorus levels, and nuisance algae in the Fox River from the Stratton Dam in McHenry County to the mouth of the river in LaSalle County. The group's study area encompasses 1,405 square miles of the Fox River watershed.

Major wastewater treatment plants that discharge to the Fox River are completing upgrades at their facilities so that total phosphorus discharges will meet an annual average limit of 1 mg/L. This will result in approximately a 75 percent reduction in total phosphorus loading to the river during summer months as compared to the 2010–13 load. These improvements will be adopted through 2022. The Fox River watershed dischargers have also committed in their NPDES permits to meet a total phosphorus limit of 0.5 mg/L annual geometric mean by 2030 unless FRSG determines that a greater phosphorus reduction is necessary and achievable before then.

The Fox River Study Group is now in its 17th year of water quality data collection in the watershed. On a monthly basis, an all-volunteer and in-kind effort by FRSG member groups collects and analyzes samples from seven main stem locations and seven tributary locations along an 80-mile stretch of the Fox River from McHenry to Yorkville. To fill data gaps, FRSG is also funding the United States Geological Survey (USGS) to collect more continuous water quality data on the Fox River during the growing season. During water years 2016–18, USGS collected data near Algonquin (USGS Station



Figure 5.4 Percentage of major municipal NPDES permits with total phosphorus limits in the Fox River watershed.





#05550001) and is collecting seasonal data during water years 2018–21 at the Stratton Dam (USGS Station #05549501).

The Illinois State Water Survey (ISWS) maintains the FoxDB environmental database, where all available data for the Fox River watershed is compiled and publicly available (ilrds.sws.uiuc.edu/fox/). The water survey released a report commissioned by FRSG—Water Quality Trend Analysis for the Fox River Watershed: Stratton Dam to the Illinois River— that presents trend analysis for nutrient-related water quality parameters (www.ideals.illinois.edu/handle/2142/103009). Sufficient data were available to report on trends in water quality at eight sites along the Fox River and seven tributary streams. Over the last decade (2006–16), ISWS analysis found that most nutrient-related pollutants levels are declining or show no trend in the Fox River between the Stratton Dam in McHenry County and Yorkville in Kendall County. Loading levels of most water quality parameters decreased across all seasons in the Fox River at Montgomery, which is the only station on the main stem with the required concentration and flow data to calculate loads. On an annual basis, flow-normalized loads decreased for all parameters, by 11% for organic nitrogen, 14% for ammonia, 16% for nitrate, 7.8% for total Kjeldahl nitrogen (TKN), 21% for total phosphorus, 25% for dissolved phosphorus, and 6.3% for suspended solids. Loads of chlorophyll a, a measure of the amount of algae in the water column, dropped by 8.8%.

The story for tributary streams is different. For the two tributaries with available flow data, Blackberry Creek and Poplar Creek, annual loads of total phosphorus and ammonia increased in both streams. Annual loads of TKN increased in Poplar Creek by 42%, but decreased by 19% in Blackberry Creek.

To make informed decisions about how best to maintain and improve the quality of the Fox River in this urbanizing watershed, FRSG has developed two computer models—watershed loading (HSPF) and instream (QUAL2K). Geosyntec Consultants is currently updating these models for FRSG. In 2018, Sierra Club volunteers greatly assisted this work by formatting data for input into the HSPF model. The instream model has been updated to QUAL2kw, a dynamic version, and is being recalibrated with data collected since the 2015 FRIP was completed. The models will be used to assess different management scenarios to address low DO and nuisance algae problems in the Fox River, and to update the FRIP for submittal to Illinois EPA by 2022.

The Fox River Study Group and the Chicago Metropolitan Agency for Planning are also updating and recalibrating the HSPF model for the Mill Creek subwatershed, which will be used in the development of a watershed-based plan for that Fox River tributary.

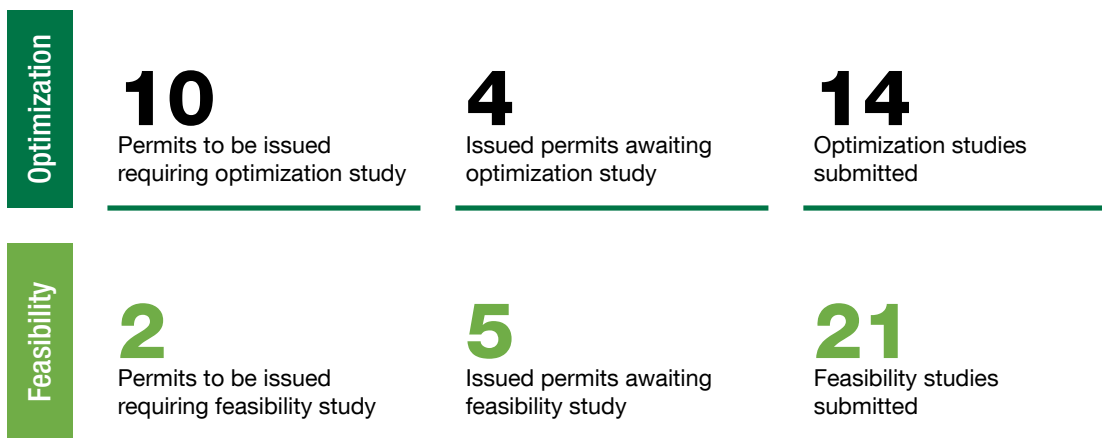




The study group continues to work with the U.S. Army Corps of Engineers and the Illinois DNR to complete the Fox River Habitat & Connectivity Study. This study, which is half-completed, will evaluate the efficacy and cost effectiveness of fish passage and riverine function restoration methods at 10 low head, run-of-the-river dams on the Fox River. The group has offered to cover the local cost-share contribution of the study for the Illinois Department of Natural Resources. BlueStem Communications also worked with FRSG to conduct three focus groups in 2018 to understand public thoughts and feelings about the Fox River and its dams.

In 2017 and 2018, FRSG conducted 23 outreach activities, mostly presentations that informed the public about Illinois NLRs, the adverse impacts of high algae levels on drinking water from the Fox River (which provides for over 300,000 watershed residents), and the efforts the watershed community is undertaking to reduce phosphorus levels and nuisance algae blooms in the river.

Table 5.8. Feasibility studies and optimization studies submitted by Illinois major facilities in the Fox River Watershed (28 total)



DuPage River Salt Creek Workgroup

The DuPage River Salt Creek Workgroup (DRSCW) formed in 2005 in response to concerns about Total Maximum Daily Loads (TMDLs) set 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). The workgroup seeks to implement targeted watershed activities that resolve priority waterway problems efficiently and cost effectively.





In 2015, a special condition to DRSCW NPDES permits was added that substantially increased financial commitments to restoration efforts focused on improving aquatic life. Special condition DRSCW projects completed in 2018:

- Post-project monitoring was conducted at the Oak Meadows Golf Course dam removal and stream restoration project along the Salt Creek in Addison, Illinois. Post-project, both the Macroinvertebrate Index of Biological Integrity (MIBI) score and individual species taxa biodiversity improved. The 2017 post-project mean MIBI (33.2) increased 9.6 points compared to the 2013 score and five new species were recorded. Additionally, the post-project Qualitative Habitat Evaluation Index (QHEI) increased at all sites with improvements in substrate, riparian, pool, and riffle scores. Mean QHEI at the project location increased 12 points to 69.3. All QHEI scores in 2017 were in the range defined as good (>60 QHEI points).
- Through a telephone survey, public input was solicited on the Fullersburg Woods dam modification in the Salt Creek in Oak Brook, Illinois. The majority of respondents were supportive of dam modification as well as cost-effective solutions to improve water quality. They also reported that they believe it is very important to improve water quality.
- The analysis of the feasibility of point source-to-point source (PS to PS) trading in the watershed is complete. The project shows the feasibility for PS to PS trading at all geographic boundaries—in a subwatershed and in the watershed.

Additionally, DRSCW is engaged in design engineering for the Fawell Dam modification—the dam is located in the west branch of the DuPage River in Naperville, Illinois. In cooperation with the Forest Preserve District of DuPage County and the Illinois State Toll Highway Authority, design and permitting of the Springbrook dam removal and stream restoration project (Springbrook Phase II in Wheaton, Illinois) is underway. Construction on the Springbrook Phase II project is expected to begin in spring of 2019. The workgroup is rerunning an analysis of causal factors influencing aquatic life, including the effects of nutrients. The analysis will cover a substantial area of northeastern Illinois. The workgroup also plans to continue its work on expanding the phosphorus- and nitrogen-trading program to include stream restoration crediting.



Figure 5.5 Percentage of major municipal NPDES permits with total phosphorus limits in the DuPage River Salt Creek watersheds.





Figure 5.5 and Table 5.9 depict the number of DuPage River Salt Creek major facilities that have submitted feasibility and optimization studies and those with phosphorus limits in their permits.

Table 5.9. Feasibility studies and optimization studies submitted by Illinois major facilities in the DuPage River Salt Creek watersheds

Optimization	1 Permits to be issued requiring optimization study	9 Issued permits awaiting optimization study	18 Optimization studies submitted
Feasibility	1 Permits to be issued requiring feasibility study	10 Issued permits awaiting feasibility study	17 Feasibility studies submitted



Hickory Creek Watershed Planning Group

Hickory Creek, a vital subwatershed 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 (HCWPG) to improve water quality there. The group includes representatives from Joliet, New Lenox, Homer Glen, Mokena, Tinley Park, Orland Park, the Forest Preserve District of Will County, Will County Stormwater Management Planning Committee, and Illinois American Water.



Figure 5.6 Percentage of major NPDES permits with phosphorus limits in the Hickory Creek subwatershed

The group completed the Hickory Creek Watershed Plan in 2011.

The current NPDES permits for some local facilities—Mokena, New Lenox Plant No. 1, Frankfort Regional, and Illinois American Oak Valley—include a monthly average effluent limit of



1 mg/L for phosphorus. Other point source dischargers in the HCWPG region are expected to receive interim total phosphorus effluent limits of 1 mg/L with their permit renewal and through the implementation of a NARP. The Hickory Creek group is expected to combine efforts with the new Lower Des Plaines Watershed Planning Group to develop a NARP for the Lower Des Plaines watershed, including the Hickory Creek subwatershed. Table 5.10 depicts the number of Hickory Creek major facilities that have submitted feasibility and optimization studies and those with phosphorus limits in their permits.

Table 5.10. Feasibility and optimization studies submitted by major facilities in the Hickory Creek subwatershed

Optimization	2 Permits to be issued requiring optimization study	0 Issued permits awaiting optimization study	4 Optimization studies submitted
Feasibility	2 Permits to be issued requiring feasibility study	0 Issued permits awaiting feasibility study	4 Feasibility studies submitted

Lower Des Plaines Watershed Group

The Lower Des Plaines Watershed Group (LDWG) formed in 2017 as a proactive way for municipalities and other dischargers to work together to address water quality issues in the watershed. The watershed encompasses approximately 490 square miles from Willow Creek, just north of O'Hare Airport in Cook County, down to the confluence with the Kankakee River in Will County. All but two municipal dischargers are participating in LDWG.

In 2018, LDWG worked with Illinois EPA to develop special conditions language for NPDES permits that allow and encourage dischargers to work together to develop a NARP. Activities in 2018 to support this plan included:

- Developing and implementing a bioassessment program to provide a baseline of biological, habitat, and chemical data. Approximately 175 sites are sampled over a five-year cycle. In the first year, sam-





pling was completed on 26 sites in the lower portion of the Lower Des Plaines main stem. The final report will be completed after the remaining main stem sites are sampled in 2019.

- Working with the Lower DuPage River Watershed Coalition, LDWG expanded seasonal outreach campaigns to Lower Des Plaines members to help meet Municipal Separate Storm Sewer Systems (MS4) outreach requirements. Campaigns focus on using native plants in the spring, detention basin maintenance in the summer, proper leaf disposal in the fall, and reducing chlorides in the winter. Outreach materials include social media posts, articles for newsletters and websites, printable handouts, and specialized items for the Salt Smart, Save More winter campaign.

In 2019, LDWG will be forming a working committee to determine a NARP framework and identify additional data and resource needs.

Lower DuPage River Watershed Coalition

The Lower DuPage River Watershed Coalition was formed in 2012 to identify and address priority water quality issues in the Lower DuPage River and its tributaries, located almost entirely in Will County. The coalition is comprised of municipalities and other public agencies with participation from all six municipal wastewater dischargers.

In 2016, the coalition collaborated with DRSCW to develop a nutrient implementation plan for the DuPage River watershed. Municipal dischargers are contributing funds to the plan development and two dischargers are contributing funds to implement projects that address contributing factors to low aquatic life scores, including low levels of dissolved oxygen (DO).

Activities include:

- In partnership with the Forest Preserve District of Will County, funding the Hammel Woods dam modification feasibility study. The study identified several modification options. The partners agreed on an approach to remove the above-grade portion of the structure and create an extended riffle to improve habitat, fish passage, and DO levels.
- Developing and implementing a bioassessment plan in 2012 modeled after the DRSCW plan that included fish, macroinvertebrates, habitat, and water chemistry at all 26 sites and sediment chemistry at select sites. The program was expanded to 41 sites in 2015. Field work for the 2018 bioassessment was completed, initial assessment results will be available in 2019 with a final report by early 2020.
- Implementing seasonal outreach campaigns to assist members in meeting MS4 outreach require-





ments. Campaigns focus on using native plants in the spring, detention basin maintenance in the summer, proper leaf disposal in the fall, and reducing chlorides in the winter. Outreach materials include social media posts, articles for newsletters and websites, printable handouts, and specialized items for the Salt Smart, Save More winter campaign.

- Providing support to DRSCW analysis of the feasibility of PS to PS trading in the watershed area. The completed analysis indicated the feasibility for PS to PS trading at all geographic boundaries—in a subwatershed and in the watershed.

The coalition is working with DRSCW to rerun an analysis of causal factors influencing aquatic life, including the effects of nutrients. The analysis covers a substantial area of northeastern Illinois. The coalition and DRSCW continue to work on expanding the phosphorus- and nitrogen-trading program to include stream restoration crediting.

North Branch Chicago River Watershed Workgroup

The North Branch Chicago River Watershed Workgroup (NBWW) was formed in 2018 to identify and assess water quality issues along the three forks of the North Branch of the Chicago River. The watershed encompasses over 95 square miles, with northern and southern boundaries roughly extending from Illinois Route 132 in Waukegan in Lake County south to Dempster Street in Morton Grove in Cook County. The workgroup membership consists of 37 separate organizations, including 27 agencies, of which two are POTWs.

In 2018, NBWW created a work plan and a Quality Assurance Project Plan and began a monitoring program. The monitoring program included:

- Identifying 25 sites in the watershed for consistent sampling.
- Collecting and analyzing water column chemistry samples from all 25 sites.
- Deploying datasondes at seven sites for collecting dissolved oxygen, pH, temperature, and specific conductance.
- Collecting and analyzing fish, macroinvertebrates, habitat, and sediment samples at 11 of the 25 sites. The remaining 14 sites are scheduled to be sampled in 2019.

The monitoring program includes a bioassessment of the watershed. The fieldwork will be conducted in 2018 and 2019 with a report to follow.





The Des Plaines River Watershed Workgroup

The Des Plaines River Watershed Workgroup (DRWW) was formed to address increased NPDES permit requirements on both POTWs and MS4 communities. This is a voluntary, dues-paying organization with a mission to bring together a diverse coalition of stakeholders to work to improve water quality in the Des Plaines River and its tributaries in a cost-effective manner. The workgroup consists of 32 members made up of POTWs, MS4 communities, environmental groups, and others.



Figure 5.7 Percentage of major NPDES permits with phosphorus limits in the Des Plaines River watersheds

Of note in 2018:

- The workgroup is continuing to focus on its comprehensive water quality monitoring program to meet NPDES permit requirements and study watershed stressors. In 2015, DRWW began conducting water quality sampling and in 2016, biological monitoring was incorporated into the program. In 2018, DRWW collected water chemistry data at 71 sites, biological (macroinvertebrates and fish) and sediment samples at 18 sites, and engaged in continuous water quality monitoring and Chlorophyll a samples at 14 sites. This growing dataset helps DRWW understand and locate stressors throughout the watershed.
- An integrated prioritization system tool is being developed with the Midwest Biological Institute, using data from the DRWW comprehensive water quality monitoring program.
- The workgroup is in the early stages of developing a NARP. Once in place, the NARP will help set discharge limits and meet NPDES permit requirements.
- Through the workgroup's lake monitoring committee, DRWW funded a special project to study nutrient loading and associated model predictions for three lakes in the watershed.
- Illinois EPA approved the Des Plaines River Watershed-Based Plan, which relied heavily on DRWW monitoring data in its development. The plan has been adopted by the Lake County Stormwater Management Commission (SMC), Lake County Board, and several communities in the watershed.
- The workgroup was involved in organizing two workshops to assist members in meeting MS4 permit requirements. A workshop on deicing was co-sponsored with Lake County SMC, Lake County Department of Transportation, Lake County Health Department, and Lake County Public Works. Additionally, DRWW held a green infrastructure seminar.





Table 5.11. Feasibility studies and optimization studies submitted by major facilities in the Des Plaines River watershed

Optimization	0	0	6
	Permits to be issued requiring optimization study	Issued permits awaiting optimization study	Optimization studies submitted
Feasibility	0	0	6
	Permits to be issued requiring feasibility study	Issued permits awaiting feasibility study	Feasibility studies submitted



Current Programs and Projects Supporting Nutrient Loss Reduction Goals

The following section highlights point source programs and projects that have undergone significant changes or have noteworthy updates since Illinois NLRS and the last biennial report.

Table 5.12 Point source programs and projects working towards Illinois NLRS Goals

NPDES Permits Issued with Nutrient Criteria	p.104
Watershed Approach	p.105
Watershed Protection Utility.....	2017 Biennial Report p.58
Permit Limits and Facility Upgrades for MWRDGC	2017 Biennial Report p.59
Agriculture and Point Source Sector Partnership: Testing BMPs	p.116
Total Maximum Daily Load	p.116
Concentrated Animal Feeding Operations	p.117
State Livestock Management Facilities Act	p.118
State Revolving Fund	p.118

(Bold type and page number indicate an update in this report. Details about programs listed in non-bold type and page number can be found in the listed document.)



Agriculture and Point Source Sector Partnership: Testing Best Management Practices

To bring together a range of stakeholders to tackle nutrient loss and to develop, and test, agricultural BMPs, MWRDGC 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. With funding from MWRD and other organizations, 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.

Beginning in 2015, MWRD began testing the effectiveness of planting cover crops early by interseeding, installed monitoring systems to collect baseline data on fields where BMPs will be implemented for watershed-scale evaluations, and set up research and demonstrations on other BMPs. Other research and demonstrations established at the site cover forage-based riparian vegetation buffers, runoff and drainage irrigation, and denitrifying bioreactors. Partners include several University of Illinois departments, Illinois Central College, the Ecosystem Services Exchange, Illinois Farm Bureau (IFB), and Fulton County Farm Bureau (FCFB). The Illinois Nutrient Research and Education Council (NREC) funds two current research projects.

In 2018, a field day was held at the site in collaboration with IFB, FCFB, University of Illinois, and NREC. Participants included farmers, representatives from the agricultural sector and communities, and other stakeholders. Highlights of the field day included a demonstration of a bioreactor installation, results from cover crop interseeding, and drainage irrigation research.

Total Maximum Daily Loads

Total Maximum Daily Loads developed for impaired watersheds include point source waste load allocations for total phosphorus and nitrate-nitrogen when these nutrients are listed as potential causes 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.



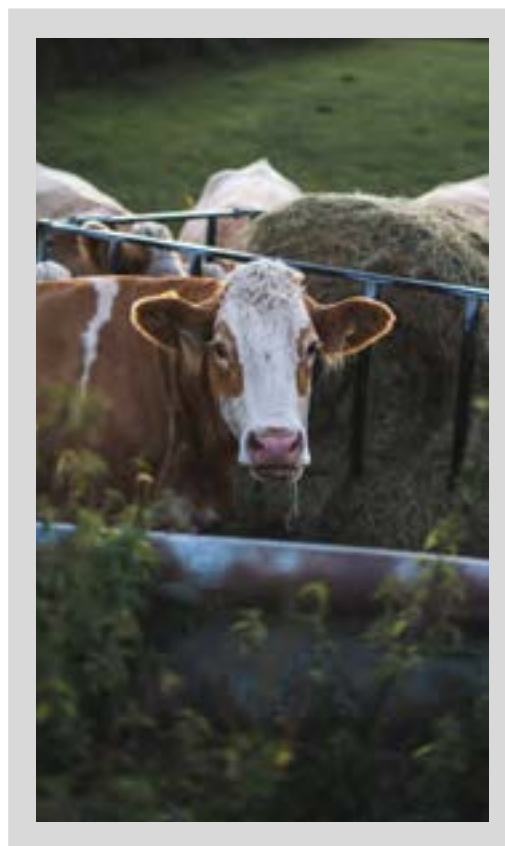


In 2017–18, three total phosphorus TMDLs and no nitrate TMDLs were approved by U.S. EPA. The three total phosphorus TMDLs include Frentress Lake in the Galena River Watershed, Lake Le-Aqua-Na in the Pecatonica watershed, and Lake Springfield in the Lake Springfield/Sugar Creek watershed. Lake Le-Aqua-Na and Lake Springfield TMDLs contained waste load allocations for total phosphorus. Illinois EPA is currently developing 52 TMDLs for total phosphorus and three for nitrate-nitrogen. At the end of 2018, Illinois had 94 approved total-phosphorus TMDLs and eight approved nitrate-nitrogen TMDLs. Information on the Illinois EPA TMDL program can be found at: <https://www2.illinois.gov/epa/topics/water-quality/watershed-management/tmdls/Pages/default.aspx>

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 536 active large CAFOs (permitted and unpermitted) in Illinois through its on-site inspection program and internal reviews. Due to increased efforts by Illinois EPA, this number is up from 288, reported in the 2017 biennial report, and 249, reported in Illinois NLRS.

Illinois EPA's current Compliance Monitoring Strategy has set goals of on-site inspections of 50 unpermitted large CAFOs and 30 medium ani-





mal feeding operations for fiscal year 2019. Since July 1, 2015, Illinois EPA field staff members have conducted approximately 351 livestock facility site visits to determine compliance or provide assistance to improve operations. Through these inspections and previous enforcement acts, 19 facilities are currently covered under the general CAFO NPDES permit—previously 31 were covered. However, 12 previously permitted facilities have reached compliance with current CAFO regulations and are now designed, constructed, operated, and maintained such that the facility no longer discharges or proposes to discharge to U.S. waters. Therefore, NPDES permit coverage is unnecessary.

State Livestock Management Facilities Act

The state’s Livestock Management Facilities Act [510 ILCS 77] was enacted in 1996 to “maintain an economically viable livestock industry in the State of Illinois while protecting the environment for the benefit of both the livestock producer and persons who live in the vicinity of a livestock production facility.” The act includes design and construction standards for new or modified livestock facilities, waste management planning requirements, facility operator training and testing, anaerobic lagoon financial responsibility demonstration, and facility setback requirements (www2.illinois.gov/sites/agr/Animals/LivestockManagement/Pages/default.aspx).

The Illinois Department of Agriculture annually receives about 100 applications for the siting and construction of new or modified livestock waste handling facilities as well as numerous facility waste management plans for review and approval. Illinois DOA received and reviewed 124 and 90 proposals in 2017 and 2018, respectively.

Approved projects are designed as zero discharge facilities; waste management plans require the agronomic use of generated manure. Livestock waste management plans are required to include appropriate manure application setbacks and other protections to ensure that nutrients in the manure remain at the application site and are appropriately used by growing crops.

State Revolving Fund

The Illinois EPA State Revolving Fund provides low-interest loans for wastewater treatment infrastructure. The Water Pollution Control Loan Program (WPCLP) 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.

In 2017, \$121,566,879 was spent on seven projects and in 2018, \$54,624,463 was spent on four projects that reduced nutrient loss through treatment plant improvements. The total funding amount through WPCLP for 2017 was \$358,848,130 and \$309,560,356 for 2018. WPCLP funding for state fiscal year 2019 is anticipated to total \$450 million.

Future Strategic Actions

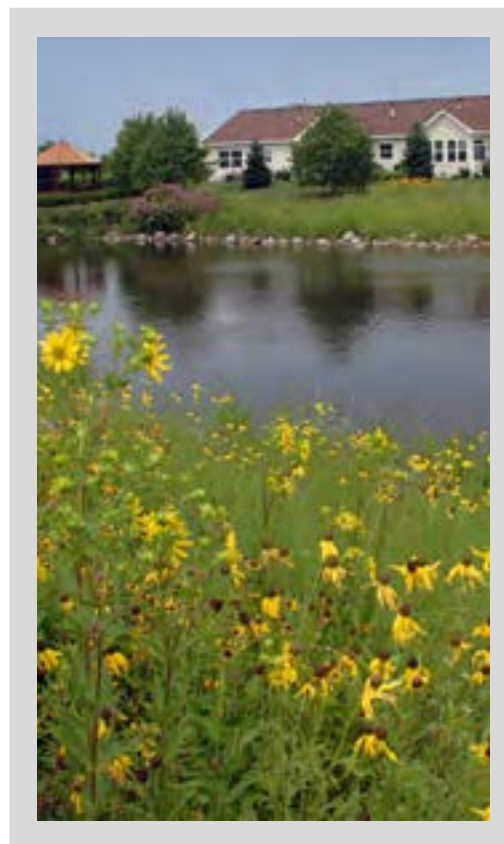
Water Quality Offset and Trading Programs

In February of 2019, David Ross, U.S. EPA assistant administrator for water, released a memorandum to U.S. EPA regional administrators titled *Updating the Environmental Protection Agency's Water Quality Trading Policy to Promote Market-Based Mechanisms for Improving Water Quality*. This memo provides an update to U.S. EPA's Water Quality Trading Policy, released in 2003.

Photo courtesy of Jack Pizzo

The purposes of the memorandum are to:

1. Reiterate EPA's strong support for water quality trading and other market-based programs to maximize pollutant reduction efforts to improve water quality.
2. Accelerate the adoption of market-based programs that will incentivize implementation of technologies and land-use practices that reduce nonpoint pollution in our nation's waters.
3. Provide additional guidance to state, tribes, and stakeholders regarding the use of market-based programs to reduce water pollution at lower overall cost.
4. Promote increased investment in conservation actions.





Illinois EPA continues to promote trading, urban and rural partnerships, or other offsets as part of watershed planning and implementation efforts.





Photo courtesy of C. Eliana Brown



CHAPTER 6 STORMWATER SECTOR

Implementation Report

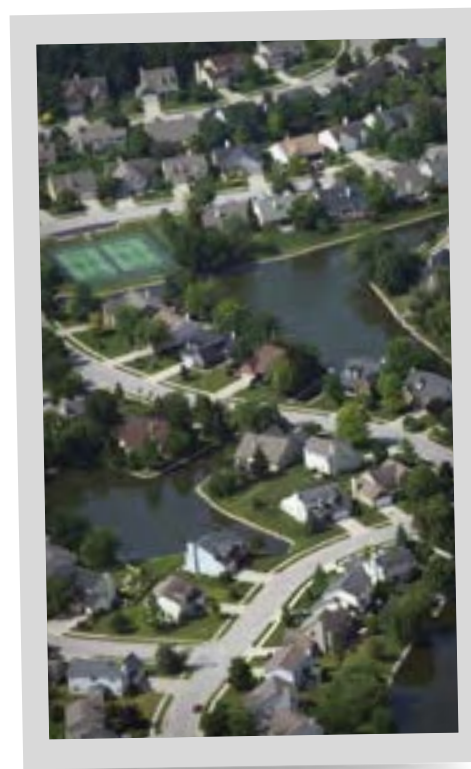
Stormwater is a source of numerous pollutants including, very importantly, phosphorus and nitrogen that load into waterways. To track the success of the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) implementation for the stormwater sector, partners began reporting in 2018 on their staff and financial resources and their outreach efforts via the strategy’s tracking spreadsheet. These data inform the Resource measures and Outreach measure sections in this chapter. The completed spreadsheets are in the Appendix.

Land and facilities measures for stormwater can be challenging to track as compared with the other sectors because stormwater data are limited and/or are not available. For 2017–18, the only source of state funding submitted for stormwater projects was the Illinois Environmental Protection Agency (EPA) Section 319 grant program. This information is later in this chapter. Municipal Separate Storm Sewer System (MS4) communities do have narrative reporting requirements for those subject to a State of Illinois issued National Pollutant Discharge Elimination System (NPDES) permit. University of Illinois Extension analyzed these narrative MS4 reports from reporting years 2017-18 to determine whether they could be a source of urban practice implementation data. The findings are later in this chapter.

This chapter also contains information about stormwater programs and projects that work toward strategy goals.

Resource Measures

As mentioned, three organizations submitted information about their staff members and funding that helped move stormwater implementation forward.





In 2018, the sector reported 44 staff members working on stormwater implementation. Table 6.1 shows funding at \$955,878. These numbers are a fraction of actual implementation resources in the state due to the low number of organizations reporting.

Table 6.1 includes the following expenditures:

- Parkland College invested \$13,000 in approaches that include stormwater-related training and marketing.
- The Greater Egypt Planning Commission was granted \$607,944 from Illinois EPA for stormwater-related projects.
- DuPage County Stormwater Management is staffed by 39 people. The agency has coordinated on water quality programs with 41 municipalities and townships wholly or partially within the county. DuPage County invested a range of grants in these municipalities and townships totaling \$334,934. These grant projects included installing permeable pavers at the Glen Ellyn Park District's Ackerman Park, streambank stabilization in Wood Dale, and the installation of permeable pavers and a rain garden in Clarendon Hills.

Photo courtesy of C. Eliana Brown

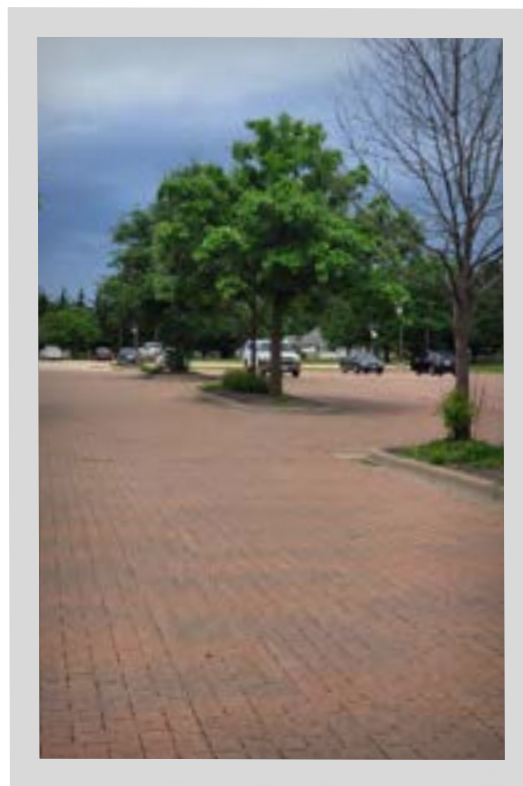


Table 6.1. Funds supporting 2018 nutrient reduction-related activities in the stormwater sector.

Nutrient reduction-related activity	2018 Totals
Grants or Loans Received	\$607,944
Grants Given	\$334,934
Other	\$13,000
Total	\$955,878





Outreach Measures

Several members of the stormwater sector reported on communication and outreach activities, which focused on efforts to improve water quality and flood control. In particular, DuPage County led an extensive public information campaign. For example, the county sponsored educational events, including field days for students and teachers. County staff members conducted workshops on sustainable wetland design and other flood control measures. In addition, they worked with local municipalities on everyday issues, like road salt and leaf collection, that can affect water quality.

Table 6.2. Outreach events reported by the stormwater sector.

Type of Activity	Number of Events	Attendance
Field Days	9	555
Presentations	31	3,815
Conferences	3	650
Workshops	17	1,150
Totals	60	6,170

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 sub-grants to support non-point source pollution control projects for both rural and urban sectors. Through technical and financial assistance, Illinois EPA encourages the development of watershed-based plans. Whether in development or complete, these watershed plans are tracked through the Resource Management Mapping Service (www.rmms.illinois.edu).

Participation and implementation in the Section 319 grant program has varied from year to year (Table 6.3 and Figures 6.1 and 6.2). In the years 2011–18, the cumulative total of urban practices installed through the program was 115. Urban practices cover a cumulative total of 23 acres.



In the Section 319 program, practices are converted into pounds of nutrients removed per year using the spreadsheet from the U. S. EPA Region 5 Model for Estimating Pollutant Load Reductions. Figure 6.3 and 6.4 show calculated nutrient loads removed in pounds per year for 2011–18.

Table 6.3. Urban practices installed under Section 319 Grant Program 2011–18

Practice	Number	Acres	Nitrogen Load Reduction (lb/year)	Phosphorus Load Reduction (lb/year)
2011				
Oil and Grit Separator	3	-	24	1
Green Roof	-	0.03	-	-
Rain Garden	9	-	46	79
Sediment Basin	1	-	28	3
Urban Stormwater Wetlands	13	-	299	80
Bioswale	-	2.50	-	-
Urban Filter Strip	-	1.48	180	28
Grass-Lined Channels	-	0.02	3	-
Infiltration Trench	11	-	11	4
Porous Pavement	-	1.00	81	8
2012				
Rain Garden	12	-	24	4
Urban Filter Strip	-	0.07	1	-
Infiltration Trench	7	-	3	-
Porous Pavement	-	1.31	96	9
2013				
Rain Garden	1	-	164	43
Urban Stormwater Wetlands	4	-	1,069	158
Bioswale	-	2.43	1,610	224
Urban Filter Strip	-	4.00	56	5
Infiltration Trench	6	-	12	22
Porous Pavement	-	1.51	17	2
Rock Outlet Protection	9	-	-	-
2014				
No Urban Practices Implemented				





2015				
Rain Garden	3	-	-	-
Urban Stormwater Wetlands	2	-	457	73
Bio-retention Facility	-	0.10	70	9
Infiltration Trench	1	-	1	-
Porous Pavement	-	1.66	11	1
2016				
Rain Garden	8	-	1	-
Structure for Water Control	3	-	276	276
Bioswale	-	0.23	582	98
Porous Pavement	-	2.32	55	4
2017				
Bioswale	-	1.03	83	13
Urban Filter Strip	-	2.00	96	15
2018				
Urban Stormwater Wetlands	2	-	279	35
Bioswale	-	0.89	21	7
Urban Filter Strip	-	0.62	36	5

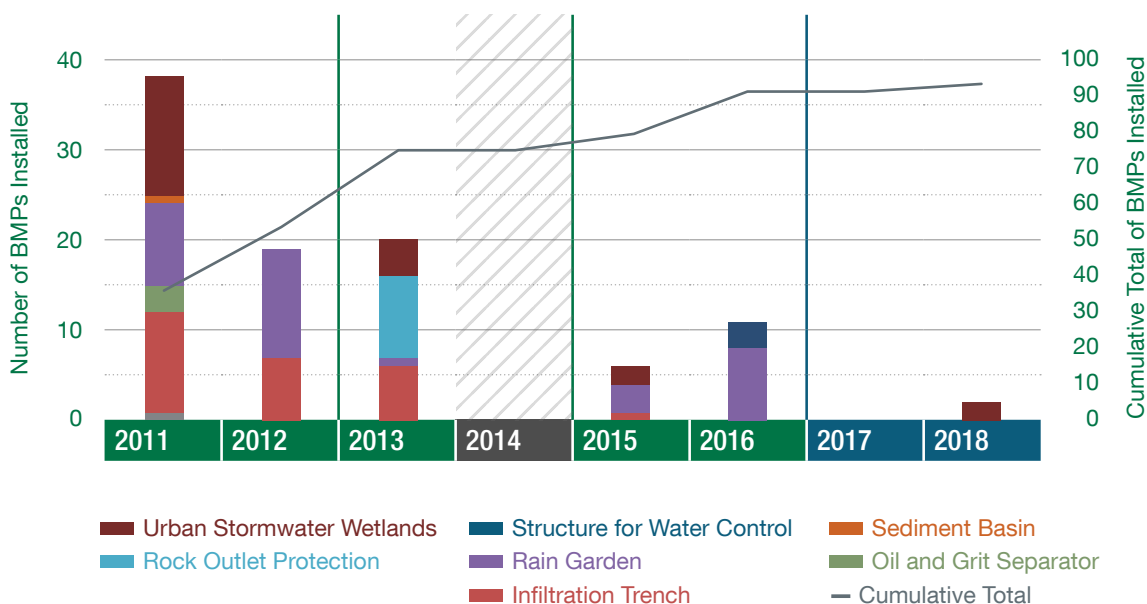


Figure 6.1. Number of urban practices installed under Section 319 Grant Program 2011–18

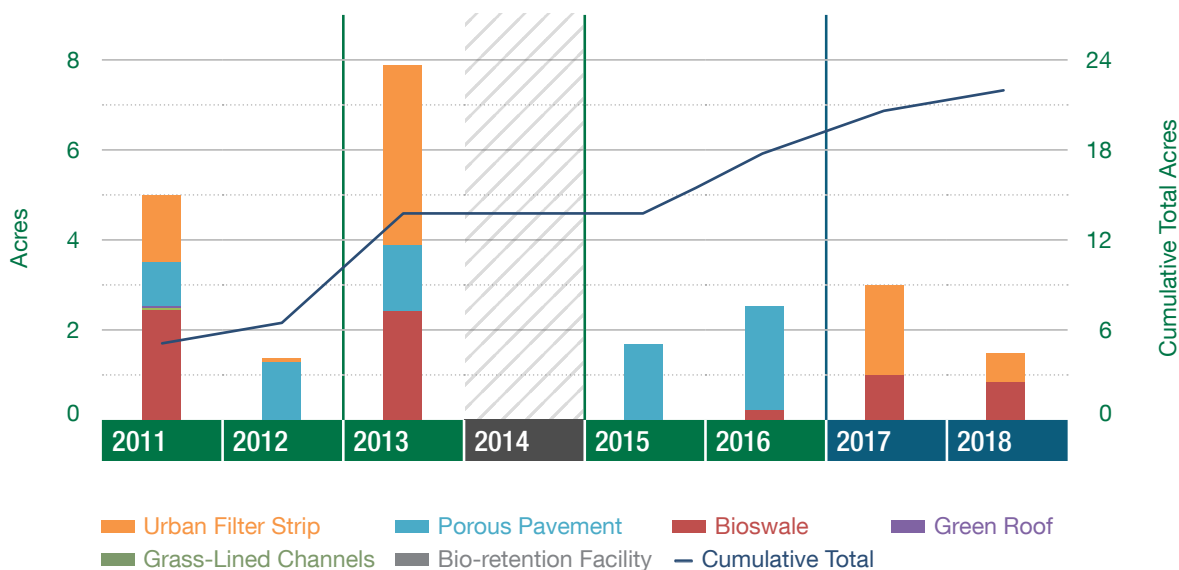


Figure 6.2. Acres treated by urban practices installed under Section 319 Grant Program 2011–18

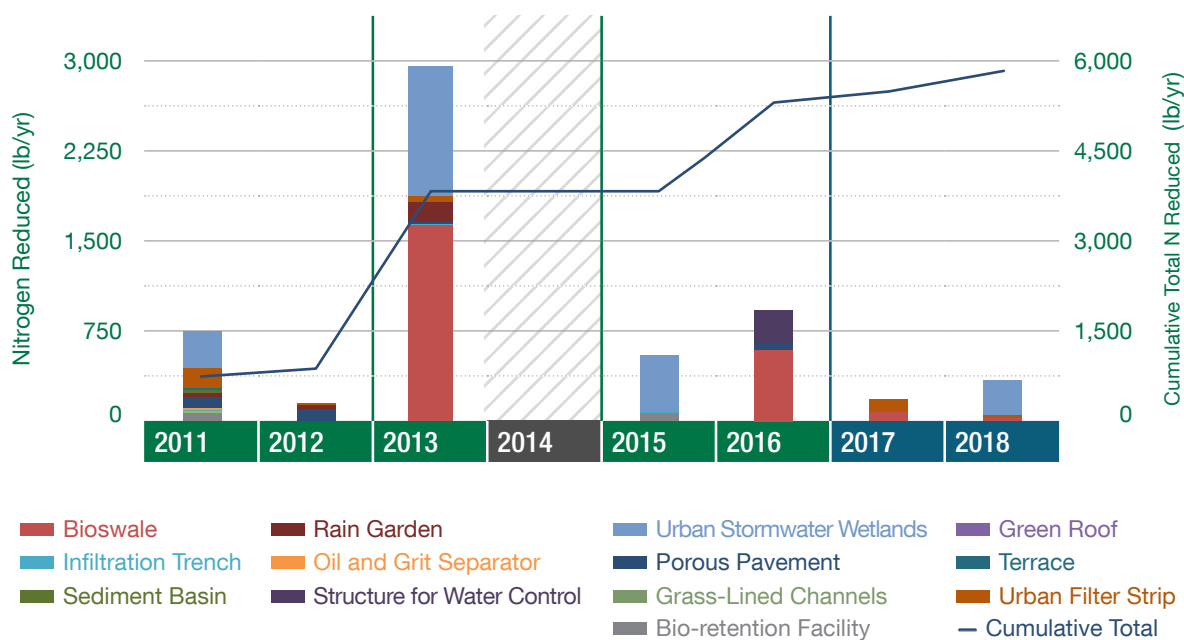


Figure 6.3. Calculated nitrogen load reduction (lb/yr) from Section 319 Grant Program urban practices 2011–18

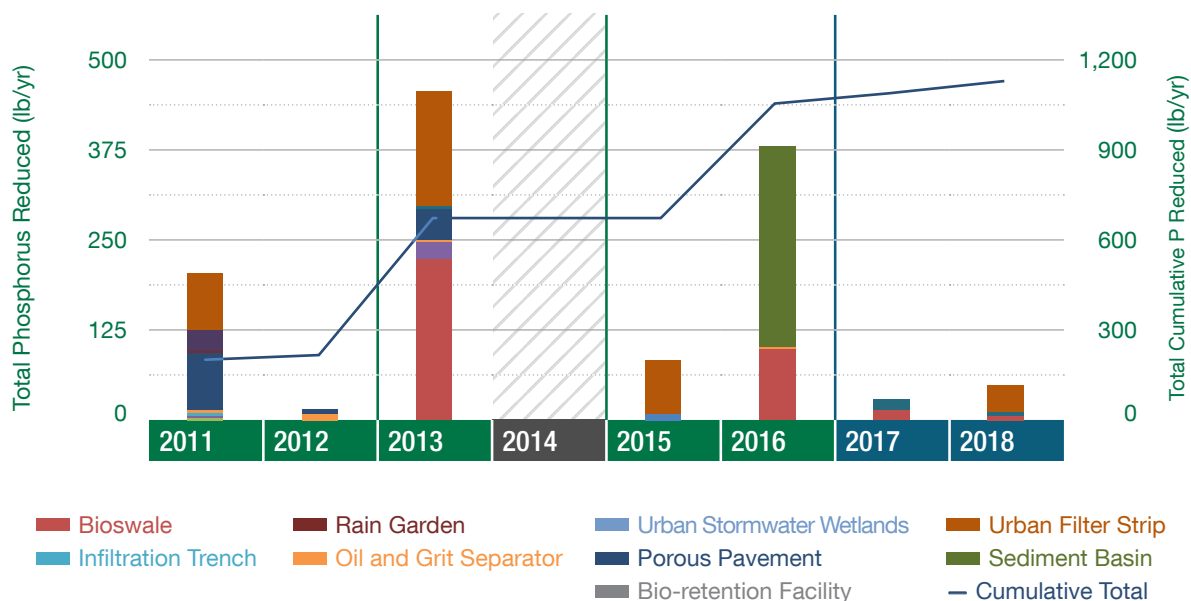


Figure 6.4. Calculated total phosphorus load reduction (lb/yr) from Section 319 Grant Program urban practices 2011–18

MS4 Report Analysis

Phase I of the NPDES stormwater program started in 1990 and required medium and large MS4s to obtain NPDES permits. The expanded Phase II program began in 2003 and required small MS4s in urbanized areas to obtain NPDES permits and implement six minimum control measures (An urbanized area as defined by the U.S. Census Bureau is densely settled census tracts or blocks along with the densely settled surrounding area, which together have a residential population of at least 50,000 and an overall population density of at least 500 per square mile). The General Permit for Stormwater Discharge for MS4s was reissued on February 10, 2016 and is in effect from March 1, 2016 to February 28, 2021.

In total, Illinois EPA has issued 379 active MS4 permits and these communities are required to submit annual reports. To determine whether MS4 reports could be a source of urban practice implementation data, Illinois Extension analyzed 287 MS4 Annual Facility Inspection Reports for 2018. The reporting period was April 1, 2017–March 31, 2018. See Figure 6.5 for the location of MS4 communities in the analysis.



Location of Illinois MS4 Communities

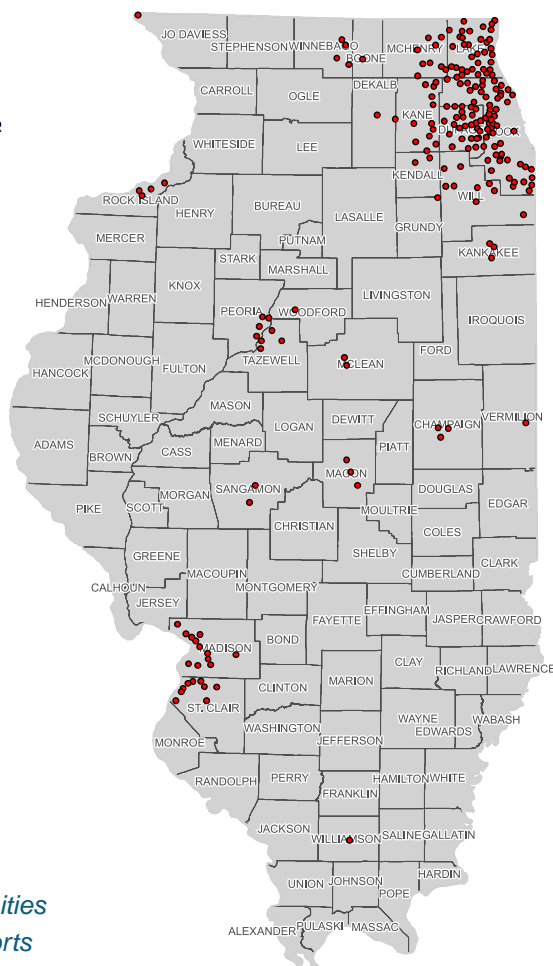
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Legend

● MS4 Communities



Note: The unincorporated communities of Ingleside and Mossville are also MS4 communities

Figure 6.5. MS4 communities with available annual reports

Data Considerations

Annual Facility Inspection Reports submitted to Illinois EPA are in narrative form with wide variation in detail; therefore, the analysis is coarse and may not fully represent all practices for all MS4 permit holders. Due to report variability, the analysis only identified whether the permit holder has relevant programming or not. It also revealed that the reports do not provide reliable estimates of the number of practices in place, as well as their age, size, or impact on water quality. Further, some MS4s overlap municipal boundaries and thus may result in a double count for practices that are controlled at the city or county level (e.g., stormwater utilities and stormwater master plans). Lastly, because these are MS4 Annual Facility Inspection Reports, data in combined sewer overflow areas are not captured by this analysis.



Findings

Table 6.4 details the reviewed urban stormwater practices and illustrates the number and percent of MS4 permit holders using that practice. All 287 reviewed communities reported at least one urban stormwater practice. However, in nearly all of these communities, the primary practice was to engage in outreach, which is a permit minimum measure requirement. Dry weather screening and street sweeping programs were the most often used physical practices. Only a few communities have stormwater master plans or related utility fees. Figure 6.6 shows the number of green infrastructure practices in MS4 communities.

Table 6.4. Number of MS4s implementing practices

	Practice	Number of MS4s	Percent of MS4s
Physical Practices	Dry Weather Screening	143	49%
	Street Sweeping	114	39%
	De-icer Management	101	35%
	Detention Basin Maintenance	89	31%
	Litter Clean up Event	51	18%
	● Community Rain Gardens	30	10%
	● Bioswales	16	5%
Plans and Policies	● Green Infrastructure Grants	32	12%
	Stormwater Master Plans	27	9%
	● Stormwater Utility Fees	24	8%
Residential Programs	Community Outreach	278	97%
	Household Hazardous Waste Collections	92	32%
	● Rain Barrel Programs	80	27%
	Electronic Recycling	40	14%
	● Homeowner Rain Garden Incentives	23	8%

● Practices and programs depicted in Figure 6.6





Number of GI Practices in Illinois MS4 Communities

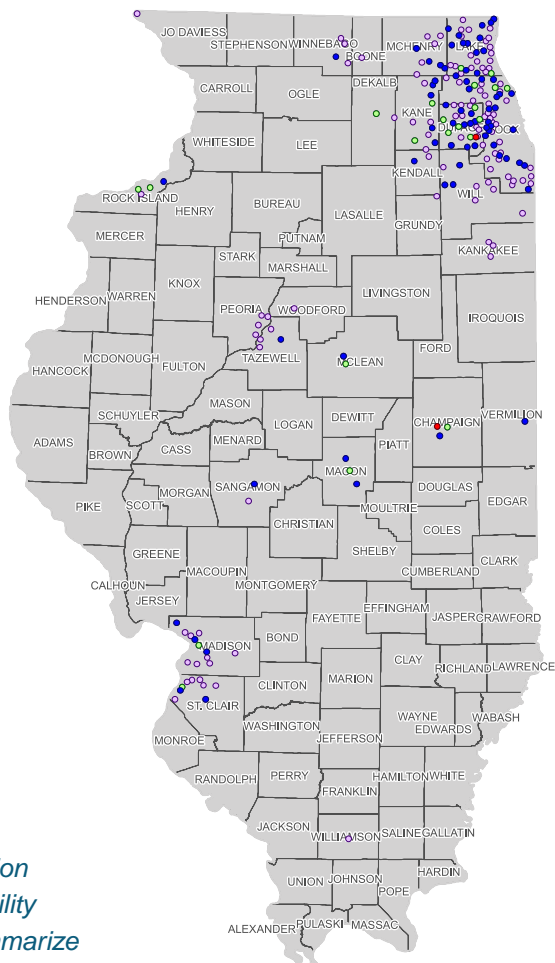
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Number of GI Practices

- 5 or More
- 3-4
- 1-2
- 0



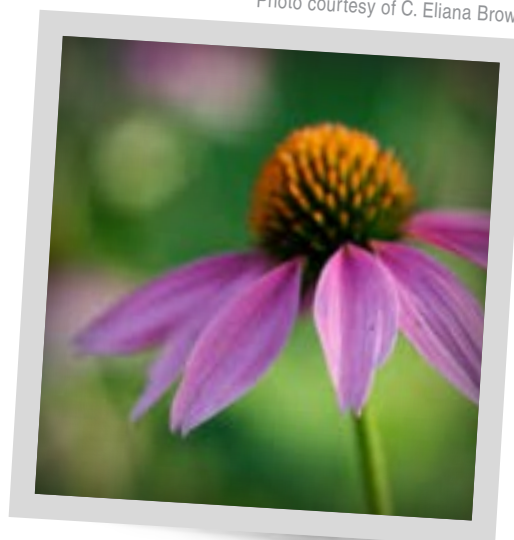
Note: The unincorporated communities of Ingleside and Mossville are also MS4 communities

Figure 6.6. Illinois Extension reviewed MS4 Annual Facility Inspection Reports to summarize urban stormwater implementation

Photo courtesy of C. Eliana Brown

Metric Establishment and Collection

It is clear that the stormwater sector implementation numbers are under-reported due to previously discussed challenges to capturing these numbers. To better quantify reporting metrics and collection, the Urban Stormwater Tracking Subgroup is working to establish a statewide tracking inventory and identify data sources (see Chapter 7 for more discussion.).





Current Programs and Projects Supporting Nutrient Loss Reduction Goals

The following section highlights programs and projects that have undergone significant changes or have noteworthy updates since Illinois NLRS and the last biennial report.

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

Section 319	p.123
Municipal Separate Storm Sewer System Permits	p.127
Urban Stormwater ILR10 Permit Reissued	p.131
Clean Water Initiative and State Revolving Fund	2017 Biennial Report p.74
MWRDGC Rain Barrel and Green Infrastructure Programs	p.132
Streambank Stabilization and Restoration Program	p.70
Total Maximum Daily Load	p.116
Calumet Stormwater Collaborative	p.133
National Green Infrastructure Certification Program	p.133
Lawn to Lake	p.134

(Bold type and page number indicate an update in this report. Details about programs listed in non-bold type and page number can be found in the listed document.)

Urban Stormwater ILR10 Permit Reissued

Illinois EPA reissued the NPDES ILR10 Stormwater Discharges from Construction Activities permit on August 3, 2018. Permit changes include language that specifically minimizes sediment tracking and dust from construction sites. It also requires 50 feet of natural buffers for construction projects that are within 50 feet of waters of the state. These permit updates are expected to reduce the amount of soil—and therefore, phosphorus—that is lost during construction activities. This permit, which applies to construction sites greater than one acre, will expire on July 31, 2023. Illinois EPA contracted with county Soil and Water Conservation Districts to provide compliance education for the ILR10 permit.





MWRDGC Rain Barrels and Green Infrastructure Programs

While the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) free rain barrel program ended in 2016, MWRDGC continues to provide barrels at cost to district residents. According to MWRDGC, if all rain barrels distributed and sold through December 31, 2017 were properly used throughout year, the volume of rainwater that was prevented from entering the sewer system in 2017 would be nearly 500 million gallons. MWRDGC also developed and distributed a rain barrel brochure at all of their community outreach events.

Space to Grow is an innovative public-private partnership with a mission of transforming Chicago schoolyards into vibrant green spaces. Prior to renovations, many of the schoolyards were little more than asphalt parking lots. In contrast, the new schoolyards typically feature multi-purpose courts on permeable asphalt, turf fields, outdoor classrooms, rain gardens, and vegetable gardens. Each schoolyard has the capacity to capture hundreds of thousands of gallons of rainwater that otherwise would have drained into local sewers.



The Space to Grow pilot included four sites, which collectively have a design retention capacity of 731,004 gallons per rain event. These projects have positively impacted thousands of local residents by providing a safe place for their children to play, providing much needed relief from localized flooding, and educating residents on the benefits of green infrastructure. Given the success of the pilot, the MWRDGC Board of Commissioners authorized expanding the program to fund green infrastructure at up to thirty more schools. This project began in 2015 and runs through 2022, with a total investment by MWRDGC of approximately \$16 million.

The program is co-managed by the Healthy Schools Campaign and Openlands with capital funding, leadership, and expertise from MWRDGC, Chicago Public Schools, and the City of Chicago Department of Water Management. The Metropolitan Water Reclamation District of Greater Chicago also provides technical support for green infrastructure elements to ensure that the new schoolyards provide optimal stormwater capture benefits.





Calumet Stormwater Collaborative

The Calumet Stormwater Collaborative (CSC) has been convening stakeholders to solve flooding and water quality problems in the Little Calumet River and Cal-Sag Channel watersheds since 2014. More than 40 organizations participate in CSC. During monthly meetings, group members exchange information on water quality and flooding needs as well as worthwhile projects and initiatives.

The collaborative has developed free, online green infrastructure design templates for communities, a new data-mapping tool for the region, a repository of stormwater management resources, and a logic model for GI training and maintenance.

In 2018, the collaborative developed a three-year work plan (www.metroplanning.org/uploads/cms/documents/csc_workplan_2018_2021_final.pdf) and convened a community workshop. In 2017 and 2018, CSC developed four watershed plans including the Little Calumet River and Cal-Sag Channel watersheds as well as the Des Plaines River in Cook County and Poplar Creek. These plans, which were approved by Illinois EPA, recommend best management practices such as green infrastructure to reduce nutrient pollution from stormwater. Communities and other stakeholders in the watersheds can apply for Section 319 grants to help support key projects.



Photo courtesy of C. Eliana Brown



National Green Infrastructure Certification Program

The Water Environment Federation (WEF) and partners, including MWRDGC, created the National Green Infrastructure Certification Program (NGICP) to grow a green workforce. The program trains entry-level workers in the base-level skillset to properly construct, inspect, and maintain green infrastructure. With this training, candidates are qualified to enter this field and earn a living wage. Designed



to meet international best practice standards, NGICP can meet a wide range of needs, including providing professional development for green infrastructure professionals (ngicp.org).

In 2018, Parkland College in Champaign signed a contract with WEF to become the first licensed training center in Illinois, and the first community college in the nation to offer NGICP. This training consists of 35 hours focused on green infrastructure construction, functionality, and maintenance. Parkland College offers the course regularly and, additionally, in response to specified needs from organizations and industries.

Lawn to Lake

Illinois-Indiana Sea Grant (IISG) established its Lawn to Lake program in 2010 through a four-year Great Lakes Restoration Initiative grant, with the goal of protecting water quality in the Great Lakes region by promoting sustainable lawn and landscaping practices. During the grant period, IISG created natural lawn care outreach publications geared towards homeowners and facilitated training workshops for landscapers, Master Gardeners, and teachers.



Photo courtesy: Jack Pizzo

Over the past two years, efforts have been focused on revamping Lawn to Lake outreach materials. Sea Grant has updated the program branding, creating a new logo and stylized templates for outreach publications and social media.

In 2018, University of Illinois Extension awarded IISG an Interdisciplinary Collaboration Extension grant to work with the Department of Agricultural Communications in the University of Illinois College of Agricultural, Consumer and Environmental Sciences to address lawn care-related pollution in watersheds. The team is conducting a statewide survey and holding focus group discussions to develop, pilot, and assess a targeted natural-lawn-care communication campaign for homeowners (iisegrant.org/work/healthy-waters/programs-initiatives/natural-lawn-care).





Future Strategic Actions

Urban Stormwater Working Group

The strategy called for the creation of the Urban Stormwater Working Group to “explore funding, identify legislative initiatives, develop plans” and “coordinate outreach and orchestrate statewide efforts related to green infrastructure expansion and retrofitting, MS4 program training, and urban stream, lake, and stormwater monitoring.” The Urban Stormwater Working Group and its two subgroups—education and tracking—continue to meet to discuss these issues. See Chapter 7 for a discussion of 2017–18 activities.



Photo courtesy of C. Eliana Brown





Photos courtesy of Kate Gardiner, Laura Christianson, and C. Eliana Brown



CHAPTER 7

WORKING GROUP ACCOMPLISHMENTS

One of Illinois' greatest strengths in developing the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) is the vast network of partners and stakeholders involved. For strategy implementation, several working groups have been convened under the Policy Working Group (PWG) to monitor progress and answer questions raised in Illinois NLRS. These groups have regular meetings and, starting in 2017, hold an end-of-the-year nutrient workshop that, among other emphases, highlights research. This chapter discusses the conclusions and accomplishments of these working groups and their associated sub-groups. Specific agendas, PowerPoints, and meeting minutes are all available on the Illinois EPA's website.

Policy Working Group

The Policy Working Group advises the Illinois Environmental Protection Agency (EPA) and Illinois Department of Agriculture on the strategy. It is comprised of representatives from agencies (local, state, and federal), the agricultural industry, and non-profit organizations as well as scientists, academics, and wastewater treatment professionals. Members include representatives from: the American Bottoms Regional Wastewater Treatment Facility, American Farmland Trust, Aqua Illinois, Association of Illinois Soil and Water Conservation Districts, Bloomington & Normal Water Reclamation District, City Water, Light, and Power (Springfield), Downers Grove Sanitary District, Environmental Law & Policy Center, GROWMARK, Illinois Association of Drainage Districts, Illinois Corn Growers Association, Illinois Department of Agriculture, Illinois Department of Natural Resources, Illinois Environmental Protection Agency, Illinois Environmental Regulatory Group, Illinois Farm Bureau, Illinois Fertilizer & Chemical Association, Illinois Pork Producers Association, Metropolitan Planning Council, Metropolitan Water Reclamation District of Greater Chicago, Nutrient Research & Education Council, Prairie Rivers Network, Sierra Club, The Nature Conservancy, University of Illinois Extension, Urbana & Champaign Sanitary District, and U.S. Department of Agriculture Natural Resources Conservation Service.

The Policy Working Group is charged with the following objectives:

- Explore funding opportunities.





- Identify needed legislative initiatives.
- Network with the appropriate people and groups.
- Identify adaptive management adjustments and update the strategy.

Over the last two years, PWG met four times: February 2 and November 30 in 2017 as well as May 30 and November 13 in 2018.

During their November 2017 meeting, PWG identified a need for a unified message regarding the strategy that incorporates expertise from each sector. Members agreed that this unified message should be shared with Illinois lawmakers as well as the public. The Policy Working Group created a short-term communication subgroup to develop strategies and materials to educate governmental bodies about Illinois NLRS. More information is provided in the Communication Subgroup section below.

Gregory McIsaac, associate professor emeritus at the University of Illinois, submitted corrections to PWG at their May 2018 meeting regarding previous estimates of statewide loads, which resulted in a reduction of 8% for nitrate-nitrogen flux instead of the 10% originally reported in the 2017 biennial report. The Policy Working Group recommended that the steering committee and Dr. McIsaac update the Science Assessment (Chapter 3).

One of PWG's charges is to adaptively manage the strategy. To meet this objective, the group decided to reconvene the Performance Benchmark Committee and to refocus on implementation and meeting the goals set forth in the strategy.

The Policy Working Group continues to meet one to two times per year to work toward achieving its objectives.

Communication Subgroup

The Policy Working Group's communication subgroup was formed at the 2017 Illinois NLRS Partnership Conference to educate elected officials, government staff members, professionals, contractors, business community members, and residents throughout the state about the hypoxic zone in the Gulf of Mexico, the strategy, and opportunities to participate. Members included representatives from the Center for Neighborhood Technology, Illinois Association of Drainage Districts, Illinois Department of Agriculture, Illinois Department of Natural Resources, Illinois Environmental Protection Agency,





Illinois Environmental Regulatory Group, Illinois Farm Bureau, Illinois Fertilizer & Chemical Association, Metropolitan Water Reclamation District of Greater Chicago, Prairie Rivers Network, and the Sierra Club.

Meetings were held January 10, January 24, and February 13, 2018.

The communication subgroup agreed to develop an Illinois NLRS 101 PowerPoint presentation, which would be available to stakeholders when speaking on these issues. Members also recognized the importance of connecting with members of the Illinois General Assembly, so elected officials are aware of Illinois NLRS and the issues that pertain to its implementation.

The communication subgroup successfully completed both action items in early 2018. Members developed an overarching presentation titled Illinois Nutrient Loss Reduction Strategy: Past, Present, and Future, which is available on the Illinois EPA website. Letters were mailed to state legislators in the spring of 2018, with copies of Illinois NLRS and the 2017 biennial report.

Going forward, the communication subgroup will meet on an as-needed basis.

Agriculture Water Quality Partnership Forum

The Agriculture Water Quality Partnership Forum (AWQPF) works collaboratively to implement policy and management decisions related to Illinois NLRS in the agricultural sector. The Agriculture Water Quality Partnership Forum is comprised of high-level officials from agencies and non-governmental organizations, and it includes representatives from: the American Farmland Trust, Association of Illinois Soil and Water Conservation Districts, Farm Service Agency, Illinois Certified Crop Adviser Board, 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, Illinois Pork Producers Association, Illinois Society of Professional Farm Managers and Rural Appraisers, Illinois Soybean Association, Illinois Stewardship Alliance, Metropolitan Water Reclamation District of Greater Chicago, Nutrient Research & Education Council, Prairie Rivers Network, The Nature Conservancy, University of Illinois, and U.S. Department of Agriculture Natural Resources Conservation Service.

The Agriculture Water Quality Partnership Forum is charged with the following objectives:





- Steer and coordinate outreach and educational efforts to help farmers address nutrient loss and select the most appropriate best management practices (BMPs).
- Identify needed educational initiatives or training requirements for farmers and technical advisors.
- Strengthen connections between industry initiatives, certified crop advisor continuing education requirements, state initiatives, and other technical services.
- Track BMPs.
- Coordinate cost-share and targeting.
- Develop other tools as needed.

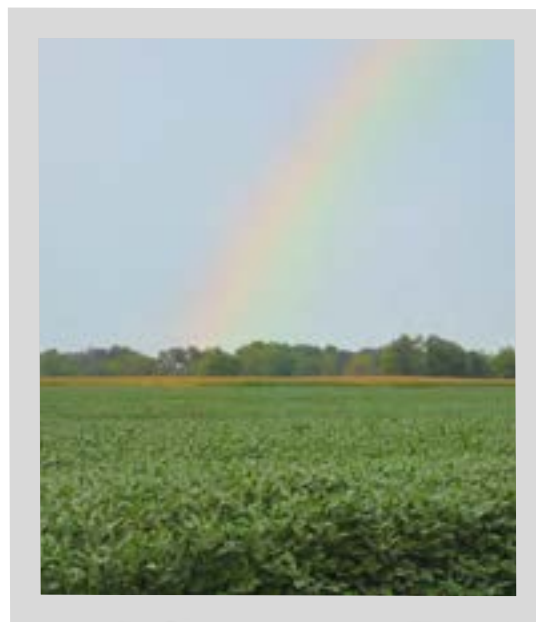


Photo courtesy of C. Eliana Brown

The Agriculture Water Quality Partnership Forum met on April 4, 2017 and April 30 and November 13 in 2018.

Members decided that tillage data should be included in this biennial report—both statewide and by watershed. The Farm Service Agency updated members on how cover crop data is reported, and the newly formed Illinois NLRS Science Team confirmed it would develop processes to add conservation practices and to review BMP performance (see Adaptive Management chapter). The Agriculture Water Quality Partnership Forum will continue to discuss BMP adoption mapping as a possibility for Illinois. Other AWQPF efforts included:

- Recommending coining a phrase for the University of Illinois “Go Date” for fall NH_3 application.
- Expressing interest in working with the two Illinois Extension watershed coordinators to discuss progress and partnerships.
- Recognizing Champaign County Soil and Water Conservation District’s S.T.A.R. program as a free tool to assist farm operators and landowners to evaluate their own nutrient loss management practices and to promote BMPs on individual fields.

The Agriculture Water Quality Partnership Forum continues to meet one to three times per year to make progress on objectives and to stay up to date on the latest nutrient research and programs in Illinois and surrounding states. During these meetings, AWQPF considers and can recommend additional actions to track progress toward implementing the strategy.





Agriculture Water Quality Partnership Forum Technical Subgroup

The Agriculture Water Quality Partnership Forum created a technical subgroup to track nutrient loss reduction implementation across Illinois. Members of the AWQPF Technical Subgroup include representatives from: the American Farmland Trust, Farm Service Agency, 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, The Nature Conservancy, University of Illinois, U.S. Department of Agriculture National Agriculture Statistics Survey, and U.S. Department of Agriculture Natural Resources Conservation Service.

The AWQPF Technical Subgroup is charged with the following objectives:

- Determine the best way to share and aggregate BMP implementation data across agencies (to track progress in accomplishing strategy goals).
- Determine what BMP implementation parameters will be tracked (e.g., cover crops, wetlands, buffer strips, etc.) and how the data will be aggregated [e.g., per watershed, statewide, practices lumped into categories (such as edge-of-field), etc.]. This includes identifying future data parameters required from producer surveys or transect surveys to track progress in accomplishing Illinois NLRs goals.

The Agriculture Water Quality Partnership Forum Technical Subgroup met on July 17, 2018.

Members agreed to continue submitting information for land measures, resources, and outreach on their programs and efforts for this report. According to the Hypoxia Task Force Nonpoint Source Measures Workgroup 2018 report, when tracking BMP implementation, the parameters to document are location, type of conservation practice, applied amount or practice units, and when the practice was applied. Subgroup members agreed to adhere to this recommendation, meeting their objective of determining which BMP implementation parameters to track.

The AWQPF Technical Subgroup continues to meet annually to reach its objectives.

Urban Stormwater Working Group

While urban runoff due to increased impervious surfaces is a smaller contributor to statewide nutrient loads than point source and agricultural non-point source runoff, it can still have impacts on local water quality.





Members of the Urban Stormwater Working Group (USWG) include representatives from: the Center for Neighborhood Technology, Chicago Metropolitan Agency for Planning, City of Champaign, City of Peoria, City of Urbana, DuPage County, Greater Egypt Regional Planning and Development Commission, Illinois Department of Natural Resources, Illinois Department of Transportation, Illinois Environmental Protection Agency, Illinois Environmental Regulatory Group, Illinois Farm Bureau, Illinois-Indiana Sea Grant, Sierra Club, Illinois State Water Survey, Lake County Stormwater Management Commission, Madison County, Metropolitan Agency for Planning, Metropolitan Water Reclamation District of Greater Chicago, National Great Rivers Research and Education Center, Parkland College, Prairie Rivers Network, The Conservation Foundation, and the University of Illinois.

The Urban Stormwater Working Group is charged with the following objectives:

- Explore funding.
- Identify legislative initiatives and develop plans.
- Coordinate outreach and orchestrate statewide efforts related to green infrastructure expansion and retrofitting; Municipal Separate Storm Sewer System (MS4) program training; and urban stream, lake, and stormwater monitoring.

Meetings were held four times in 2018 via conference call on May 14 and August 22 and in person on September 26 and November 13.

The Urban Stormwater Working Group invited several speakers to its meetings. Tom Schueler of the Chesapeake Bay Stormwater Network spoke to USWG about his experiences and lessons learned from tracking stormwater BMPs, and Roger Bannerman, formerly with the Wisconsin Department of Natural Resources, talked about the United States Geological Survey (USGS) leaf management study, which found that improved leaf collection can significantly reduce annual total phosphorus loads. Working group members decided to use Mr. Schueler's lessons learned and the USGS leaf management study to further stormwater tracking and education in Illinois.

Members of USWG agreed to explore developing a statewide MS4 coordinator network and a crowd-sourcing application that can track green infrastructure information. Future topics were identified, including green infrastructure municipal code audit procedures and successful green infrastructure projects. One possible example is the Preserve at Oak Meadows, a golf course in DuPage County that has a wetland installation.





The Urban Stormwater Working Group continues to meet annually to fulfill their goals.

Urban Stormwater Education Subgroup

The Urban Stormwater Working Group created an education subgroup to explore ways to provide stormwater education resources and to make audiences aware of stormwater issues. Members include representatives from: the Center for Neighborhood Technology, Chicago Metropolitan Agency for Planning, DuPage County, Greater Egypt Regional Planning and Development Commission, Illinois Department of Natural Resources, Prairie Rivers Network, and the University of Illinois.

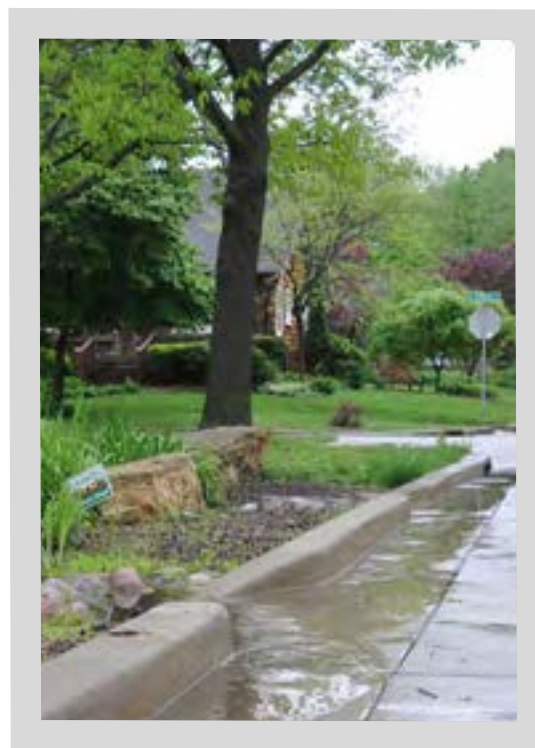
The Urban Stormwater Education Subgroup met via conference call on June 26 and August 7 in 2018.

Over the course of these calls, the subgroup amended the Calumet Stormwater Collaborative's resource repository to include information from the rest of the state. Members worked with the Illinois Association of Floodplain and Stormwater Managers to publish the repository on that group's website (www.illinoisfloods.org; under Publications & Resources). The subgroup also created a Stormwater 101 presentation template for outreach by municipalities, adapted from DuPage County's existing PowerPoint presentation.

Photo courtesy: C. Eliana Brown

Urban Stormwater Tracking Subgroup

The Urban Stormwater Working Group created a tracking subgroup to determine metrics appropriate for stormwater BMPs. This can be challenging due to MS4 reporting methods and limited staff resources of both the permitting agency and the permittees. Subgroup members include representatives from: The Conservation Foundation, DuPage County, the Illinois Department of Natural Resources, Illinois Environmental Protection Agency, Lake County Stormwater Manage-





ment Commission, Sierra Club, and the University of Illinois.

The Urban Stormwater Tracking Subgroup met via conference calls on June 28 and July 24 in 2018.

Members discussed tracking stormwater BMP installations during both calls. According to the Hypoxia Task Force Nonpoint Source Measures Workgroup 2018 report, the key base parameters to track BMP implementation are location, practice type, size, acres treated, and date installed. Since abatement of stormwater runoff from new development is usually considered net-neutral when following recent ordinances, the subgroup agreed to focus on tracking the retrofitting existing structures and practices to reduce runoff.

DuPage County staff members demonstrated how the county tracks stormwater BMPs using geographic information systems (GIS) mapping technology. Urban Stormwater Tracking Subgroup members agreed that other MS4s that have GIS capabilities may be interested in a similar approach, and they discussed how to apply this technology to BMP tracking across the state. Members are exploring how to export DuPage County's system to other counties. Illinois Extension shared an analysis of Illinois EPA MS4 annual reports. This analysis is featured in Chapter 6.

Nutrient Monitoring Council

The Nutrient Monitoring Council's (NMC) overall goal is to coordinate the development and implementation of monitoring activities that provide the information necessary to:

- Generate estimates of five-year running average loads of nitrate-nitrogen and total phosphorus leaving Illinois compared to 1980–96 baseline conditions.
- Generate estimates of nitrate-nitrogen and total phosphorus loads leaving selected Illinois NLRS identified priority watersheds compared to 1997–2011 baseline conditions.
- Identify nutrient load trends both statewide and in Illinois NLRS priority watersheds over time.

The Nutrient Monitoring Council, chaired by Illinois EPA, has a membership of 13 representatives from agencies and organizations involved in monitoring and assessing nutrient loads and their impacts in Illinois; they include: Aqua Illinois, Illinois Corn Growers Association, Illinois Department of Natural Resources, Illinois Environmental Protection Agency, Illinois State Water Survey, Metropolitan Water Reclamation District of Greater Chicago, Sierra Club, U.S. Geological Survey, University of Illinois National Center for Supercomputing Applications, and the University of Illinois's Departments of Ag-





gricultural and Biological Engineering and Natural Resources and Environmental Sciences.

The Nutrient Monitoring Council meetings took place on March 14 and September 6 in 2017 and March 15 and August 29 in 2018.

Over the last two years, NMC continued to collaborate with the National Center for Supercomputing Applications (NCSA) to help guide development of the Illinois NLRs Data Portal. This portal, powered by the Great Lakes to Gulf Observatory, provides insight into changes in nutrient loadings and water resource quality using visualization tools. Initial data were collected from the Illinois EPA Ambient Water Quality Monitoring Network, Fox River Study Group, Upper Mississippi River Restoration Program, USGS and its “super gages,” and Great Rivers Ecological Observation Network. With assistance from NMC, NCSA continually strives to add datasets, GIS layers, and improved content and applications in the Illinois NLRs Portal (greatlaketogulf.org).

Operation of the USGS super gage network and the development of annual nitrogen, phosphorus, and suspended sediment loading reports continued throughout 2017–18. Funded by Illinois EPA, the eight-station, continuous monitoring network can directly determine nutrient and sediment loads leaving Illinois from approximately 75% of its land mass. With funding provided by the Metropolitan Water





Reclamation District of Greater Chicago, USGS installed and began operating another super gage on the Des Plaines River near Joliet in 2018. This ninth super gage will be extremely beneficial in determining point source nutrient contributions from Chicago metropolitan and collar county areas. Super gage network operation will continue through approximately September 2020, with annual and overall five-year summary reports developed thereafter. As of this writing, a funding source has not been secured for continued operation of the network after that time.

Some areas of the Mississippi River Basin are known to contribute meaningful nutrient loads from groundwater sources. Such is the case in the Havana Lowlands area in Illinois. With funds provided by Illinois EPA, USGS is conducting a Havana Lowlands groundwater monitoring and research project to better understand groundwater and surface water interactions as well as potential nutrient loading to surface water—first to Quiver Creek, then to the Illinois River, and finally to the Mississippi River. Project data collection will continue into 2019 to better inform Illinois NLRs regarding potential groundwater nutrient contributions to surface waters.

The Nutrient Monitoring Council continues to meet two to three times per year to discuss water quality monitoring issues and activities.

Nutrient Science Advisory Committee

The Nutrient Science Advisory Committee (NSAC) was established in 2015 to recommend numeric nutrient standards for Illinois rivers and streams to Illinois EPA.

The Nutrient Science Advisory Committee members were selected through an evaluative process conducted by Policy Working Group sector representatives. The committee's science experts represented agencies and universities, including: Indiana University, Loyola University Chicago, the National Council for Air and Stream Improvement, Southern Illinois University, the University of Illinois, U.S. Environmental Protection Agency, and U.S. Geological Survey.

After nearly thirty meetings over three years, NSAC submitted a report in December of 2018 to Illinois EPA titled [Recommendations for Numeric Nutrient Criteria and Eutrophication Standards for Illinois Streams and Rivers](#). Based on stakeholder comments, Illinois EPA is currently determining the next steps.





Performance Benchmark Committee

The Performance Benchmark Committee (PBC) was originally established by the Policy Working Group to address implementation needs defined in the strategy. Their charge is to collaborate with sector work groups to identify on-the-ground steps to meet:

- 2025 interim milestones.
- Ultimate nutrient loss reduction targets.
- In-state strategy waterway cleanup goals.

Members of the Performance Benchmark Committee include representatives from: the American Bottoms Regional Wastewater Treatment Facility, American Farmland Trust, Association of Illinois Soil and Water Conservation Districts, Illinois Association of Drainage Districts, Illinois Department of Agriculture, Illinois Environmental Protection Agency, Illinois Environmental Regulatory Group, Illinois Farm Bureau, Illinois Fertilizer & Chemical Association, Illinois Pork Producers Association, Metropolitan Water Reclamation District of Greater Chicago, The Nature Conservancy, Prairie Rivers Network, Sierra Club, U.S. Department of Agriculture Natural Resources Conservation Service, and Village of Deerfield.

The Performance Benchmark Committee met on August 21, 2018.

During the meeting, PBC members discussed options to define and integrate adaptive management as it relates to implementation of Illinois NLRS to meet nutrient reduction goals. They discussed the need for a comprehensive tool to track implementation of BMPs. Members acknowledged the inherent challenge of increasing BMP adoption while maintaining interest among early-adopters. They decided that it is more suitable to look at progress toward achieving reduction goals as a trajectory rather than meeting a set benchmark. They discussed the need to better define scenarios laid out in the strategy Science Assessment, particularly implementation scenarios NP2 and NP3, in conjunction with the assumptions made to support them. Citing strategy implementation scenarios, PBC agreed that many combinations of practices and scenarios could be used to reach Illinois NLRS goals. To that end, PBC has assisted in establishing a formal process to develop and adopt new or updated BMPs and is working toward tying this to strategy adaptive management.

The Performance Benchmark Committee efforts informed the adaptive management discussion in the next chapter.





Photo courtesy of C. Eliana Brown



CHAPTER 8

ADAPTIVE MANAGEMENT AND MEASURING PROGRESS

Both the Illinois Nutrient Loss Reduction Strategy (Illinois NLRS or the strategy) and the Gulf Hypoxia Action Plan 2008 discuss integrating adaptive management into strategy implementation. Illinois NLRS recommends that the Policy Working Group (PWG) identify adaptive management adjustments after the first biennial report (Illinois NLRS page 9-11).

Adaptive management involves learning and adapting to new research, monitoring, and policy information as it affects the decision-making process. Including adaptive management as an integral component to the overall strategy helps ensure that Illinois NLRS is a living document, remaining relevant to all stakeholders over time and focused on traditional and new activities that can enhance both in-state and Gulf of Mexico water quality.

This chapter pulls together agricultural and point source sector information with other pertinent data, methodologies, and policies to assess strategy implementation progress as a first step in adaptive management. It includes a process for adding new conservation practices and performance information to Illinois NLRS, based on peer-reviewed science. Finally, the chapter presents future needs and considerations related to further strategy goals. As stated in Illinois NLRS, “as success is achieved in implementing certain controls or practices, priority for funding, incentives, outreach, and education may be shifted towards additional effective controls or practices. If load reductions or other water quality improvements are not observed, or if implementation of management actions does not meet expectations, PWG will evaluate whether new strategic actions must be considered.”

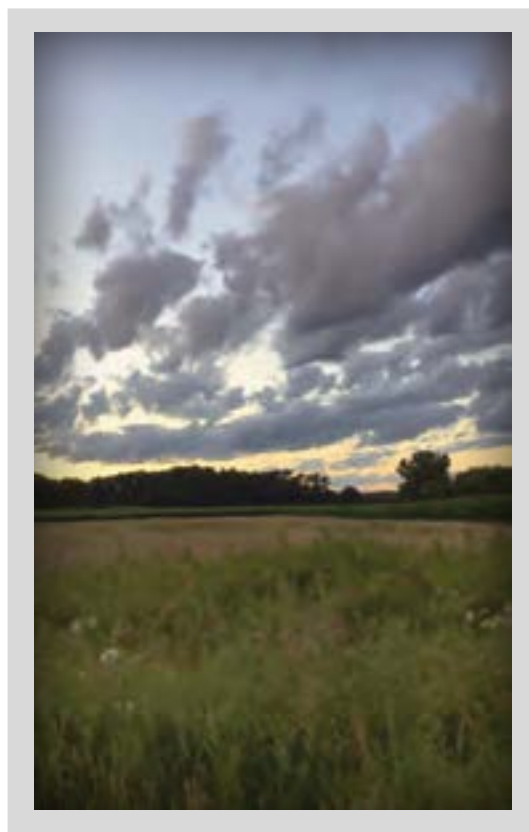


Photo courtesy: Katrina Widholm





Water Quality Goals

The overall objective of the strategy is to improve water quality, not only in Illinois, but downstream, to reduce the impact of the hypoxic zone in the Gulf of Mexico. Illinois NLRS set a long-term goal of reducing loads from the state for total phosphorus (P) and total nitrogen (N) by 45%, with interim reductions of 15% nitrate-nitrogen and 25% total phosphorus by 2025. (Figures 8.1 and 8.2.) The graphs compare the loads for nitrate-nitrogen and total phosphorus to the original baseline loads of 1980–96, the updated loads of 1997–2011, the 2011–15 average loads, and the 2013–17 average loads. These graphs also include the target loads based on the interim 2025 goals and the final targets for the 45% reduction.

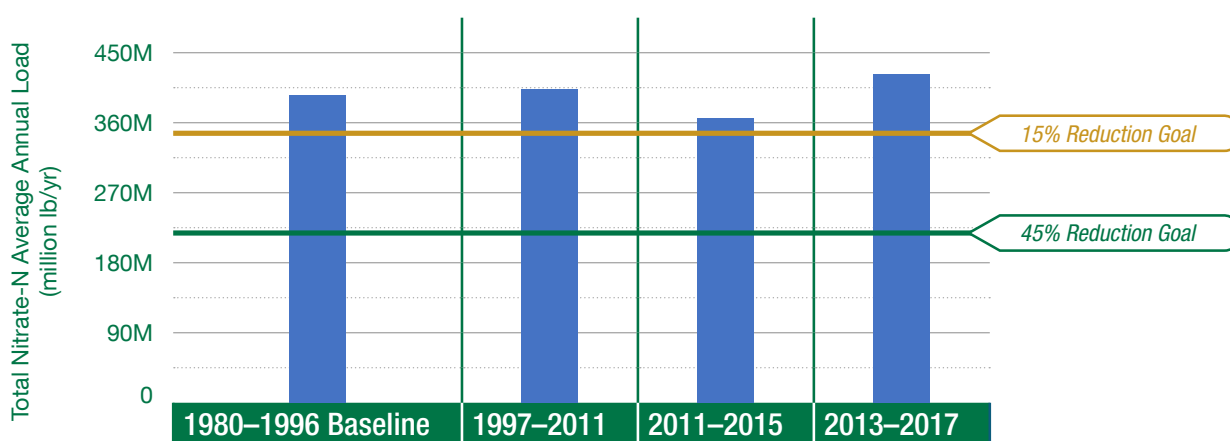


Figure 8.1. Illinois Nitrate Load

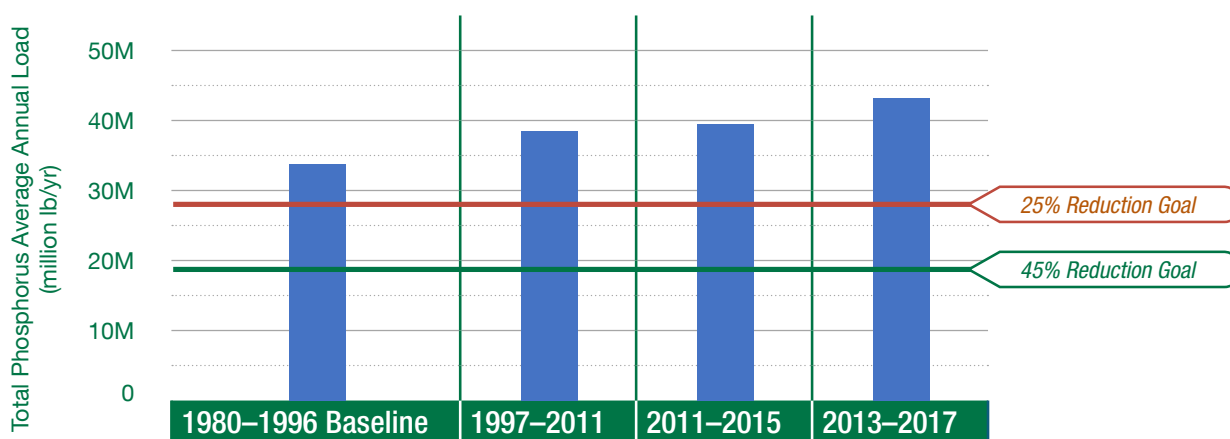
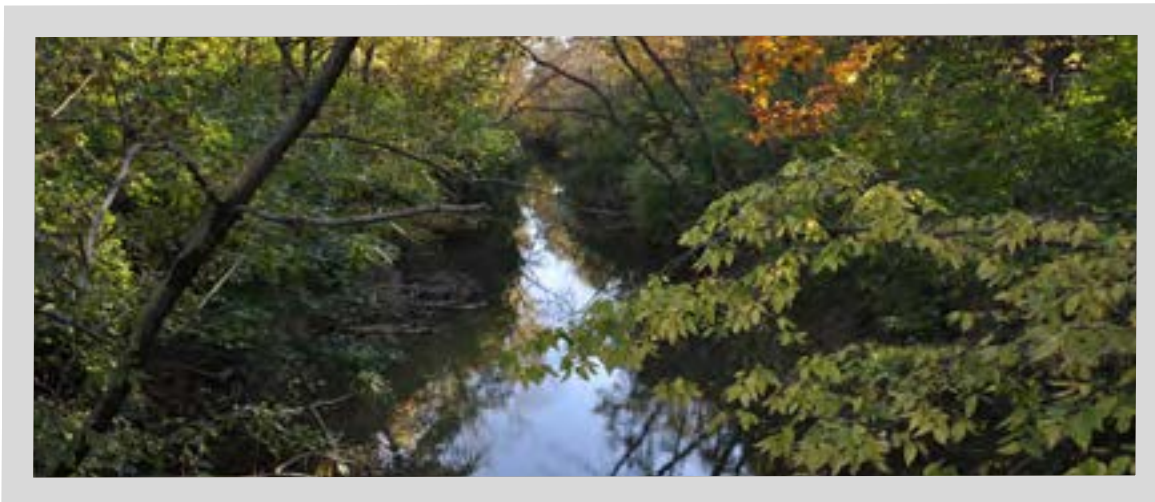


Figure 8.2. Illinois Total Phosphorus Load





Photo courtesy of C. Eliana Brown



The 2017 biennial report stated that the 2011–15 nitrate-nitrogen loads had decreased by 10%, while total phosphorus loads increased by 17%. Discussion in the first biennial report’s Science Assessment Update included possible explanations for these trends. The decrease in nitrate-nitrogen loads may have been due to 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 report goes on to point out that with flows at near average from 2011 to 2015, the 10% reduction in nitrate-nitrogen loads cannot be explained by flow levels, but rather that improved management and conservation efforts led to progress in decreasing nitrate-nitrogen losses from Illinois. The authors speculated that the 17% increase in total phosphorus loads could have been due to population growth, and associated land use changes, and the fact that some wastewater facilities had not yet completed nutrient removal upgrades.

However, the 2013–17 data used in this report’s Science Assessment Update shows a 7% increase state-wide in nitrate-nitrogen loads and a 26% increase in total phosphorus loads. Flow, which drives nutrient loads, was up 13% compared to the 1980–96 baseline period. As discussed in Chapter 3 of this report, “much of the increase in the nitrate load occurred in the Rock River, while much of the increase in TP load occurred in the Illinois River.”

U.S. Geological Survey Continuous Loadings Network

In 2015, the United States Geological Survey (USGS), in cooperation with the Illinois Environmental Protection Agency (EPA), began a monitoring program to determine nutrient (nitrate-nitrogen and total



phosphorus) and sediment loadings over an initial five-year period at eight monitoring stations on the eight primary Illinois tributaries in the upper Mississippi River Basin. In 2018, a ninth station was added on the Des Plaines River to determine progress in the highly urbanized area of northeastern Illinois. Each gaging station, referred to as a “super gage,” continuously measures discharge, which, combined with nutrient and sediment concentrations, determines continuous loading.

The U.S. Geological Survey submitted a report to Illinois EPA (Nutrient and Sediment Export from Illinois—Quantification through a Continuous Loadings Network: Preliminary Results through Water Year 2017) summarizing the data collected through the real-time monitoring network. The report estimates the 2016 and 2017 nutrient loads, along with the two-year mean. Data from the super gages estimated that the 2016–17 mean statewide nitrate-nitrogen load was 466,250,000 pounds and the 2016–17 mean statewide total phosphorus load was 38,130,000 pounds.

The data used to estimate loads in the Science Assessment Update were collected every six weeks by Illinois EPA while USGS data are based on continuous data, which enables the capture of a range of flow and storm events. Eight of the nine real-time sensors drain an estimated 75% of Illinois land. It should be noted that USGS estimates include contribution from watersheds in Wisconsin and Indiana.

Implementation Scenarios

To measure progress, it is important to refer to the implementation goals laid out in the strategy Science Assessment. The assessment authors present statewide nitrate-nitrogen and total phosphorus implementation scenarios and then combine those scenarios with the percent of nutrient reductions, reduction costs per pound of nutrient, and annualized costs (see Table 3.17 of Illinois NLRS). Of the combined scenarios presented, only Scenarios NP2 and NP3 met the 45% reduction goal for both nitrate-nitrogen and total phosphorus (See Table 8.1). Note, however, that implementation scenarios in the strategy were presented as examples for meeting the 45% reduction, and are by no means the only possible scenarios for consideration. Using the practice/scenario reductions listed in Tables 3.11 and 3.14 of Illinois NLRS, one could develop additional implementation scenarios to meet the interim and 45% reduction goals.

Since the release of the strategy, PWG has not formally adopted any example scenarios as recommendations. However, many Illinois NLRS stakeholder partners are recommending practices put forth in the implementation scenarios. With a few years of implementation data available for analysis, certain trends may become evident.





Table 8.1

Name	Combined Practices and Scenarios	Nitrate-N reduction (percent)	Total P reduction (percent)	Cost of reduction (\$/lb)	Annualized costs (million \$/yr)
NP2	MRTN, spring-only N application, bioreactors on 50 percent of acres, wetlands on 10 percent of acres, no P fertilizer on 12.5 million acres above STP maintenance, reduced till on 1.8 million conventionally tilled acres eroding >T, cover crops on all corn/soybean acres, point source to 1 mg total P/L and 10 mg nitrate-N/L	45%	45%	**	878
NP3	MRTN, spring-only N application, bioreactors on 30 percent of acres, no P fertilizer on 12.5 million acres above STP maintenance, reduced till on 1.8 million conventionally tilled acres eroding >T, cover crops on 87.5 percent of corn/soybean acres, buffers on all applicable lands, perennial crops on 1.6 million and 0.9 million additional acres	45%	45%	**	827

The Performance Benchmark Committee reviewed implementation scenario examples NP2 and NP3 to understand how practices relate to measurable goals. Some assumptions built into the practices were not necessarily evident in the strategy Science Assessment. Greg McIsaac, a principal writer, provided information on these assumptions. Table 8.2 presents scenarios NP2 and NP3, and connects each practice with the appropriate assumptions, acres needed, relevant nutrient, and the suggested data source for reporting each metric. In some cases, the same practice is recommended for both implementation scenarios, but some practices are unique to one scenario.

Reporting challenges

The assumptions made in Illinois NLRS for implementing certain practices in the recommended scenarios can be challenging to capture as a reporting metric. Some practice scenarios define the amount of necessary acres, some use percentages, and others do neither. For instance, “MRTN” refers to “reducing N rate from background to MRTN on 10 percent of acres.” This implementation scenario assumes that



MRTN will be used for calculating annual nitrogen fertilizer rates on all corn acres in a given year. However, this assumed that only 10% of acres are receiving more nitrogen than MRTN requires, so 10% of total corn acres would show a reduction in nitrate loss. Another practice scenario is “no P fertilizer above STP maintenance.” The estimated necessary acres for this practice to realize 45% reduction is 12.5 million, assuming that 12.5 million acres were previously over applying phosphorus compared to the Illinois Agronomy Handbook recommendations. Research may be needed to confirm these assumptions.

Table 8.2

Scenario NP 2	Recommendation	Est. Acres (Million)	Nutrient Reduced	Potential Data Sources for Tracking Metric
Reducing N rate from background to MRTN	Applies to all corn acres, but reductions only realized on 10%	11	N	NASS
Spring-only N application	Tile drained corn acres	5.7*	N	NASS
Bioreactors (acres treated)	50% of crop acres	11	N	Illinois EPA-from reported data
» Wetlands (acres treated)	10% of crop acres	2.2	N	NRCS, Illinois EPA
No P fertilizer above STP maintenance	Assumes 12.5M acres are above maintenance	12.5	P	Illinois Dept. of Agriculture, other. Assumes that 12.5M acres are above maintenance.
Reduced till of conventional eroding >T	Defined as leaving 30% or greater crop residue cover	1.8	P	Soil Transect Survey
Cover crops on all corn/soybeans	Fall planted	22	N&P	NASS, FSA, IEPA, NRCS, satellite imagery
» Point Sources (Majors only)	1 mg/L TP permit limit	N/A	P	Illinois EPA
» Point Sources (Majors only)	10 mg/L nitrate limit	N/A	N	Illinois EPA

Scenario NP 3	Recommendation	Est. Acres (Million)	Nutrient Reduced	Potential Data Sources for Tracking Metric
MRTN	Applies to all corn acres, but reductions only realized on 10%	11	N	NASS
Spring-only N application	Tile drained corn acres	5.7*	N	NASS
Bioreactors (acres treated)	30% of crop acres	6.6	N	Illinois EPA-from voluntary reported data
No P fertilizer above STP maintenance	Assumes 12.5M acres are above maintenance	1.8	P	IL Dept of Ag tonnage report, other
Reduced till of conventional eroding >T	30% or greater crop residue cover	1.8	P	Soil Transect Survey
Cover crops on corn/soybeans	87.5% of acres	19.25	N&P	NASS, FSA, IEPA, NRCS, satellite imagery
» Buffers on all applicable lands	Estimated 100 feet from stream	0.2*	P	Illinois EPA, FSA, NRCS, GIS analysis
» Perennial crops on land eroding >T	Biofuels, hay, or CRP	1.6	N&P	FSA (CRP), IDNR (CREP), other
» Additional perennial crops	Biofuels, hay, or CRP	0.9	N&P	FSA (CRP), IDNR (CREP), other

» Practices are unique to that Scenario

*Estimated by Science Team



Agricultural Implementation Progress

To illustrate agricultural implementation progress, Figures 8.3 and 8.4 present comparisons of implemented conservation practice levels from the Illinois NLRs survey (conducted by the National Agricultural Statistics Service or NASS) with recommended levels from strategy scenarios. The Illinois NLRs survey is useful because other available data—including from cost-share programs for agricultural conservation practices—does not provide the full spectrum of implementation in the state. The NASS data, which is discussed in Chapter 4, is an integral tool to gauge the number of implemented practices, regardless of cost-share assistance. Note that Illinois NLRs survey results for bioreactors were too low to allow for a statistical statewide estimate. Therefore, the bioreactor data presented in the graphs are based on bioreactor installation data discussed in Chapter 4.

As these figures demonstrate, implementation progress is taking place, particularly with changing fertilizer practices.

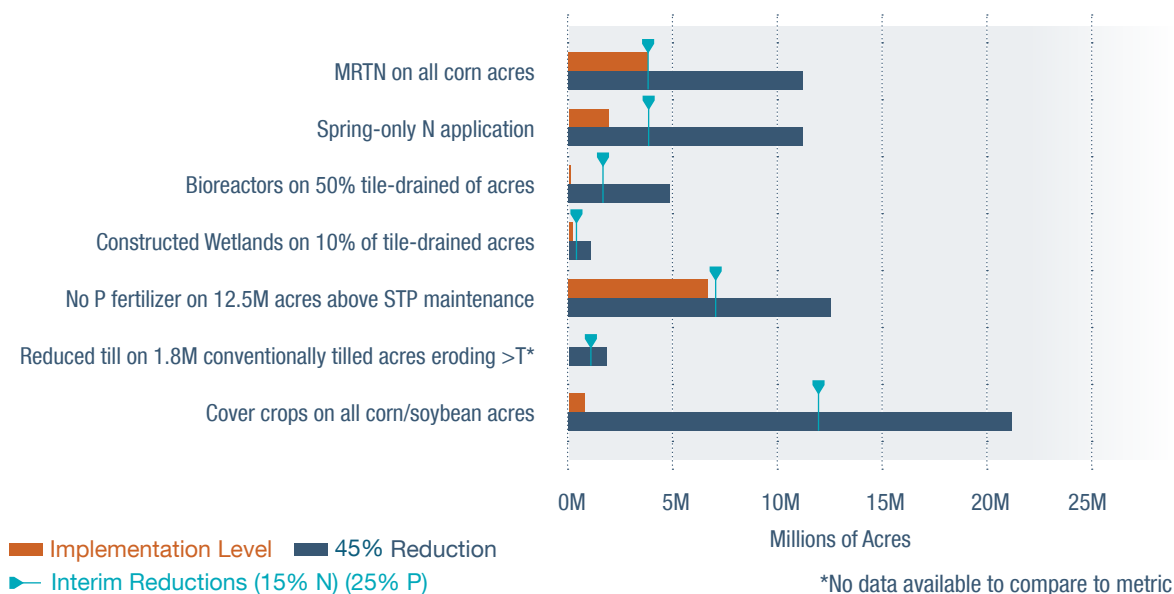


Figure 8.3. Agricultural implementation as compared to Scenario NP2

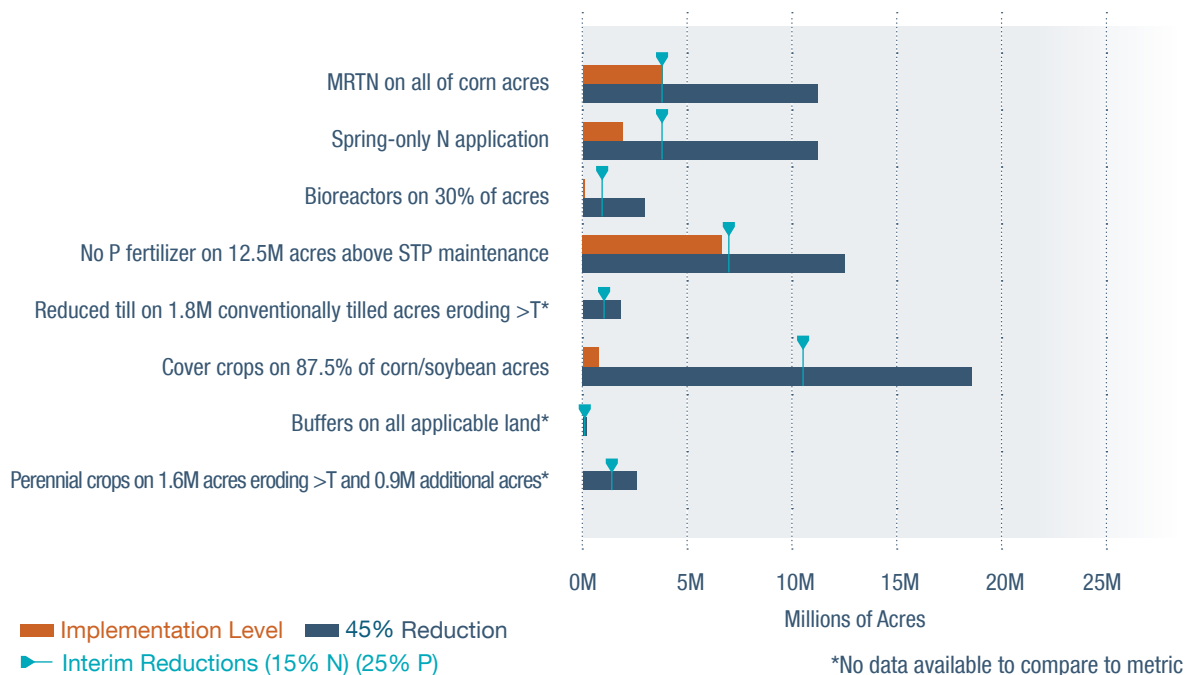


Figure 8.4. Agricultural implementation as compared to Scenario NP3

Point Source Implementation Progress

As Chapter 5 illustrates, reductions for both total phosphorus and total nitrogen loads from point sources are already being realized, and will continue, particularly as total phosphorus limits are included in future NPDES permits for major municipal facilities. Total phosphorus discharge from all point sources for 2018 was estimated to be 13.8 million lb/yr, 24% less than the 2011 estimate of 18 million lb/yr. The statewide 2018 point source total nitrogen discharge is estimated to be 78.4 million lb/yr, or about 10% less than the previous estimate for 2011 of 87.3 million lb/yr.

The Science Assessment (Illinois NLRs page 3-29) states that for total phosphorus from point sources, “... it is clear that most of the potential reduction comes from lowering the current discharge concentrations of 2.5-3.0 mg/L-1 to 1 mg/L-1. In addition, lowering phosphorus discharge from the top 20 major sources accounted for 58% of the estimated reduction in total phosphorus. A few very large plants in Illinois produce a large portion of the state’s point source total phosphorus, and reductions from these facilities lead to large reductions in the statewide estimated total phosphorus loads.” The discussion goes on to state that “...we estimated the cost and reductions that would occur if all majors lowered their effluent concentrations to 10



mg nitrate-N/L-1 and 1 mg total P/L-1.” Therefore, implementation scenario NP2 assumes all major municipal point sources will need to meet those concentrations for each nutrient to attain a 45% reduction in that scenario. Note that scenario NP3 does not include point source reduction.

Figure 8.5. shows the 1997-2011 updated baseline load of 18.1 million lb/yr from all point sources. The 2018 annual total phosphorus load was approximately 11 million lb/yr from 213 major municipal point source facilities and 2.7 million lb/yr from industrial and minor municipal point sources. Currently, 65 major municipal facilities are required to meet a 1 mg/L total phosphorus concentration limit in their respective permits. In the next few years, eight more major municipal facilities are on schedule to meet a 1 mg/l total phosphorus concentration. The graph shows an estimate of future annual total phosphorus loads from the point source sector if all major municipal facilities meet 1 mg/L and 0.5 mg/L total phosphorus concentrations, respectively. It assumes that the industrial and minor municipal point source level remains steady.

The estimated reductions are conservative because the calculations assume that facilities are discharging at their design average flows, while in reality many facilities discharge less than their design average flows.

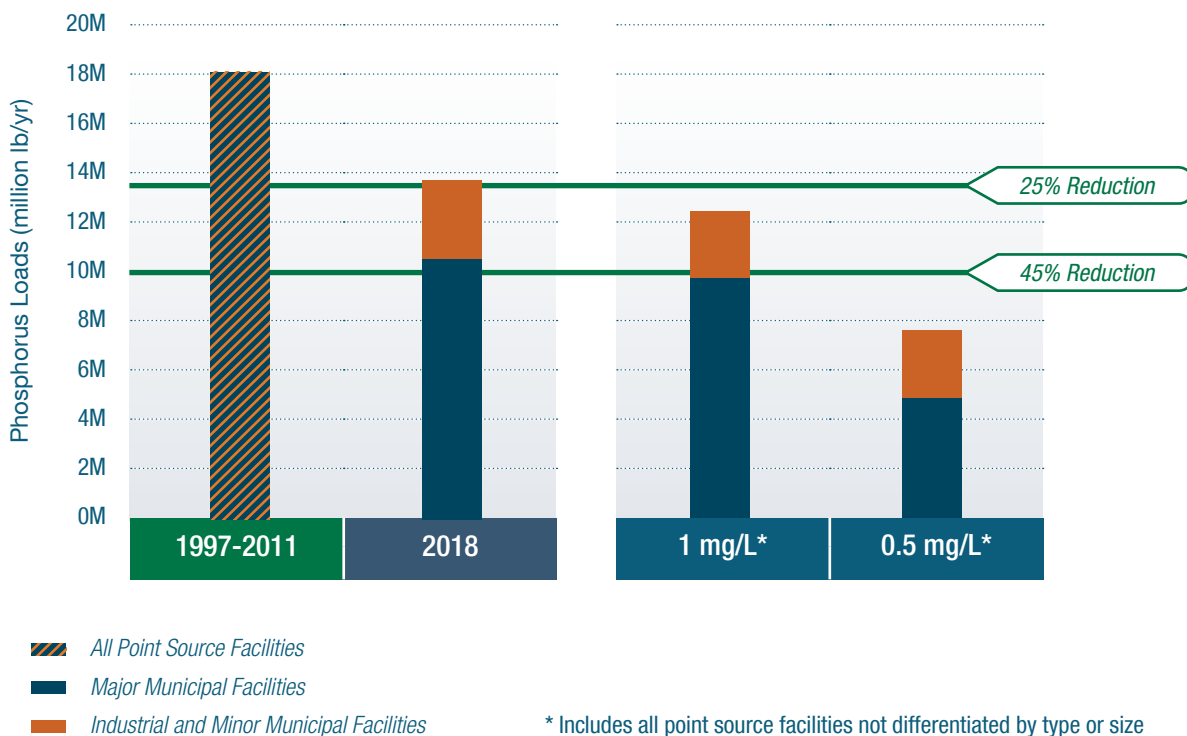


Figure 8.5. Total Phosphorus (Point Source Load), Estimated Future Total Phosphorus (Point Source Load)



Adopting New Conservation Practices and Updating Practice Performance

The University of Illinois Extension formed the Illinois NLRs Science Team to support two watershed outreach associates as part of an agreement between Illinois Extension and Illinois EPA. (See Chapter 4 for more information about the watershed outreach associates.) The science team is comprised of University of Illinois College of Agricultural, Consumer and Environmental Sciences faculty from the following departments: agricultural economics, agricultural and biological engineering, and crop sciences. Extension's interim assistant dean of agriculture and natural resources serves as chair.

Illinois NLRs lists accepted conservation practices—as research emerges about these or other practices, formal evaluation is needed before existing ones can be updated or new practices can be added to the official strategy list. To address this, in consultation with the Agriculture Water Quality Partnership Forum (AWQPF) at their March 12, 2018 meeting, members of the Illinois NLRs Science Team identified Iowa's update process as an appropriate model. The science team met on September 6, 2018, October 11, 2018, and November 13, 2018, to discuss and write the procedure for Illinois. At the October meeting, the Illinois NLRs Steering Committee provided input into the process and on November 13, science team members presented the procedure to AWQPF, addressing members' questions. The procedure for updating practice performance and adding new practices to the strategy was released in December of 2018.

The Nutrient Research and Education Council has been funding research for several years on many practices recommended in Illinois NLRs. As more performance data accumulates, the science team can update information on a practice's performance. The required use rate of a particular conservation practice to meet the strategy's goals is largely based on the practice's nutrient reduction performance. These values were estimated as statewide numbers, even though research results may show that, in addition to other factors, the same practice can vary in performance based on location. If enough regional research data is available, perhaps results will show that practice performance varies by the state's regions as well.

The full proposal submission process to add new conservation practices or to update practice performance is detailed below. It is also available on the Illinois EPA website at go.illinois.edu/NLRS.





Proposal Submission Process

Submit full proposals to IllinoisNLRs@gmail.com.

For full consideration, proposals should be submitted by December 31 of the year prior to a biennial report year. More simply, proposals should be submitted by December 31 of even numbered years. Proposals will be reviewed once per biennial report cycle.

Proposals submitted on a timely basis initially will be reviewed by the Illinois NLRs Steering Committee to determine if the package is complete, upon which the proposal will be forwarded to the Illinois NLRs Science Team for review. The science team will develop a consensus as to either recommend the practice or not to recommend the practice. On successful review, the science team will make recommendations to the Illinois NLRs Policy Working Group, and final recommendations will be included in the following biennial report.

Proposal Format

1. Background.
 - a. Provide details about the practice, how it reduces nutrient loss, and landscapes for which the practice is appropriate (i.e. tile drained, highly erodible, etc.).
 - b. Discuss the effectiveness of the practice and its level of uncertainty (low, medium, high) with appropriate justification.
 - c. Discuss how research results were obtained and the representativeness of study conditions. It is the applicant's responsibility to justify the robustness of results in terms of research methods, comprehensiveness of data, number of site-years, climate conditions, etc.
2. Results. Provide a summary table of studies documenting effectiveness of the practice along with the % N and/or % P loss reduction value (or range of values) from each study. The studies themselves must also be included as attachments for review.
3. Cost efficiency of the practice. (\$ per ac and \$ per lb nutrient loss reduction) Describe all supporting assumptions for calculations and provide justification for these values. Discuss the sensitivity of cost efficiency to these assumptions.
4. Tracking. Identify how the practice can be tracked for biennial reporting purposes, including how to report the Key Base Parameters as identified by the Mississippi River/Gulf of Mexico Hypoxia





Task Force (https://www.epa.gov/sites/production/files/2018-05/documents/nps_measures_progress_report_1-_may_2018.pdf; see page 8).

5. If a proposal is a practice revision, the proposal must additionally include:
 - a. Identify the specific practice for which a change is being requested. Any practice revision request must be for a practice exactly as it is listed in Illinois NLRS, not a nuanced difference. For example, cover crops are defined as grass-based in the strategy so literature focusing on radishes as cover crops should not be used as justification to revise the grass-based cover crop practice.
 - b. Rationale for why the existing values need modification.
 - c. Full justification, calculations, and literature documenting the new values.

Criteria for proposal evaluation

- Peer-reviewed scientific articles are the gold standard.
- Gray literature (conference proceedings, white papers, trade reports) may be considered on a case-by-case basis. In the proposal, it should be discussed why results were not published in a scientific journal.
- Field-scale studies are the expected research method. However, the science team will assess on a case-by-case basis whether laboratory or modeling studies are appropriate to include.
- Studies should be performed in Illinois, near Illinois, or where the case can be made that the biophysical conditions where the study was performed are representative of Illinois.
- Greater weight will be given to cases where there have been more studies performed on a given practice (ideally by different research groups), and where there are more site-years documenting practice performance.
- Submission of pertinent USDA NRCS National Conservation Practice Standards is suggested.

Looking Ahead

Future Strategy Considerations

Currently, strategy implementation is focused on scaling up the level of best management practices adoption, especially in the agricultural sector, with a short-term focus on meeting the interim reduction goals. While Illinois NLRS sets interim goals for nutrient reduction by 2025, PWG has not adopted a date for meeting the final 45% reduction. The Mississippi River Gulf of Mexico Watershed Nutrient





Task Force's New Goal Framework from 2014 updated the goal and interim targets from the Gulf Hypoxia Action Plan 2008. These updates include reducing the five-year running average areal extent of the Gulf of Mexico hypoxic zone to less than 5,000 square kilometers by 2035. It also sets an interim target of a 20% reduction of nitrogen and phosphorus loading by 2025.

To achieve these goals, focus has been on priority watersheds. Chapter 3 provides updates to the eight-digit Hydrological Unit Code (HUC8) watershed nutrient loads and yields and compares them to those in the strategy Science Assessment. This process could be performed approximately every five years, as resources allow, to continue tracking nutrient loads on a HUC8 basis and to determine the contributions from point and non-point sources. Additionally, by tracking changes at the HUC8 watershed scale, PWG may use this information to determine if it is prudent to reprioritize watersheds in the future. Local watershed groups can also integrate this information into their planning efforts and use it to track progress.

Statewide scenarios to achieve nutrient reduction were developed and these were included in the Strategy Science Assessment (Illinois NLRs page 3-48). More scenario examples could be developed if new practices are added or practice performances are updated per the process included in this chapter, and to also reflect PWG's latest understanding of practices represented in the scenarios. Recommendations on the number of practices needed to meet reduction goals, as well as changes in costs, may also be revised as needed. Future work may be focused on these concepts and could be updated in the next biennial report.

Finally, it is important long-term to track the respective trajectories for the three source sectors and overall water quality load. Thus, accurate and thorough data for all of these areas is essential for the success of this effort.

Potential Future Resource Needs

The Policy Working Group has identified a number of resources that may be necessary to continue implementing nutrient reductions at a pace that meets the 2025 milestones and the 45% reduction strategy goals. Increased investments for all sectors can only be made when the needs are clearly defined and quantified. Performance Benchmark Committee members were asked to voluntarily provide information on the financial needs (discussed below) for implementing Illinois NLRs recommendations. A formal needs assessment survey could also be conducted to expand and refine resource needs and associated costs.





Partners for Conservation

In 1995, the Illinois General Assembly initiated Conservation 2000 (C2000), a comprehensive, six-year, \$100 million initiative, designed to take a holistic, long-term approach to protecting and managing Illinois' natural resources. With overwhelmingly positive support for the program, House Bill 1746 was signed into law in 1999, extending the C2000 program until 2009. Then, in 2008, the program was extended to 2021 as Partners for Conservation (www.dnr.illinois.gov/conservation/pfc/Pages/default.aspx).

Much of the work to reduce nutrient pollution in Illinois rivers and lakes is taking place at the watershed scale through local stakeholders. Their efforts could be greatly enhanced with funding from a reinvigorated Partners for Conservation program. The original C2000 program provided some nominal support for ecosystem partnerships that in many cases operated at the watershed scale. Ongoing partnerships would benefit from renewed state support, as would revived and new partnerships.

Soil and Water Conservation Districts

State cost-share funding for nutrient-capture practices that help limit nutrient loss from farmland has historically been distributed to Illinois farmers through a partnership between state government and its network of county-based Soil and Water Conservation Districts (SWCDs). Currently, 97 SWCDs cover 102 counties in Illinois. They provide valuable technical assistance on a variety of natural resource issues such as soil conservation, water quality, nutrient management, sustainable land use, and conservation education. Over 500,000 people benefit from SWCD services each year.

The Soil and Water Conservation Districts also administer the Illinois Department of Agriculture Partners for Conservation program by providing technical assistance and financial cost-share incentives to farmers and suburban and urban landowners for installing conservation practices such as grassed waterways, filter strips, and cover crops. Additionally, the SWCDs provide ongoing technical and administrative assistance to the U.S. Department of Agriculture to implement some federal Farm Bill programs. At any time, SWCDs are assisting with over \$400M in active, multiyear contracts (www.aiswcd.org/about-aiswcd/swcds/). The State of Illinois should support SWCDs, so they can fulfill their critical role in assisting landowners in adopting agricultural and urban conservation practices.





Wastewater Treatment Facility Upgrades

The point source sector has incurred, and will continue to incur, large costs as major municipal wastewater treatment plants are required to meet nutrient limits, especially total phosphorus, through renewed NPDES permits. As stated in Chapter 5 and earlier in this chapter, currently, 65 major municipal wastewater treatment plants have permit limits of 1 mg/L total phosphorus. As total phosphorus limits are added to more permits, the need for funding is expected to increase.

Local governments require loans or cost-share grants to finance and construct nutrient-capture infrastructure at municipal wastewater facilities to reduce nutrient loads from point sources expediently. The Illinois Association of Wastewater Agencies has compiled information on necessary funding to implement phosphorus removal at major wastewater facilities throughout the state. Forty-six facilities provided actual or estimated design and construction costs, with construction costs totaling over \$650 million. Based on this, the average capital cost for phosphorus removal for one million of gallons per day (MGD) of effluent is just under \$1 million. This information provides a way to estimate costs for all major wastewater facilities (treating one MGD or more) in the state to install phosphorus removal technologies.

Stormwater Practice Adoption

While only a small percentage of statewide nutrient loads are from urban stormwater runoff, approximately 379 communities and jurisdictions in Illinois are implementing their Municipal Separate Storm Sewer System (MS4) permit requirements. Reducing nutrient inputs from urban runoff plays a big role in improving water quality in many of the state's streams and lakes where urban runoff represents a large part of the nutrient load. Continued public investments are needed to implement stormwater BMPs, with an emphasis on green infrastructure practices.

Resources may be needed to improve the rate of stormwater practice adoption by the urban sector. From its review of reporting by the state's MS4 communities, University of Illinois Extension found that improved outreach or continuing education to MS4s about practices, funding, and implementation is needed to accelerate green infrastructure practice adoption by this sector (Chapter 6). Funding could be allocated for this critical outreach. Another potential future action is to identify state-wide stormwater decision makers in MS4 communities and beyond.





Water Quality Monitoring

U.S. Geological Survey

Since 2015, Illinois EPA has contracted with USGS to provide cost-share funding for operation and maintenance of the eight super gages. Each super gage continuously monitors streamflow, nitrate, orthophosphate, turbidity, temperature, specific conductivity, dissolved oxygen, and pH. Summary bulletins regarding the network operation, including annual loading estimates, are developed after each full year of data collection. These super gages also provide direct monitoring and evaluation support for generating estimates of five-year running average loads of nitrate-nitrogen and total phosphorus leaving Illinois. Monitoring under the current contract runs through approximately September of 2020.

The Metropolitan Water Reclamation District of Greater Chicago has committed to four years of funding for the ninth gage, which was added in 2018 on the Des Plaines River in Joliet to capture nutrient loads coming from the urban environment in northeastern Illinois. Continued funding for these nine gages is necessary to provide data for calculating statewide nutrient loads on an annual basis and to determine the five-year running average so that progress in nutrient reduction can be monitored and reported.

Illinois EPA

Illinois EPA, with contractual assistance provided by USGS and the Illinois State Water Survey, operates an Ambient Water Quality Monitoring Network consisting of 146 fixed stations to support surface-water chemistry data needs. Integrated water column samples are collected every six weeks and analyzed for a minimum of 55 universal parameters, including nutrients. Data from this network was used in the strategy science assessment, as well as assessment updates, to calculate nutrient load and yields on a HUC8 basis. This monitoring program is crucial, not only to track nutrient load trends over time, but it is the foundation for making individual waterbody assessments for the Illinois EPA Integrated Report and 303(d) List.

In 2013, Illinois EPA initiated the Illinois Harmful Algal Bloom (HAB) Program. The HAB Program consists of two primary components—routine monitoring and event response. The primary goal of the overall program is to protect public health and safety for drinking water and recreational uses. Allocating



resources to continue this program is recommended.

The updated Science Assessment in this biennial report provides recommendations for enhancing water quality monitoring to improve future calculations of nutrient loads at the HUC8 scale. Recommendations include expanding collection of data at locations closer to HUC8 outlets, increasing the frequency of sampling at existing monitoring locations, and expanding or relocating sampling sites to coincide with USGS flow gages. It is suggested that the Nutrient Monitoring Council consider these recommendations, identify the resources needed to implement them, and prioritize the ones that could potentially be acted upon.

Illinois NLRs Meetings and Reporting

The structure of PWG, as well as subgroups and committees, provides the collaborative foundation for Illinois NLRs implementation. This work is dependent on ongoing investment in these activities. Likewise, the development of the biennial report is an important process for recognizing implementation successes, providing updates, and noting new challenges and opportunities. Illinois EPA currently provides financial support to the University of Illinois Extension to facilitate PWG, subgroups, and committee meetings, as well as to coordinate the development of the biennial report. Long-term resources that support these activities are necessary to ensure continued implementation of the strategy and water quality improvement in Illinois.





ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY

Biennial Report

2019
