

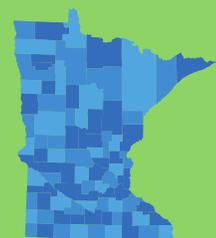
August 2020

Executive Summary

5-year Progress Report on Minnesota's Nutrient Reduction Strategy



m MINNESOTA



Executive summary

The Nutrient Reduction Strategy (NRS) outlines how Minnesota will reduce nutrient pollution in its lakes and streams, and reduce the impact downstream. The strategy specifies goals and provides a framework for reducing phosphorus and nitrogen levels.

The NRS, adopted by 11 organizations in 2014, calls for reducing nutrient levels by 10 to 20% over much of the state by 2025, with much larger long-term reductions by 2040.

The NRS calls for a progress report every 5 years to evaluate whether Minnesota is on track for reducing nutrient pollution. The state evaluates progress in three primary ways:

1. Analysis of trends in waters over the past one to two decades: Is water quality improving?
2. Evaluation of state-level program advancements: Are programs making progress?
3. Assessment of change in practices: Are enough practices being added to reduce nutrient pollution?



Nutrients cause algal blooms in Minnesota rivers and downstream.

Analysis of trends in waters over the past one to two decades: Is water quality improving?

In looking at data from intensive river monitoring efforts across Minnesota over the past 10 and 20 years, it's both good and bad news:

- The good news is that phosphorus concentrations - the amount of phosphorus per liter of water - have generally decreased.
- The bad news is that nitrogen concentrations have increased at many locations.
- For both, high year-to-year variability makes it difficult to detect trends at many of the monitoring locations.

Both flow-adjusted and non-flow adjusted evaluation methods were used to create a more complete picture of how nutrients are changing in Minnesota rivers. Flow-adjusted methods are intended to separate the water quality effects caused by human changes on the land and cities from those caused by variability in precipitation and river flow.

Past 10 years

When using the flow-adjusted techniques for the past decade:

- For phosphorus, 24 of 50 (48%) river sites showed decreasing trends, with all other sites showing no detected trend. This indicates that efforts to reduce phosphorus in recent years have been making a difference.
- For nitrate-nitrogen, the dominant form of nitrogen in polluted rivers, 14 of 38 sites (37%) had increases, with the rest having no detected trend. This suggests that efforts to reduce nitrate thus far are either insufficient and/or need more time to be effective.

Past 20 years

Similar patterns were found when looking at flow-adjusted trends over the past two decades:

- The Mississippi River monitoring sites near the Twin Cities showed phosphorus concentration decreases of 21 to 26%. Whereas nitrate had 20-year increases in the range of 25 to 34%.
- Further downstream, closer to the Iowa border, the Mississippi River phosphorus concentrations have dropped by 50%, and nitrate was too variable to detect the trend.
- In the Red River of the North, phosphorus concentrations over the past two decades have decreased in the upstream reaches but increased at the Minnesota-Canada border. With some exceptions, river nitrate concentrations increased in the Red River Basin.



Phosphorus concentrations are decreasing throughout much of Minnesota.

High flows lead to high loads

While reducing nutrient concentrations is important for local water health and drinking water, reducing nutrient loads - the total amount that goes downstream - is important for downstream waters such as the Gulf of Mexico. Nutrient loads are affected by both nutrient concentrations and river flow:

- Because precipitation and associated river flow has markedly increased during the past two decades throughout much of Minnesota, decreasing phosphorus concentrations are not translating into statistically significant decreasing phosphorus loads.



Nitrogen concentrations are increasing throughout much of Minnesota.

Phosphorus loads in the Mississippi River Basin do not have a detectable decreasing trend unless the influence of river flow changes is removed through statistical methods.

- For nitrate, the combination of increasing concentrations and increasing flow has led to load increases of 62% in the Mississippi River near Red Wing.

Smaller monitoring efforts

In addition to intensive river monitoring across the state, Minnesota has dozens of edge-of-field and small watershed monitoring efforts that help scientists understand reasons for water nutrient changes. Evaluating connections between changes on the land and associated trends in water quality is important for demonstrating the effects of changing practices. The MPCA and partners are using results from small-scale monitoring to refine watershed-level nutrient strategies.

Steps for next 5 years – river monitoring

During the next 5 years, river monitoring and associated trends analysis should continue so that nutrient changes occurring between 2014 and 2024 can be used for the 2024 NRS update and republishing.

Evaluation of state-level program advancements: Are programs making progress?

All Minnesotans are part of the nutrient reduction solution. In order to make the wide-scale changes to significantly reduce nutrient pollution, Minnesota needs large-scale collaboration at all levels and in all sectors. The NRS identifies a multi-pronged approach to advance state, local, private industry, and federal programs that can drive nutrient reduction changes.

During the first 5 years of NRS implementation, Minnesota advanced almost every major program area identified in the 2014 Strategy. At the state and regional levels, Minnesota has initiated and/or expanded more than 30 programs associated with Strategy recommendations. The table on the following page outlines many of the programs that advanced between 2014 and 2019. While several programs are prompting changes on hundreds of thousands of acres, effects of other programs are more difficult to quantify or need much more time to reach their full potential.

Steps for next 5 years – Program advancements

During the next 5 years, Minnesota partner agencies need to continue developing, implementing, and expanding the programs that have advanced thus far. If these programs continue to advance, best management practice (BMP) adoption is expected to accelerate in the 2020 to 2024 timeframe, as compared to 2014 to 2018.

Education, Outreach and Research	Voluntary Programs	Regulatory Programs	Watershed Partnerships
<ul style="list-style-type: none"> • Nitrogen Smart training for farmers and farm-advisers • Annual nutrient management and conservation tillage conferences • Forever Green Initiative • Discovery Farms • Minnesota Office of Soil Health • Guidance manuals for agricultural best management practices, drainage, and urban stormwater management • Conservation professionals training and certification • Nutrient Mgmt. Initiative with on-farm cover crop trials • Center for Changing Landscapes 	<ul style="list-style-type: none"> • Minnesota Agricultural Water Quality Certification • 4R Certification led by private industry (cropland nutrient management) • Red River Basin Initiative and Red River Valley Drainage Water Management • Minnesota Conservation Reserve Enhancement Program • Board of Water and Soil Resources Cover Crop Demonstration Program • Clean Water Fund – increases for BMP implementation • Point – nonpoint trading • Reinvest in Minnesota • Multi-purpose drainage water management 	<ul style="list-style-type: none"> • Municipal and industrial wastewater program • Groundwater Protection Rule (nitrogen fertilizer) • Minnesota Riparian Buffer Law • Feedlot and land application of manure rules and inspections • Urban stormwater runoff program • Subsurface Sewage Treatment Program 	<ul style="list-style-type: none"> • Watershed Restoration and Protection Strategies (WRAPS) • One Watershed, One Plan (1W1P) Program • Groundwater Restoration and Protection Strategies • Watershed Conservation Planning Initiative • Small focus watersheds – Federal Section 319 Program (20 new watersheds) • Guidance on Lake Protection for WRAPS and 1W1P • National Water Quality Initiative and Mississippi River Basin Healthy Watershed Initiative • Watershed-based funding implementation program • Local Field to Stream Partnerships

Assessment of change in practices: Are enough practices being added to reduce nutrient pollution?

Cropland practices

To guide Minnesota’s progress toward reducing nutrients, the 2014 NRS included cropland BMP adoption goal scenarios. These scenarios were intended to serve as an example of the level of BMP adoption needed to achieve the nutrient reduction goals and milestones in major river basins.

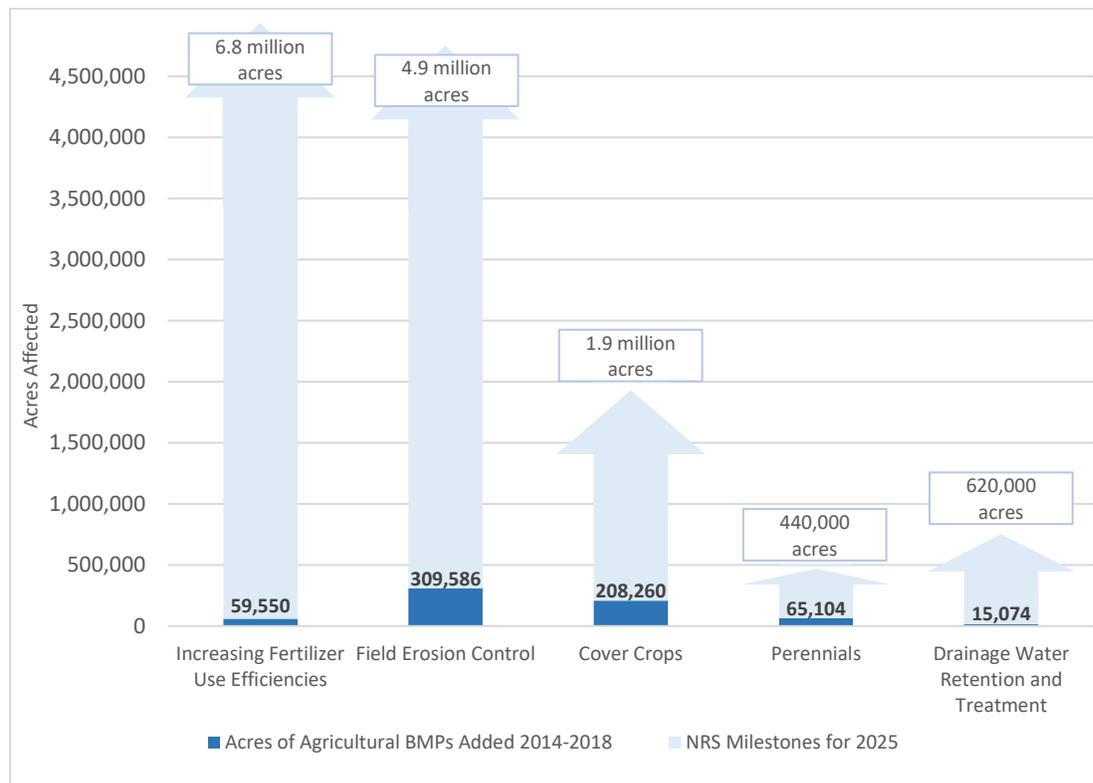
Achieving NRS goals depends on landowners and producers adopting millions more acres of BMPS, such as:

- Cover crops and other continuous living cover vegetation;
- Optimal use of nitrogen fertilizer and manure;
- Cropland erosion control practices; and
- Storing and treating tile drainage waters.

Minnesota has made significant progress during the past 5 years to establish tools to help track BMP adoption progress. BMPs adopted through all major government programs are tracked through a new web-based system entitled, [“Healthier watersheds: Tracking the actions taken,”](#) which now shows new

[BMP adoption at the same scales needed for NRS progress evaluation](#). Additionally, satellite imagery advancements are beginning to provide useful snapshots on the use of conservation tillage and cover crop practices.

As the figure below shows, between 2014 and 2018 Minnesota has added many BMPs through government assistance programs that reduce nutrient pollution. However, these new practices represent only a small fraction of the NRS scenario goals needed to reach 2025 milestones.



Comparing the actual acres of agricultural BMPs adopted through government programs to the total number of acres needed to meet NRS goals by 2025, showing that Minnesota has a long way to go.

New BMPs adopted through government funding programs achieved the following percentage of acres needed for reaching 2025 NRS milestones:

- 1% of nutrient efficiency acres;
- 10% of cover crops and perennials;
- 6% of conservation tillage and erosion control acres; and
- 2% of the tile drainage treatment acres.

It is clear that the scale of agricultural BMP adoption through government programs alone has not been on-pace to achieve 2025 NRS milestones thus far. Because private adoption of practices outside of government programs are also critical for increasing the rate of BMP adoption, this progress report also considered indicators of overall BMP adoption in the state derived from survey information, sales data, satellite imagery findings, soil testing and other sources of information.

Most of these overall indicators show trends during the past 5 to 10 years also show that Minnesota is not on track to reach the needed scales of change for meeting nutrient reduction goals.

Steps for next 5 years – Cropland practices

During the next 5 years, Minnesota partner agencies and organizations will need to identify and address the primary social, economic, and human dimension barriers impeding the scaling-up of new BMP adoption. Strengthening Minnesota’s soil-health building emphasis and new private-public partnerships for 4R nutrient stewardship will also be very important.

Regulatory practices: Wastewater, urban stormwater, rural septic systems and feedlots

In addition to practices on cropland, reducing nutrients from regulated urban and rural sources is also important for meeting NRS goals.

Wastewater

The NRS calls for continued phosphorus reductions through limits in wastewater permits. It also outlined steps to make progress with wastewater nitrogen removal.

Much of the 70% reduction in wastewater phosphorus discharges occurred prior to the 2014 NRS. Statewide, wastewater dischargers have maintained these improvements and achieved additional reductions in alignment with the NRS. Currently, 90% of municipal wastewater flow volumes across the state have phosphorus limits.

One of the first NRS steps for reducing nitrogen from wastewater was to increase monitoring. Minnesota now has 255 facilities regularly monitoring nitrogen in their effluent, which represents the majority of wastewater flow volumes. Estimated statewide nitrogen loads from wastewater have generally remained steady, increasing slightly along with population and precipitation.

Other regulatory programs for urban stormwater, rural septic systems, and feedlots continued to make progress that is in-line with the NRS:

- Regulated stormwater requirements are applying to more urban areas, and there are more requirements for reporting progress on annual phosphorus and sediment reductions.
- For septic systems, more than 13,000 annual inspections show a decrease in imminent public health threats, which is consistent with meeting the NRS milestone. However, continued work is needed to further reduce health threats and to better protect groundwater from untreated septic system discharges.
- Feedlot inspections showed a high rate of compliance (about 97%) related to runoff at the feedlot facility itself. However, inspections of land application of manure showed considerable room for improvement concerning setbacks from waters, rates of nitrogen applied, record-keeping practices, and soil phosphorus testing and management.

Steps for next 5 years – Regulatory programs

During the next 5 years, the MPCA and partner organizations need to continue taking the steps outlined in the NRS for achieving nitrogen reductions from wastewater, while at the same time maintaining and continuing the progress with phosphorus. Continued progress with urban stormwater, septic systems and manure spreading will also be important.

Additional steps to take in the next 5 years

At this mid-way point to the NRS milestones, indicators of progress suggest that existing efforts alone are not likely sufficient for reaching the scale of change needed to achieve nutrient reduction goals. Building on the steps listed above, Minnesota needs to:

1) Maximize the multiple benefits of NRS practices by coordinating with other plans and strategies that use similar practices to achieve resiliency to climate change and ecosystem improvements.

NRS implementation should be increasingly coordinated and integrated with other water plans and strategies, at state and local levels, to inspire the needed scale of change for nutrient reduction, while at the same time maximizing multiple benefits such as:

- Greenhouse gas reductions;
- Sediment reduction to waters;
- Resiliency to climate variability;
- Long-term agricultural sustainability and profitability;
- Wildlife habitat improvement;
- Drinking water source protection (for public and private wells);
- Lake water quality improvement; and
- Other ecosystem benefits.



Reducing nutrient pollution will help keep Minnesota streams healthy for aquatic life and recreation.

2) Identify and address social, economic and other human dimension obstacles to scaling-up BMP implementation.

Refine effective, socially-acceptable and financially feasible approaches for programs, policies and incentives that will increase rates of BMP adoption. Plans should be developed and implemented to address hindrances to large-scale adoption. Increase support for private-public partnerships that are achieving success with new practice adoption, including the Agricultural Water Quality Certification Program.

3) Use the latest research to continue refining the optimal combination of practices that will achieve the needed nutrient reductions in our waters.

Concurrent with ongoing NRS implementation, evaluate recent scientific findings to set the stage for an updated NRS in 2024. A team of scientists should develop alternative scenarios that ensure Minnesota is moving forward with:

- The most effective BMPs;
- Accurate nutrient reduction potential estimates;
- Optimal combinations of practices to achieve goals; and
- Updated implementation cost estimates.

4) Optimize wastewater nitrogen treatment.

Define strategies to reduce wastewater nitrogen discharges through optimization of nitrogen and phosphorus removal, emphasizing use of existing infrastructure.