

Nitrate Reduction in Southeast Minnesota

Nitrate-nitrogen is one of the most common contaminants in Minnesota's groundwater. Most Minnesota households have access to safe drinking water supplies. However, in areas vulnerable to groundwater contamination, some public and private wells have nitrate levels that exceed the health risk limit for nitrate. Public water systems regularly test for nitrate and ensure levels meet the U.S. Environmental Protection Agency standard, while it is the responsibility of private well owners to test their well. Human activities such as sewage disposal, livestock production, and crop fertilization can elevate the level of nitrate in groundwater.

There are unique geologic features in southeast Minnesota that make the groundwater more vulnerable to contaminants like nitrate. The underlying bedrock deteriorates when exposed to mildly acidic water, creating sinkholes, sinking streams, caves, springs, and other features. These Karst geology features dictate the speed and direction of water moving from the surface through layers of soil and rock below.

MDA Programs Targeting Nitrate

The Minnesota Department of Agriculture (MDA) is concerned about nitrate in groundwater, and the agency has taken significant actions over the past decade to address these concerns. Work is ongoing in the eight southeast counties of Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Wabasha, and Winona.

Nitrogen Fertilizer Management Plan

The Nitrogen Fertilizer Management Plan is designed to reduce nitrate levels in areas with vulnerable groundwater. This strategy outlines an approach to assessing agricultural practices and working with the agricultural community to select and promote recommended best practices in the most vulnerable areas of the state.

The original Nitrogen Fertilizer Management Plan was developed in 1990. The plan went through a revision process from 2010 to 2014. The revised plan includes new scientific information about groundwater protection and is better aligned with current water resource programs and activities. An important outcome of the plan was the Township Testing Program.

Township Testing Program

The MDA's Township Testing Program (2013-2019) offered over 90,000 private well owners a free nitrate test and worked with over 32,000 residents across Minnesota to sample wells and raise awareness about elevated nitrate in drinking water.

In the eight southeast Minnesota counties, 21,801 residents were offered a free test. Of the 8,714 that submitted a sample, 12.1% (1,058 wells) were greater than 10 mg/L nitrate— the federal and state health standard.

The Township Testing Program has provided the most recent and best available data related to nitrate in private wells. It has also provided foundational scientific information to help identify areas of concern and prioritize work for state and local partners.

Groundwater Protection Rule

As an outcome of the Nitrogen Fertilizer Management Plan, the MDA developed the Groundwater Protection Rule. Since 2019, the MDA has implemented the rule, prohibiting fall application of commercial fertilizer on 71% of cropland (approximately 1.1 million acres) in southeast Minnesota and over 9 million acres statewide.

The MDA has convened local advisory teams and is working with farmers to adopt practices to address local groundwater problems, including some of the first commercial acres of Kernza® being planted in vulnerable drinking water supply management areas.

The MDA can move to further regulation if the agency is not successful with voluntary adoption of practices through local advisory teams.

Minnesota Agricultural Water Quality Certification Program

The Minnesota Agricultural Water Quality Certification Program (MAWQCP) assesses whole-farm risks to water quality and invests in conservation practices that protect our water resources. On an average certified farm, there is up to a 49% reduction of nitrate loss through the adoption of conservation practices like nutrient management, cover crops, and conservation crop rotation. Since the program began in 2014, MAWQCP has certified over 1 million areas statewide. There are 269 MAWQCP-certified producers operating over 191,000 acres (as of December 31, 2023) in southeast Minnesota.

County	Certified Producers	Total Acres
Dodge	20	22,471
Goodhue	31	32,017
Fillmore	28	18,880
Houston	29	12,451
Mower	21	14,051
Olmsted	56	42,744
Wabasha	52	25,539
Winona	32	23,558

On-farm Trial Programs and Projects

Nutrient Management Initiative

The Minnesota Nutrient Management Initiative assists farmers and crop advisers in evaluating nutrient management practices on their own fields. It is a simple tool that can lead to improved fertilizer efficiency and improved water quality. Each participating farmer can work with a crop adviser to set up field trials. Results and information from these field trials assist participants in evaluating practices which can help reduce nitrate losses from fields, along with other environmental and economic benefits. Nearly 700 on-farm trials have been established statewide since 2015.

Nitrogen BMP Outreach Program

The Nitrogen Best Management Practice (BMP) Outreach Program is specific to southeast Minnesota. It addresses on-farm nitrogen fertilizer use and environmental protection through on-farm trails, payments for the use of BMP practices, and cost-share for well sealing. This program funding was supported by the MDA and is now funded through the Board of Water & Soil Resources, with staff from multiple state and local agencies contributing time to work with farmers, crop advisers, and project partners. The on-farm trials compare current and alternative nitrogen management practices that may help reduce nitrate losses or boost yields.

There have been over 300 trials in southeast Minnesota through the NMI and Nitrogen BMP Outreach programs since 2015.

Research Collaboration with the University of Minnesota

The MDA is currently working with the University of Minnesota Southern Research and Outreach Center on nitrogen rate and timing research that will improve farm profitability and water quality in southeast Minnesota. There have been 32 trial sites in the region since 2015. The data helps improve fertilizer guidelines in the state and region.

AgBMP Loan Program

The AgBMP Loan Program is a water quality program that provides low-interest loans to farmers, rural landowners, and agriculture supply businesses. The program supports agricultural best management practices that prevent or reduce runoff from feedlots, farm fields, and other pollution problems identified by the county.

In southeast Minnesota, 284 loans totaling nearly \$12 million have been invested in projects from January 1, 2019, through December 4, 2023.

County	Number of Loans	Total Loan Amounts
Dodge	21	\$839,788.38
Goodhue	40	\$2,072,052.12
Fillmore	43	\$2,038,635.55
Houston	6	\$259,862.60
Mower	102	\$2,977,859.23
Olmsted	13	\$499,357
Wabasha	33	\$1,439,701.78
Winona	26	\$1,789,327.01

Continuous Living Cover Grants

The Continuous Living Cover Grants help develop enterprises, supply chains, and markets for continuous living cover crops and cropping systems in the early stage of commercial development. Continuous living cover refers to agricultural systems where living plants and roots are in the ground throughout the entire year. The MDA has received funding for these grants in fiscal years 2023, 2024, and 2025. To date, two of the 11 selected projects are in southeast Minnesota.

Continuous Living Cover crops have been shown to enhance water and soil quality, sequester carbon, build soil health, and provide greater biodiversity and pollinator habitat. Significant environmental benefits will result from widespread production of these crops; however, robust value chains and markets are required for full-scale production.

Soil Health Financial Assistance Grant

Building soil health on Minnesota's working lands is an important step in ensuring that the state's agricultural industry remains resilient and productive. Practices widely accepted to foster soil health offer co-benefits, including increased water quality.

The MDA piloted a program in 2022 and then created a new Soil Health Financial Assistance Program in 2023 to provide grants to individual producers, groups of producers, and local government units for the purchase of soil health equipment. Over the two years, the MDA received \$2.875 million to award grants to 97 recipients statewide. To date, 12 recipients will use equipment to benefit soil health on an estimated 14,000 acres in southeast Minnesota.

County	Total Grant Awards Over Two Rounds	Estimated Acres Impacted Annually
Goodhue	2	6,120
Houston	1	200
Mower	2	2,060
Olmsted	4	3,945
Wabasha	1	850
Winona	2	1,100

MDA Partnerships Focusing on Nitrate

The MDA relies on strong partnerships throughout southeast Minnesota to support groundwater protection. The department works with 36 local government units statewide, including all eight Soil & Water Conservation Districts in southeast Minnesota, and other state agencies on nitrate monitoring and reduction activities.

Root River Field to Stream Partnership

Through the Root River Field to Stream Partnership, the MDA and partners are working directly with farmers and crop advisors to implement and maintain conservation practices on 11,000 crop acres in the Root River Watershed in southeast Minnesota. Installed practices include new and restored grassed waterways, new water and sediment control basins, new cover crops, targeted perennial vegetation like prairie strips and improvements to reduce runoff from feedlots.

This project provides a unique assessment of the amount and sources of sediment and nutrients in surface water and groundwater at multiple scales and helps determine the effectiveness of agricultural conservation practices. For instance, 10 continuous nitrate sensors have been installed to measure real-time nitrate concentrations in drainage tiles, springs, and streams. The MDA has measured reduced contaminant losses at the field because of practices implemented by farmers. This partnership is providing relevant information to farmers, landowners, and their advisors which is helping spread and accelerate the adoption of precision conservation practices.

Southeast Minnesota Volunteer Nitrate Monitoring Network

The Southeast Minnesota Volunteer Nitrate Monitoring Network was developed in 2008 to determine nitrate trends in private wells in the region. The MDA works with the County Water Planners to conduct testing and summarize results.

Network participants in nine counties are sent a nitrate test kit directly to their home on an annual basis. The homeowner simply fills up the bottle and sends it directly back to a lab for analysis. The lab then sends homeowners their results.

In 2022, 376 private drinking water wells were sampled for nitrate. Results from 2022 are similar to previous years:

- 69.4% of nitrate results were < 3 mg/L
- 22.3% of nitrate results were 3 < 10 mg/L
- 8.2% of nitrate results were ≥ 10 mg/L

Forever Green Initiative

The Forever Green Initiative at the University of Minnesota brings together researchers, local groups, private-sector partners, and non-profits to advance and commercialize new high-value commodity crops for conservation purposes, reducing erosion and nutrient loss. The MDA receives Clean Water Funds to support the initiative.

The Economic and Environmental Clusters of Opportunity (EECO) program offered by the Forever Green Initiative provides financial and technical support to farmers to adopt new perennial and winter annual crops in areas of Minnesota. Southeast Minnesota is one of four focus areas across the state (the 11 tribal nations in Minnesota are also eligible), and several farmers in the region are enrolled in the EECO program.

Nutrient Reduction Strategy

The MDA, along with multiple state agencies, works on the Nutrient Reduction Strategy. First created in 2014, it is a living body of work that involves further defining the problems of nitrogen and phosphorous in our state waters and sets phosphorus and nitrogen reduction goals. The strategy calls for reducing nutrient levels in major rivers by 10-20% by 2025 from 2014 levels, with much higher reductions by 2040.

Visit www.mda.state.mn.us/nitrate to learn more about the MDA's nitrate reduction work in southeast Minnesota.