Implementation Progress Report

Executive Summary

2017 – 2019

Wisconsin's Nutrient Reduction Strategy

April 2020
Environmental Management
Wisconsin DNR

EGAD # 3200-2020-17

The original Nutrient Reduction Strategy (2013) was developed by the Department of Natural Resources with contractual assistance from the University of Wisconsin – Extension. This Implementation Progress Report provides information on progress achieved since the publication of the original work. Substantial input from WDNR staff and individuals in federal, state and local agencies was provided both for the original and this Implementation Progress Report. To keep the document to a reasonable size, programs and activities are not described in detail. For more information, the reader is encouraged to go to websites identified in the text.

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In November 2013, the Wisconsin Department of Natural Resources issued "Wisconsin's Nutrient Reduction Strategy" on behalf of state, federal and local agencies in Wisconsin that are involved in managing phosphorus and nitrogen losses to water. Wisconsin, like all states in the Mississippi River basin, had agreed to develop and implement a nutrient reduction strategy to address its contribution to Gulf of Mexico hypoxia (consistent with the *Gulf of Mexico Hypoxia Action Plan 2008*). However, Wisconsin's main objective in minimizing nutrient losses to water is to improve lakes, rivers, streams and groundwater within the state. Like other states in the Mississippi River basin, implementation of the Nutrient Reduction Strategy is occurring mainly through existing programs which have catalyzed municipalities, farmers, landowners, technical assistance providers and concerned citizens to collaborate in addressing water quality problems in their own watersheds. The actions implemented to address local nutrient-related water quality impairments are also effective in reducing nutrient losses to the Mississippi River.

A previous progress report was published to document actions taken in 2015-2016 to reduce nutrient losses to Wisconsin rivers, lakes, streams and groundwater. Actions to reduce phosphorus, primarily, are widespread. This report is a compendium of nutrient reduction activities in 2017-2019 that represent further progress in implementing Wisconsin's Nutrient Reduction Strategy.

2013 Nutrient Reduction Strategy

2015 – 2016 Implementation Progress Report

Water Quality Status and Trends

- *Lakes*--Overall, nutrient concentrations have not changed in most lakes over time. A small number saw increases or decreases. Some lakes with phosphorus concentrations that are below the phosphorus standard are trending upwards and some others that are above the criterion are trending downwards.

- *Rivers/Streams*—In flowing waters, we see a reduction in **total phosphorus** for all years since 2013—the reductions are small but significant, and most of the reduction occurs in sites that drain to the Mississippi River basin. The opposite is true for statewide trends in **nitrate**—loads have increased statewide since 2013, and most increases have occurred in streams that drain to the Mississippi River.

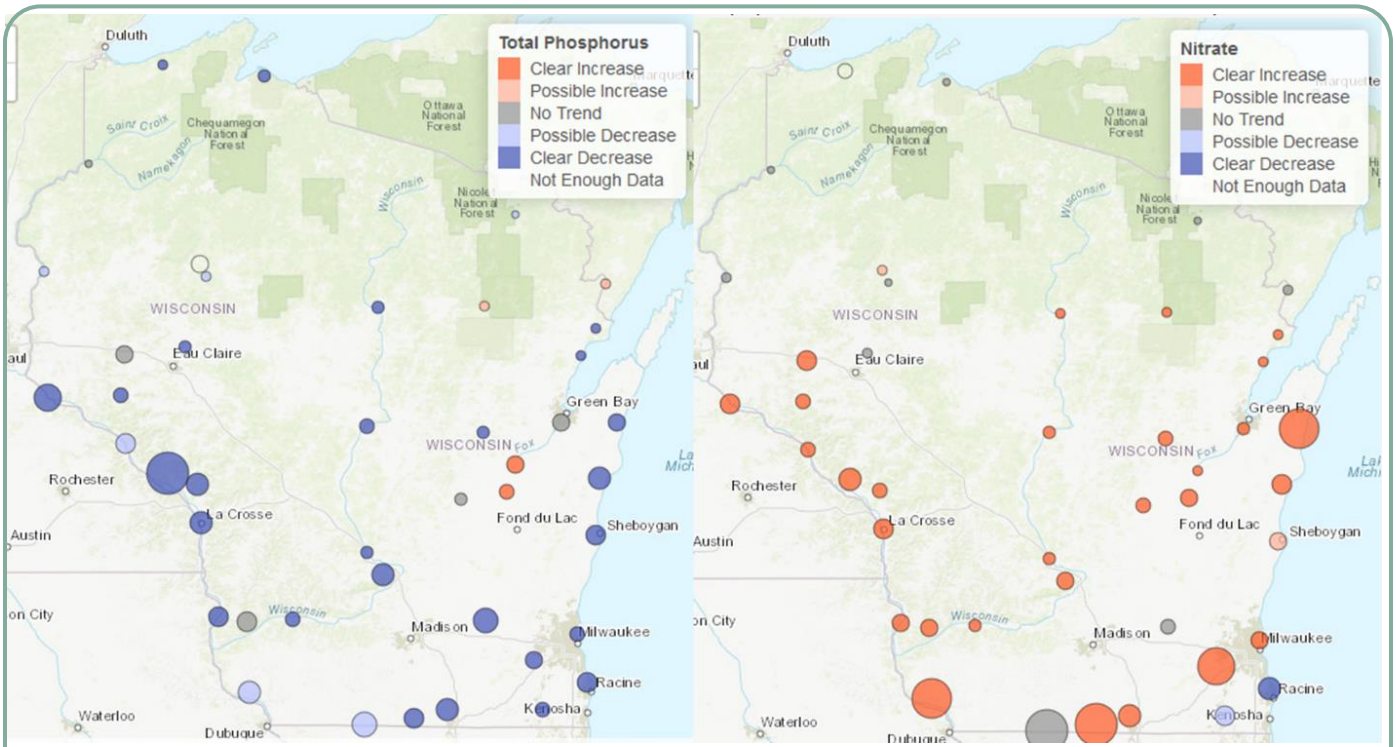


Figure 1. Changes in total phosphorus and nitrate concentrations in Wisconsin's 44 River Long-Term Trend Monitoring Network sites. The size of the circle corresponds to the 2018 mean annual concentration (high values correspond with larger circles). Current concentration and flow-normalized trend estimates are derived from the WRTDS model for each site. Background maps courtesy of Leaflet Tiles© by ESRI.

- *Phosphorus Impairments*—Phosphorus continues to be a main cause of impairments in rivers, lakes and streams, accounting for 47% of impairments listed on Wisconsin's 2018 303(d) list.

- *Progress Toward Gulf Hypoxia Goals*-- The Wisconsin Nutrient Reduction Strategy (WDNR, 2013) estimated Wisconsin's baseline total phosphorus load in 1995, and the progress made toward meeting the 45% reduction for the year 2009, for both the point and nonpoint source contributions within the

Mississippi River Basin side of Wisconsin. The report estimated a total reduction of 23% between the years of 1995 and 2009; however the methods for determining this reduction at the time were limited. Using a method that more accurately estimates the Wisconsin contribution to the Mississippi River Basin, we estimated the flow normalized load for 2018 to be 3,803 tons per year, or a 20% reduction from the baseline 4,778 tons in 1995. This load reduction is less than what was originally estimated for 2009, however the disparity may simply be associated with better data and tools for estimating loads, rather than a backsliding from reaching the reduction goal.

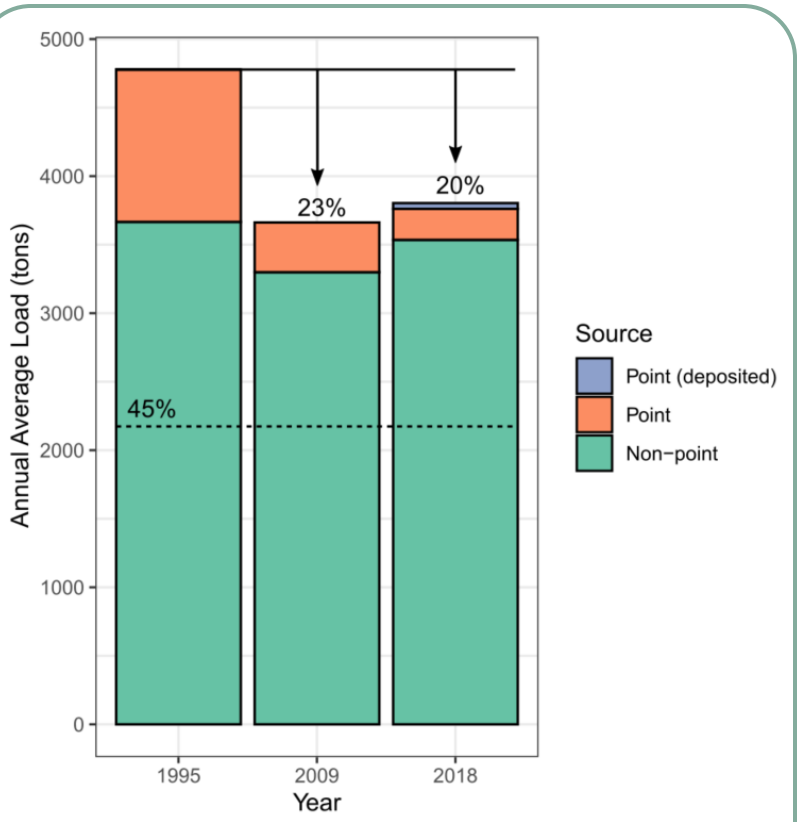


Figure 2. Progress toward meeting the 45% total phosphorus reduction goals established in the Gulf Hypoxia Task Force Action Plans (MRGMWNTF, 2001, 2008). The original Nutrient Reduction Strategy Report (WDNR, 2013) estimated a 23% reduction between the years of 1995 and 2009 using coarse-level estimates for loading. We have more recently estimated loading reductions from 1995 to 2018 to be 20%, less than what was estimated for 2009; however the methods used for 2018 are more accurate than those that were used for 2009. "Deposited" refers to the estimated fraction of point source load that is not delivered to the Mississippi River.

Nutrient Reduction through WPDES Permits

Through the use of Wisconsin Pollutant Discharge Elimination System (WPDES) permits, point source phosphorus discharges are limited under the permit according to the applicable water quality criterion for phosphorus and/or by the Waste Load Allocation established by a Total Maximum Daily Load (TMDL) for the receiving waterbody. Point sources continue to make steady progress in reducing phosphorus loads: a 70% reduction has been realized between 1995 and 2018. Although Wisconsin does not currently have a water quality criterion for nitrogen, WPDES permits for municipal majors in the Mississippi River Basin issued since November 2012 contain a requirement for quarterly effluent monitoring for total nitrogen. In the fall of 2019, this requirement was expanded to include Great Lakes Basin dischargers as well. WPDES permittees can address stringent phosphorus permit limits through optimization and/or treatment upgrades, or through watershed-based options, noted below.

Adaptive Management

Adaptive management is a phosphorus compliance option that allows point and nonpoint sources (e.g. agricultural producers, non-regulated storm water utilities, developers) to work together to improve water quality in those waters not meeting phosphorus water quality standards. The clear environmental and economic benefits of the adaptive management approach have been recognized by communities across Wisconsin. As of 2019, 21 municipal wastewater facilities have undertaken an adaptive management effort. These permittees will work to curtail roughly 30,000 lbs/year of phosphorus loading within their watersheds over the next five-year permit term. The 20-year goal for these projects (to restore their receiving water to the water quality criterion) requires a reduction of over 200,000 lbs/year.

The Adaptive Management Technical Handbook is available to help describe adaptive management and how to develop a successful adaptive management strategy: http://dnr.wi.gov/topic/surfacewater/documents/adaptivemanagmenthandbooksigned.pdf

Water Quality Trading

Water Quality Trading (WQT) may be used by WPDES permit holders to acquire pollutant reductions from other sources in the watershed to offset their point source load so that they will comply with their own permit requirements. As of 2019, over 40 permittees have formally indicated that WQT will be used to comply with phosphorus limits. Of these, 23 permittees have submitted an approvable water quality trading plan to WDNR. The average phosphorus reduction for each trade is roughly 800 lbs/year, and with the average trade ratio of 2:1, the average point source credit user applies approximately 400 lbs/year of credit to offset its point source discharge. The most frequently used nonpoint source best management practices include conversion of row crops to perennial prairie vegetation and streambank stabilization. Stormwater practices, buffer strips, and cropping practices have also been used to generate credits.

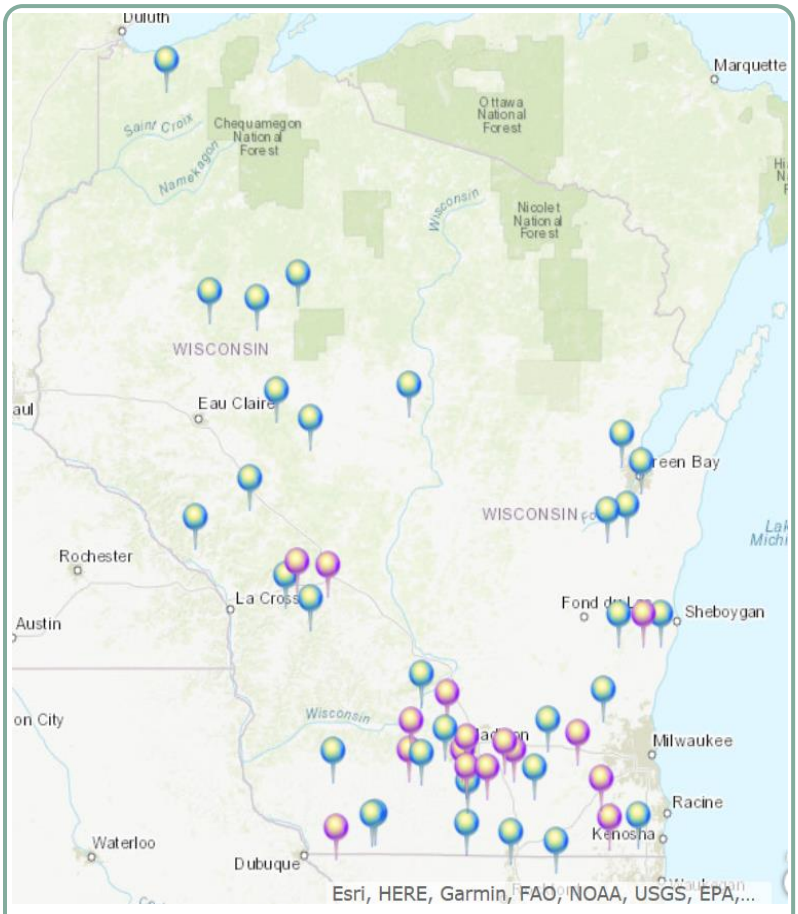


Figure 3. Adaptive Management and Water Quality Trading project locations.

Guidance for implementing WQT is available to help describe water quality trading and how to develop a successful trading strategy (https://dnr.wi.gov/topic/SurfaceWater/documents/WQT_guidance_Aug_21_2013signed.pdf).

Multi-Discharger Variance (MDV)

The MDV allows eligible point sources a longer timeframe (up to 20 years) to comply with low phosphorus limits while making strides in water quality improvement within the watershed. A discharger may choose to pay $50 per pound (adjusted for inflation) of phosphorus discharged above a target value (generally 0.2 mg/L). The payment is made available to the county land and water conservation departments (LCDs) within the HUC 8 watershed to provide cost sharing for meeting NR 151 agricultural performance standards. In 2019, 74 WDPES permittees were covered under the MDV, with approximately $935,000 paid to 34 participating counties.

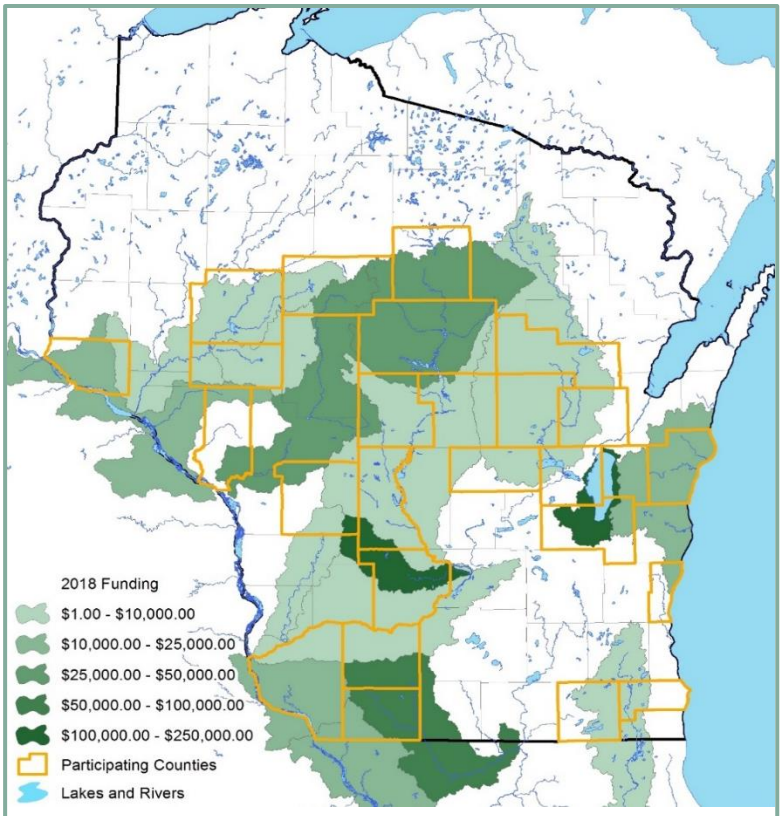


Figure 4. Multi-discharger variance funding 2018; final

Nutrient Reduction through Agricultural Nonpoint Source Programs

Nutrient Management Plan (NMP) Development

In 2018, Wisconsin farmers reported 8,220 NMPs on 3.3 million acres covering 36.6% of Wisconsin's nine million cropland acres. Some counties reported NMPs in place for between 50% and 100% of cropland acres (Figure 5). More information is available in Wisconsin's Nutrient Management Update, produced by DATCP in November 2018.

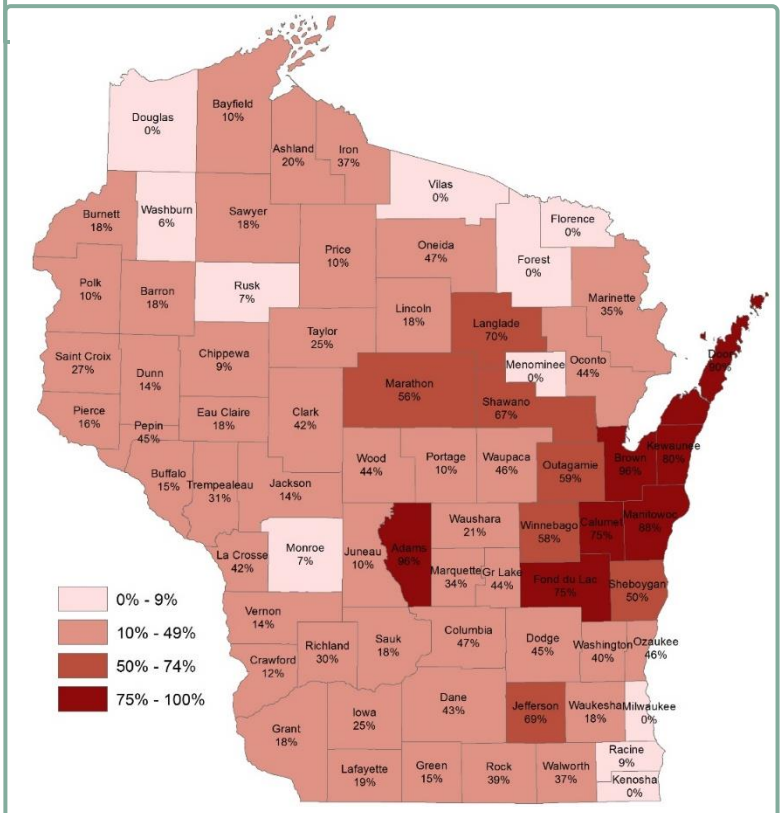


Figure 5. Percentage of cropland acres with Nutrient Management Plans. Cropland acres derived from National Agriculture Statistics Service, Census of Agriculture, 2012. Pasture land not included.

Nine Key Element Watershed Plans

Watershed-based plans consistent with EPA's nine key elements provide an important framework for improving water quality in a holistic manner within a geographic watershed. These plans are a typical precursor in Wisconsin to implementation activities to reduce agricultural losses of nutrients to water, particularly in TMDL watersheds.

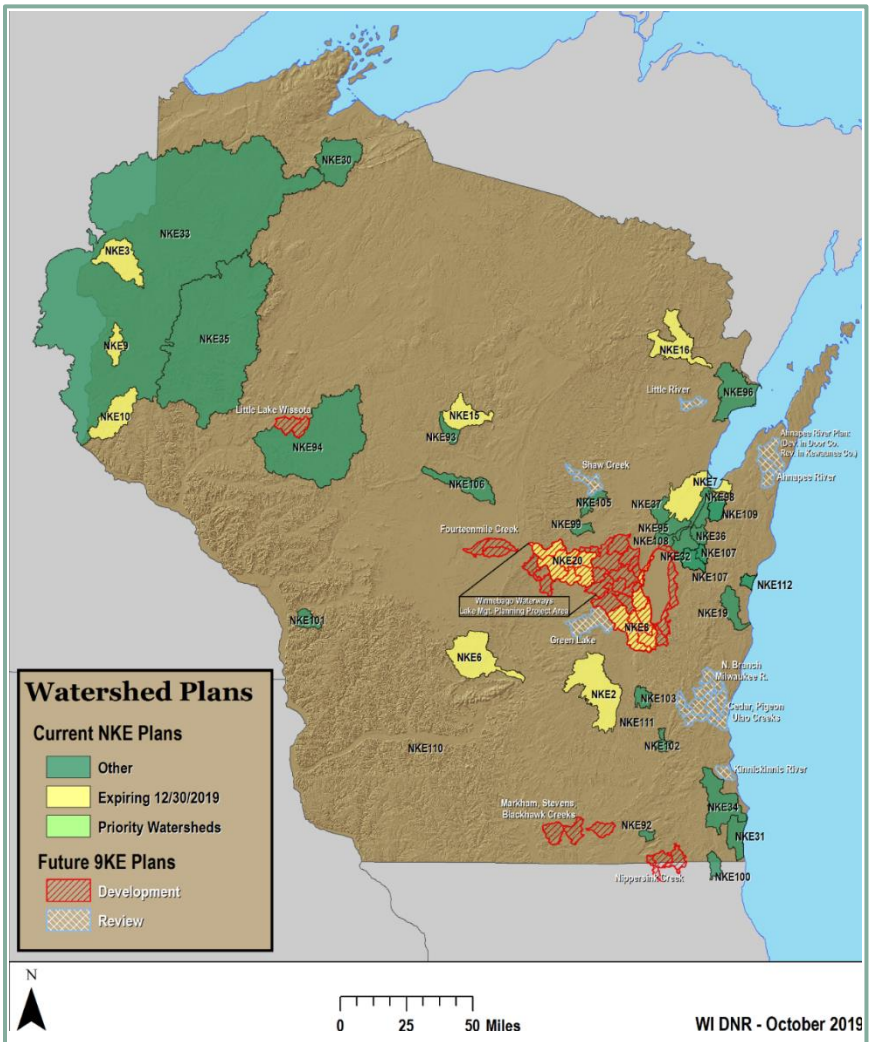


Figure 6. Nine Key Element Watershed Plans, current and future.

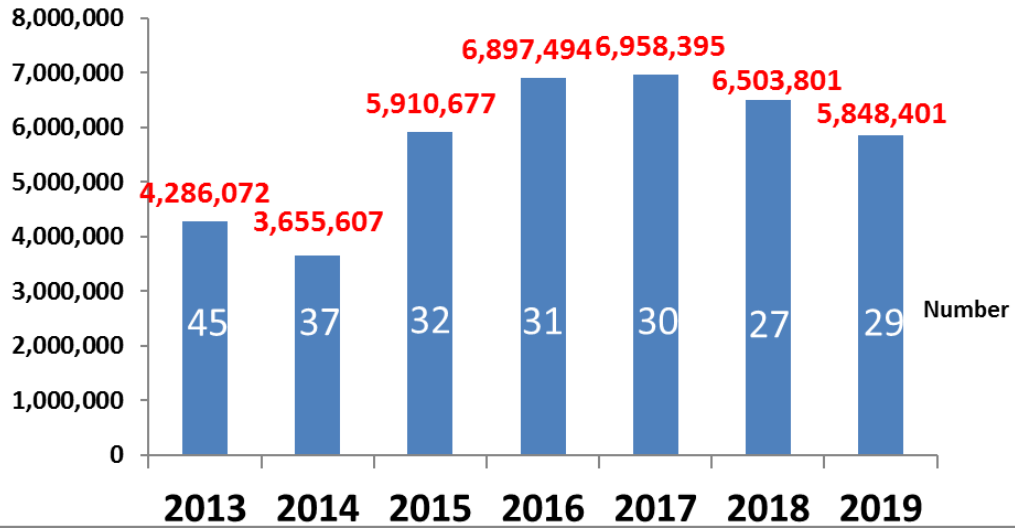


Figure 7. Wisconsin total acres and count of Nine Key Element Watershed Plans.

Wisconsin Producer-Led Watershed Groups

Wisconsin's Producer-Led Watershed Protection Grant program continues to grow as does the popularity of this important approach to nutrient loss reduction at the watershed scale. In 2019, $750,000 in grants was awarded to projects that focus on ways to prevent and reduce water quality impacts from farming operations and that work to increase farm participation in these voluntary efforts (see DATCP Producer Led Project Summaries) (Figure 8). Program objectives include supporting groups as they work to improve water quality through reduced phosphorus and sediment loading, increase farmer knowledge of and engagement with water quality issues (including adoption of conservation practices) and develop water quality leadership among farmers in the watershed.

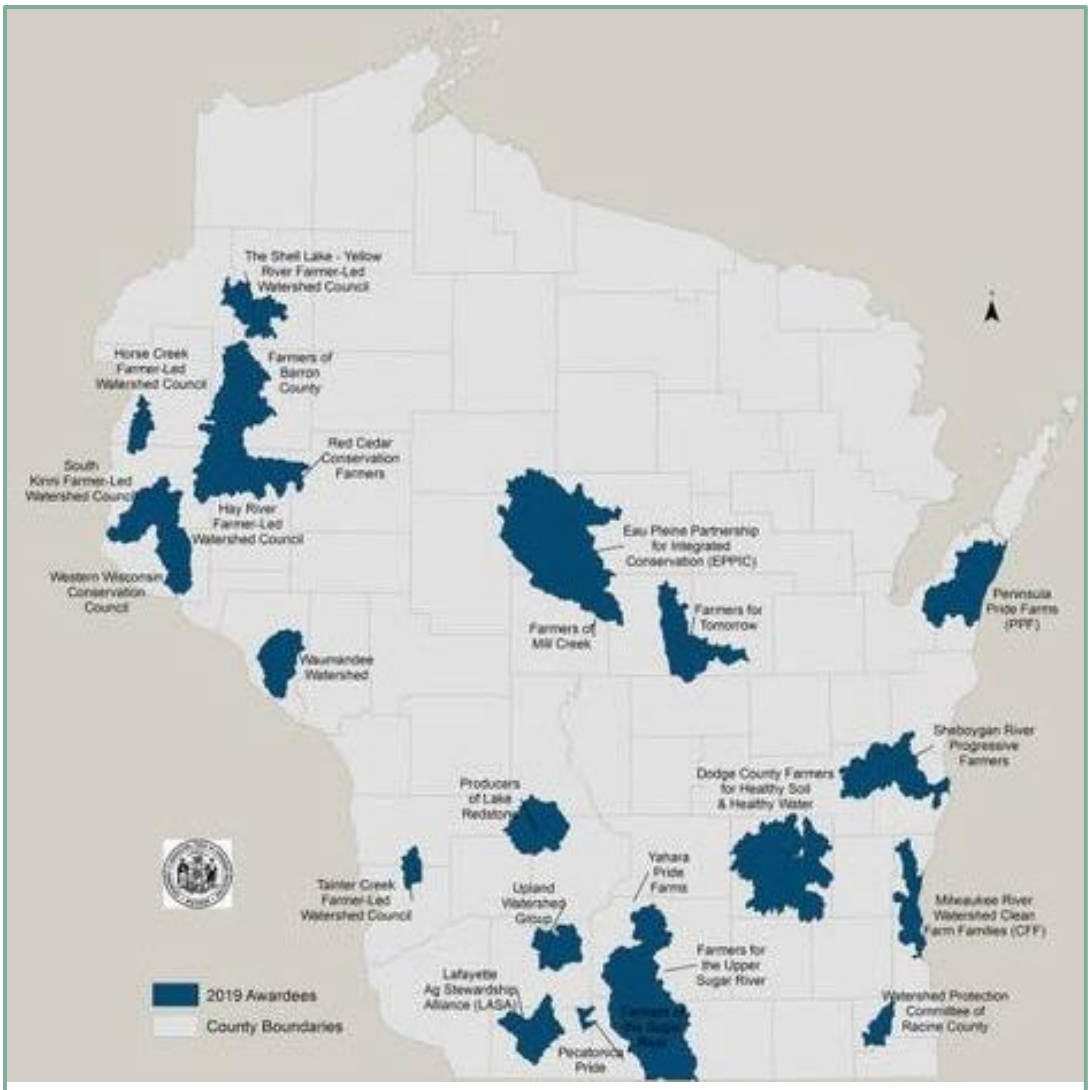


Figure 8. 2019 Producer-Led Watershed Protection Grant recipients.

State Financial Assistance

The Wisconsin DNR and DATCP partner to provide financial support that is critical to achieving nutrient reductions through agricultural nonpoint source conservation practices. In 2017 and in 2018, DATCP provided nearly $9.0 million, and nearly $9.4 million in 2019 statewide for technical staff at county Land and Water Conservation Departments. DATCP also provided between $600,000 and $650,000 in financial support each year for awards to cooperators to carry out training, nutrient management support and related activities of statewide significance. County staff, with the help of cooperators, provide outreach, education and technical and financial assistance to farmers to plan, design and install conservation practices that reduce sources of nutrients and

protect water quality. In 2017, 2018 and 2019 WDNR and DATCP jointly allocated $11.65 million, $11.33 million and $10.7 million in grant funding to cost-share conservation practices, respectively. Highlights of land and water conservation programs and project success stories can be found in the 2017 and 2018 Land and Water Conservation Annual Report.

University of Wisconsin Extension – Discovery Farms Networks

Discovery Farms is a program of the University of Wisconsin-Madison Division of Extension. Discovery Farms is working with farmers across Wisconsin on phosphorus and nitrogen management. Research from edge-of-field sites, evaluations like nitrogen use efficiency, and information sharing strategies like webinars, presentations and materials are tools that Discovery Farms uses in its educational programming. Discovery Farms finished watershed projects within the Jersey Valley watershed (Monroe and Vernon Counties) and the Dry Run watershed (St. Croix County), and began projects in Rock, Langlade, Juneau, and Kewaunee Counties. Additionally, a monitoring project funded by the Conservation Innovation Grants program to understand the connection between agricultural tile drainage, farming systems and soil health began in 2017 in Kewaunee, Shawano, Manitowoc and Brown Counties. The project includes 24 monitoring sites and 14 farms.

USDA Natural Resources Conservation Service (NRCS) Programs

Wisconsin NRCS programs and staff play a key role in providing technical and financial assistance for implementing practices to reduce nutrient losses to water. The Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP) and Agricultural Conservation Easement Program (ACEP) provided $62 million (M) in 2018 funding for conservation practices statewide. In Fiscal Year (FY) 18, the Environmental Quality Incentives Program (EQIP) obligated $10.88 M for 1,316 cover crop contracts compared to $2.34 M for 513 cover crop contracts in FY15. This demonstrates the growing interest in soil health practices to reduce nutrient losses, reduce erosion and improve soil quality. **Through all NRCS programs in FY18, 414,216 acres had conservation practices applied to improve water quality.**

In 2019, the WDNR proposed the de-listing of 303(d) impaired sections of the Legler School/Pioneer Valley streams in Green County. These segments were targeted as part of one of the original NRCS National Water Quality Initiative (NWQI) watersheds in Wisconsin in 2012. Through the partnership efforts of the Green County Land and Water Conservation Department, WDNR, NRCS and cooperating producers, this is the first NWQI watershed in Wisconsin to reach this point in the de-listing process.

Demonstration Farms Networks

The USDA Natural Resources Conservation Service (NRCS) and the Great Lakes Commission (GLC) partnered to establish a Great Lakes Demonstration Farm Network, the first of its kind in Wisconsin. Brown County Land & Water Conservation Department has since assumed the project agreement with NRCS, and the Outagamie

County Land Conservation Department and University of Wisconsin Extension are also partners in the project. The Network is working to provide better information on the effectiveness of conservation systems used to improve water quality. The participating farms demonstrate effectiveness and adaptability of conservation practice systems to reduce erosion and sedimentation, control phosphorus runoff, and address other nonpoint source pollution issues.

The initial four farms participating in the Network have now increased to eight and a new project element has been added to provide dedicated, one-on-one technical assistance to other farms that are interested in adapting the demonstrated practices on their operations. Due to the success and interest generated by the Lower Fox model, NRCS has partnered with county land conservation departments, DATCP, producer-led groups, and a lake association to form four new Demonstration Farm Networks to pursue similar goals in Door-Kewaunee Counties, Ozaukee County (primarily Milwaukee River watershed), Upper Fox-Wolf, and Between the Lakes (Manitowoc-Sheboygan River Watershed).

Tracking/Measuring Progress

County land and water conservation departments reported to DATCP the amount of conservation practice adoption in 2018, and estimated what amount of phosphorus, nitrogen and sediment reduction was associated with groups of practices (Figure 9). Not all reductions of phosphorus, nitrogen and sediment achieved through conservation practices implemented in 2018 are tracked and reported. The numbers shown here capture only the known estimated reductions in 2018 as reported by counties in March 2019, or provided in the Conservation Reserve Enhancement Program's annual report. As a result, the numbers shown here are only a fraction of the likely total reductions in phosphorus, nitrogen and sediment from conservation efforts in 2018.

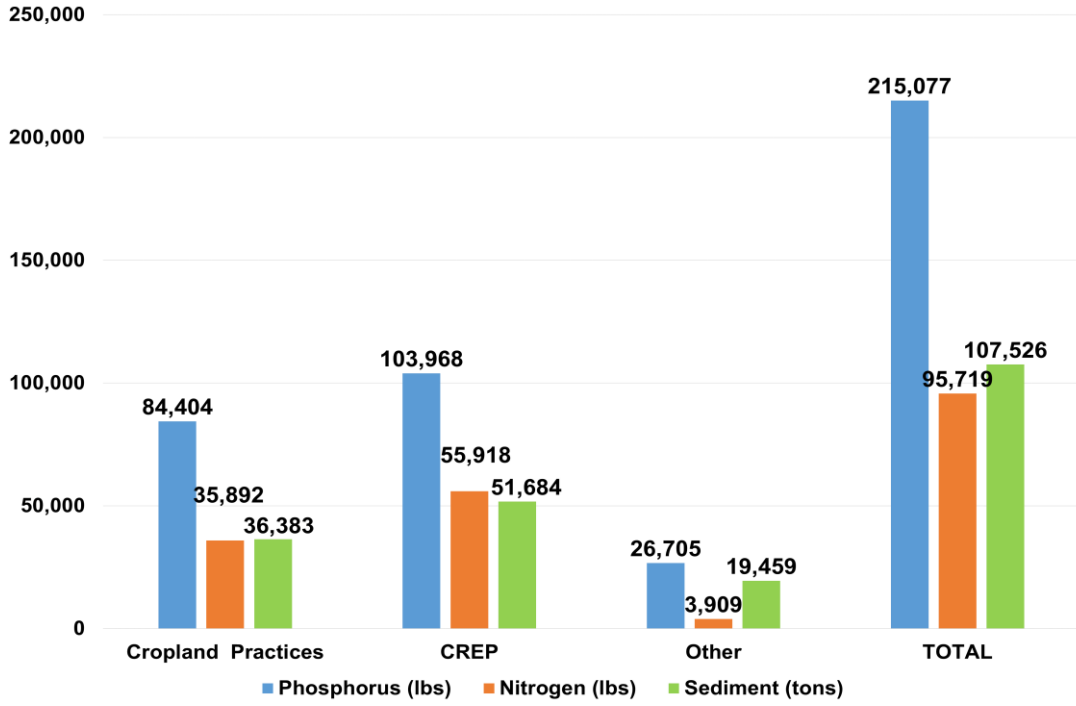


Figure 9. Estimated reductions from conservation practices in 2018. "Other" conservation practices include streambank stabilization, riparian buffers, and critical area stabilization.

When it comes to phosphorus loss from cropland, widespread adoption of two key practices, no till and cover crops, are important to improving water quality. Using data from the 2012 and 2017 census of agriculture, an assessment was made of changes in adoption of these practices (Figure 10). Counties were ranked from 1 to higher than 30 based on degree of implementation.

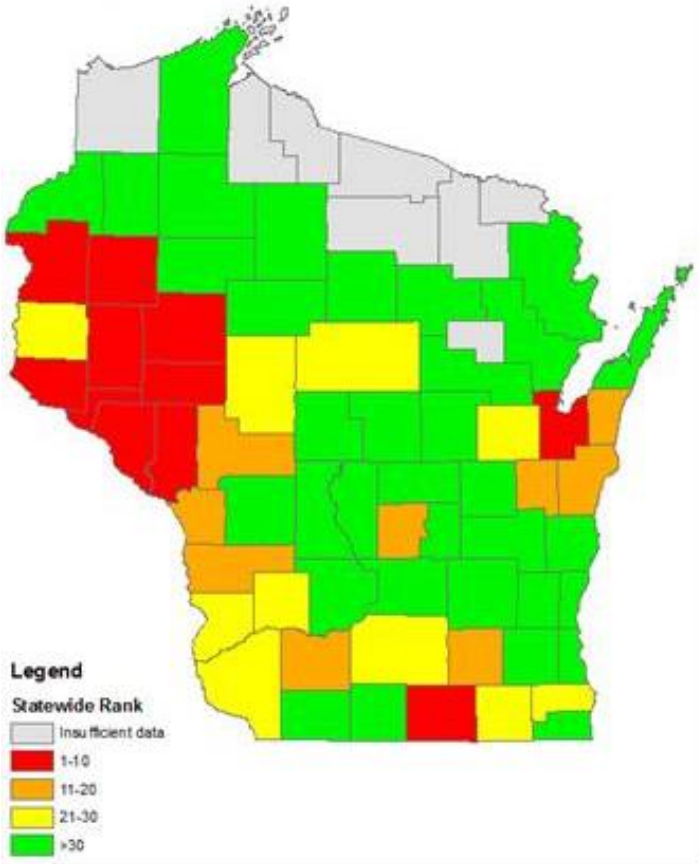


Figure 10. Ranking of counties based on no-till and cover crop practice implementation.

Nutrient Reduction in High Priority Watersheds

Whether in watersheds identified within the top group in the 2013 Strategy or within TMDL watersheds, and in the Mississippi River Basin or the Great Lakes Basin, nutrient reduction is widespread. The focus is mainly phosphorus reduction, but reducing nitrate loss to groundwater has become a more common "high priority issue" in several counties. Implementation at the watershed scale is detailed in two of the chapters in this report. Portraying watershed-scale implementation status for nonpoint sources is challenging. However, a few different approaches to portraying degree of implementation are highlighted below.

Upper Rock River TMDL Implementation

Progress continues with both point and nonpoint sources towards TMDL Implementation goals. A strong foundation for promoting nutrient reductions in the Rock River Basin has been provided by a combination of the Rock River TMDL, WPDES permit programs, efforts of three farmer-led watershed groups, implementation of statewide phosphorus criteria, and watershed-based permit compliance alternatives (Adaptive Management and Water Quality Trading).

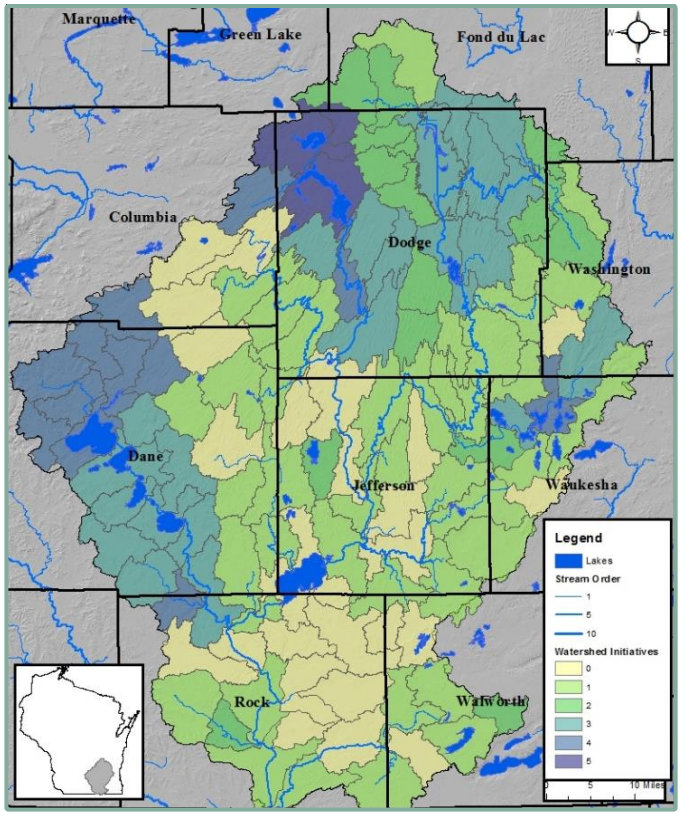


Figure 11. Rock River Recovery: TMDL implementation initiatives by watershed. Note: This figure only includes watershed-scale activities and does not reflect local activities – e.g., a watershed ranked 0 in this figure will still have local projects being implemented.

From a basin perspective, TMDL implementation progress can be viewed as the sum of implementation related activities within a HUC 12 watershed. Figure 11 summarizes targeted implementation-related activities by ranking each HUC 12 watershed by how many of the following implementation activities are taking place:

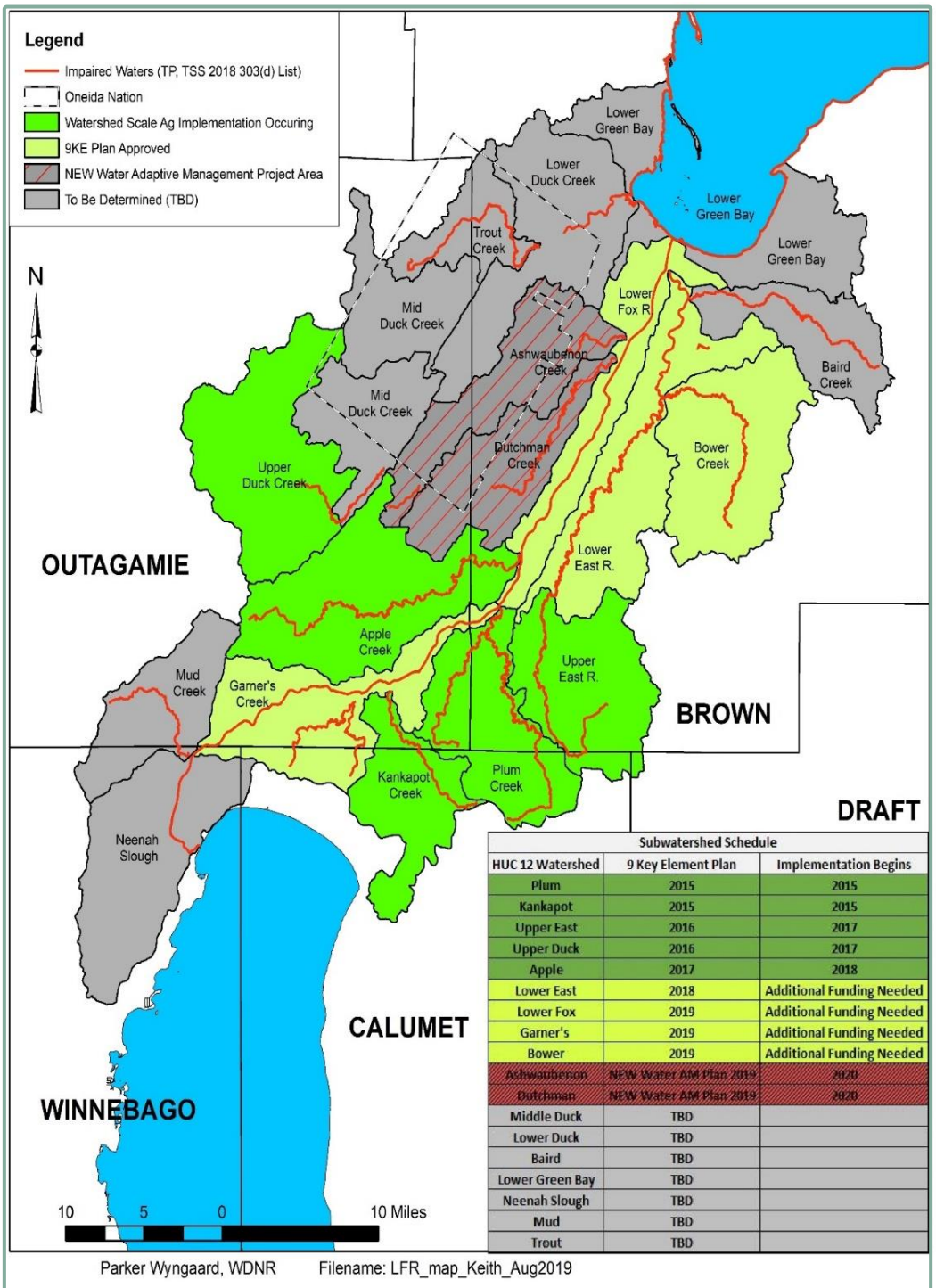
- Priority Watershed Restoration Project
- Nine Key Element Watershed Restoration Plan
- Active Farmer-led Watershed Group implementing recognized practices
- Point source discharge facility with TMDL limits
- Watershed-based permit compliance projects – (Adaptive Management or Water Quality Trading)

Lower Fox River TMDL Implementation

Nonpoint Source Implementation – Nine Key Element Watershed Plans

WDNR completed review and issued approval of Nine Key Element Watershed Plans for the Apple River in 2017, the Lower East River in 2018 and the Lower Fox River, Garner's Creek and Bower Creek in 2019 (Figure 12). Nine Key Element Plans for the Upper East and Upper Duck began implementation in 2017. The Apple River plan began implementation in 2018.

All plans have ten-year schedules and contain milestones that reflect realistic landowner participation rates and implementation of various practices on 75% of cropland acres in each watershed. Because of this, the plans explain they will make substantial progress towards, but fall short of, meeting overall Lower Fox TMDL phosphorus reduction goals. To meet the nine elements, each plan explains additional practices or



Subwatershed Schedule

HUC 12 Watershed	9 Key Element Plan	Implementation Begins
Plum	2015	2015
Kankapot	2015	2015
Upper East	2016	2017
Upper Duck	2016	2017
Apple	2017	2018
Lower East	2018	Additional Funding Needed
Lower Fox	2019	Additional Funding Needed
Garner's	2019	Additional Funding Needed
Bower	2019	Additional Funding Needed
Ashwaubenon	NEW Water AM Plan 2019	2020
Dutchman	NEW Water AM Plan 2019	2020
Middle Duck	TBD	
Lower Duck	TBD	
Baird	TBD	
Lower Green Bay	TBD	
Neenah Slough	TBD	
Mud	TBD	
Trout	TBD	

Figure 12. Lower Fox River Basin TMDL Watershed Implementation Schedule.

new technologies to meet the remaining TMDL phosphorus and sediment reductions that are predicted, via SWAT modeling, to restore impaired waters in the basin. The plans represent current pieces of the overall Lower Fox TMDL implementation strategy. The status of TMDL implementation by watershed is shown in Figure 12.

Wisconsin River Basin TMDL Implementation

In April 2019, the USEPA approved a TMDL addressing phosphorus impairments for 120 river segments and nine lakes. The TMDL project area encompasses the Wisconsin River Basin upstream of the Prairie du Sac Dam which forms Lake Wisconsin, and includes Petenwell and Castle Rock Lakes, covering approximately 14% of the state.

Implementation is just beginning for this TMDL, but already nonpoint source implementation efforts have been focused on a variety of locally-led projects through the Wisconsin River Basin. These early, locally-led projects have been developed in areas where considerable nonpoint reductions are needed. Implementation comes through various programs, as noted in Figure 13.

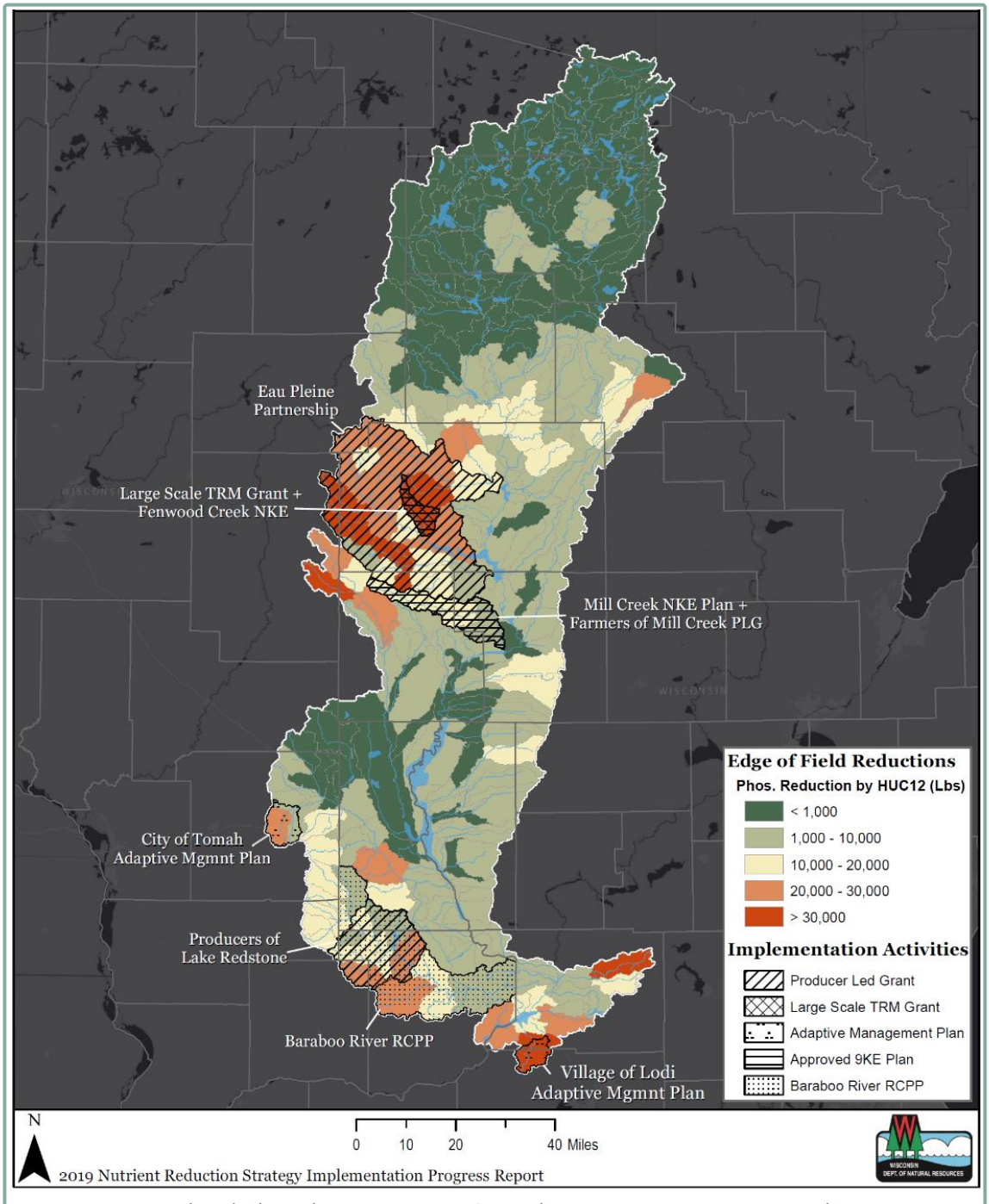


Figure 13. Cropland Phosphorus Targets & Implementation Activities in the Wisconsin River TMDL – 2019.