

Wing River Township in Wadena County Nitrogen Fertilizer Management Plan Summary

Groundwater, Nitrogen Fertilizer Management, and Nitrogen Loading Analysis



Township

September 2026

Introduction

This document summarizes the Minnesota Department of Agriculture’s (MDA) current understanding of nitrate-nitrogen levels in domestic (private) wells in Wing River Township in Wadena County and its understanding of nitrogen management information. This summary presents information the MDA considered to determine whether the proposed list of nitrogen fertilizer best management practices (BMPs) and Alternative Management Tools (AMTs) will be protective of groundwater.

Project Area and Private Well Nitrate-Nitrogen Data

Groundwater protection is fundamental to the Nitrogen Fertilizer Management Plan (NFMP). The NFMP calls for an assessment of nitrate conditions on the township scale. Accordingly, the MDA offered nitrate tests to private well owners in four townships in Wadena County in 2013 (as part of a larger, statewide Township Testing Program). At least 10% of private wells in the township sampled over the Health Risk Limit of 10 mg/L nitrate-nitrogen, prompting the establishment of a local advisory team (LAT) made up of farmers, agronomists and other agricultural stakeholders within the township.



Figure 1. Wing River Township in Wadena County, Minnesota is out-lined in yellow and black. Coarse-textured soils are highlighted in purple

Table 1. Final Wadena County Township Testing Private Well Dataset

Township	Number of Wells	Wells $\geq$ 10 mg/L Nitrate-N Count	Wells $\geq$ 10 mg/L Nitrate-N Percentage
Aldrich	24	2	8.3%
Thomastown	93	1	1.1%
Wadena	76	7	9.2%
Wing River	29	3	10.3%
Total	222	13	5.9%

Wing River Township includes more than 10,000 acres of cropland. About 97% of this cropland is on coarse-textured soil: 70% is loamy sand and 27% is sandy loam. The remaining cropland soil is 1% loam soil and 2% mucky.

Wing River Township Land Use

The NFMP designates mitigation Level 2 for townships with at least 10% of samples submitted from private wells over the Health Risk Limit of 10 mg/L nitrate-nitrogen. Level 2 of the NFMP recommends the formation of an LAT for input on agricultural practices (BMPs and AMTs) that can reduce nitrate losses below cropland.

A review of the publicly available [USDA Cropland Data Layer](https://croplandcros.scinet.usda.gov) (croplandcros.scinet.usda.gov) in Wing River Township shows that land use is predominately cropland. The data illustrated in Figure 2 is from the February 2025 data release. Additionally, Table 2 shows an estimate of the primary crops and average number of acres grown in the township from 2020 to 2024.

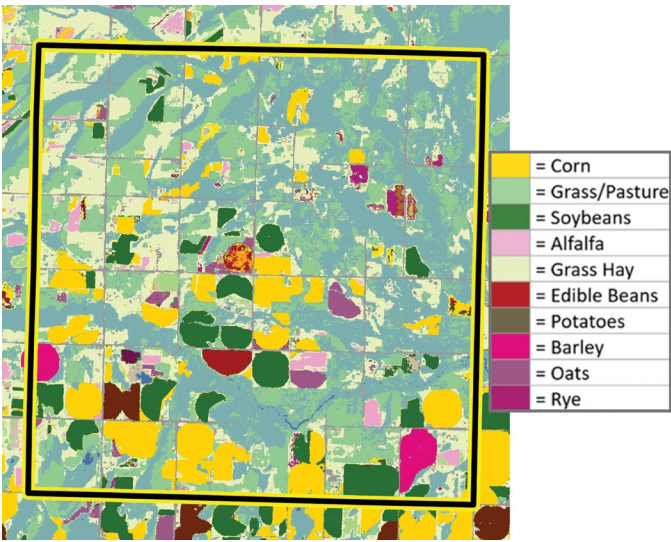


Figure 2. 2025 Cropland in Wing River Township from the USDA Cropland Data Layer

Table 2. Five-Year (2020-2024) Cropland Acres

Crop	Acres (5-yr Ave)	% Cropland
Grass/Other Hay	3,756	40.8%
Corn	2,094	22.7%
Soybeans	1,633	17.7%
Potatoes	565	6.1%
Alfalfa	493	5.4%
Small Grains	323	3.5%
Edible Beans	271	2.9%
Other Crops	72	0.8%

The MDA defines cropland as land used primarily for the production or harvest of annual or perennial field, forage, food, fiber, or energy crops, including pasture but excluding forestland. Within Wing River Township, the most common annual crops are corn, soybeans, potatoes, and edible beans. In 2020-2024, these crops accounted for 49% of the total cropland. Perennials—pasture, alfalfa, and grass hay—covered an average of 46% of cropland over the five-year timeframe.

The MDA surveyed agronomists and farmers to understand nitrogen fertilizer management practices used in the township. Having current and accurate nitrogen fertilizer management data is critical to the discussion of agricultural practices. The management information collected includes crop planting, harvest, and nitrogen fertilizer use information.

Surveys indicate that splitting nitrogen fertilizer applications on corn, edible beans, and potatoes is a common practice. Additionally, accounting for all nitrogen sources, crediting for manure applications and previous crops, and avoiding fall applications of nitrogen fertilizer are practices followed on most cropland.

In 2025, the MDA surveyed three fertilizer dealers about nitrogen fertilizer BMP use in the township. Nitrogen rates provided in the survey are shown in Table 3.

Table 3. 2025 Corn Nitrogen Fertilizer Rates in Wing River Township

Crop Rotation	Range of Nitrogen Rates Applied (lbs. N per acre)	Nitrogen Rate Most Commonly Applied (lbs. N per acre)	Percent of Acres Applying the Most Common Nitrogen Rate
Corn following corn—dryland	160-185	165 or less	63%
Corn following soybean—dryland	120-155	135 or less	41%
Corn following corn—irrigated	190-255	191-210	56%
Corn following soybean—irrigated	160-225	181-205	52%

Nitrate-Nitrogen Loss Below Cropland

Using a crop and soil computer simulation model called the [Environmental Policy Integrated Climate model \(EPIC\)](http://epicapex.tamu.edu/epic/) (epicapex.tamu.edu/epic/), the MDA estimated nitrogen loss below soils and weather conditions in Wing River Township. Modeling indicates a reduction from current irrigated corn nitrogen rates to the high end of the University of Minnesota's 0.10 price ratio range (currently 225 lbs. N/ac for corn after corn and 195 lbs. N/ac for corn after soybeans) would reduce nitrate leaching under irrigated corn systems by 18%. This estimate of nitrogen loss is based on producers maintaining multiple applications of nitrogen (three or more) during the growing season. Nitrogen fertilizer dealership surveys and reviews with the LAT indicate that more than 60% of irrigated corn acres receive four or more applications of nitrogen during the growing season. Similarly, modeling results indicate that a reduction from current dryland corn nitrogen rates to the 0.15 Maximum Return to Nitrogen (MRTN) (currently 165 lbs. N/ac for corn after corn and 135 lbs. N/ac for corn after soybeans), would reduce nitrate leaching under dryland corn systems by 13%.

The dealer survey indicated that cover crops are planted in the fall on about 52% of annual row crop acres. The EPIC model indicates that leaching is reduced 10-15% per acre when cover crops are grown in corn-soybean rotations in the township. Perennials, including alfalfa in rotation with corn, can reduce leaching by 57% per acre or more when compared to corn-corn or corn-soybean rotations.

MDA Recommended Nitrogen Fertilizer Best Management Practices for Wing River Township

Nitrogen BMPs are based on University of Minnesota research and are considered economically and environmentally sustainable. Nitrogen rate is a BMP that could vary within the township depending on weather, soil, and management. In-field data from nitrogen-rate trials or use of precision agriculture can identify the optimum nitrogen rate for a given field.

In consultation with the LAT, the MDA developed the following list of BMPs to protect groundwater in the township.

- Apply nitrogen to irrigated corn in a corn-corn or corn-soybean rotation at or below the high end of the 0.10 price-ratio range in the University of Minnesota's nitrogen fertilizer application guidelines.
- Apply nitrogen to dryland corn in a corn-corn or corn-soybean rotation at or below the 0.15 MRTN in the University of Minnesota's nitrogen fertilizer application guidelines.
- Account for all nitrogen sources when calculating nitrogen rate.
- Take appropriate credits for previous legume crops and manure used in the crop rotation.
- Split applications of nitrogen fertilizer on coarse-textured soils.
- Use a nitrogen rate for potatoes based on variety, harvest date, and realistic yield goals.

A complete list of the MDA recommended BMPs is available on the [Wing River Township](http://mda.state.mn.us/wingriver-twp) webpage (mda.state.mn.us/wingriver-twp)

AMTs and Additional Practices for Wing River Township

In addition to BMPs, other practices, including AMTs, can be more protective of groundwater; the LAT recognizes the benefits of those listed below. While BMPs are applicable to most cropland acres, AMTs and additional practices tend to be less universal but very appropriate in select situations or fields. On a township scale, even small improvements in nitrogen management can reduce nitrogen loss below cropland and, over the long term, reduce nitrate levels in groundwater. Currently, the most applicable **AMTs** for this township include: Minnesota Ag Water Quality Certification, cover crops, on-farm nitrogen rate trials and precision nitrogen management.

Approved AMTs

Minnesota Ag Water Quality Certification Program

Land conservation programs

Increasing continuous cover: perennial vegetation

Increasing continuous cover: cover crops

On-farm nitrogen rate trials

Precision nitrogen management

Intermediate wheatgrass (Kernza)

AMTs will be added to this approved list and posted on the [Approved AMTs](https://mda.state.mn.us/pesticide-fertilizer/approved-amts) webpage (mda.state.mn.us/pesticide-fertilizer/approved-amts). Once posted, the new AMTs will be applicable in the township.

Additional practices

- Attend educational activities that highlight products or practices intended to reduce the risk of nitrogen loss.
- Field testing to determine nitrogen requirements for specific crops.
- Test manure using a lab certified or approved by the MDA.
- Use products delaying nitrification approved by the MDA.
- Establish demonstration sites for nitrogen use practices.
- Schedule irrigation according to crop need and soil water-holding capacity in the root zone to avoid leaching.
- Manage irrigation water to leave space in the root zone for possible precipitation.

In addition to the items above, the LAT recognized the importance of improving nitrogen fertilizer-use efficiency. Members highlighted the value of precision agricultural practices, and the importance of a well-calibrated yield monitor to know the effectiveness of management practices being used. The team also shared that in-season tissue testing can be a valuable tool to guide nitrogen-use decisions. The discussion emphasized that producers and agronomists strive to be as efficient as possible with their nitrogen fertilizer inputs. Additionally, the team explained the importance of education—encouraging farmers and ag professionals to learn from field days, university outreach, industry events, research studies, field trials, online workshops and training, and other resources to continually improve nitrogen fertilizer-use efficiency.

On irrigated acres within the township, promoting and supporting tools and information that improve irrigation scheduling and system upgrades to improve water use efficiency could further reduce the risk of saturated soil conditions that can lead to leaching. The irrigation technology Regional Conservation Partnership Program (RCPP) grant sponsored by the MDA is an example of the type of promotion and support to expand adoption of these tools. More information is available at the [Precision Irrigation Cost-Share](https://mda.state.mn.us/precision-irrigation-cost-share) website (mda.state.mn.us/precision-irrigation-cost-share).

In addition to the items listed above, the MDA recognizes the use of manure on cropland within the township. Careful manure management is critical to make efficient use of this resource and avoid practices with inherently higher risk of nitrogen loss below the root zone. Careful crediting of nitrogen available from manure is fundamental. In addition to crediting, promoting manure testing, calibration of spreading equipment and storage upgrades can improve crop use of nitrogen available from manure and reduce nitrogen losses below the root zone.

Conclusion

In Wing River Township, the MDA reviewed the cropping history, surveyed nitrogen management practices, and discussed current practices with the LAT. A substantial amount of the township's cropland is in perennial cover, including grass hay, alfalfa, and pasture. Over a five-year period, perennials accounted for an average of 46% of cropland. Maintaining and increasing this type of perennial land use is important to minimizing nitrate leaching.

Current University of Minnesota nitrogen fertilizer timing, placement, and product BMPs already are widely used within the township, but adoption of these BMPs on all cropland acres would offer even greater water-quality benefits. MDA modeling suggests that fine-tuning nitrogen rates can be the most effective practice to reduce nitrate leaching from cropland. Limiting nitrogen rates on irrigated corn to at or below the University of Minnesota's high end of the 0.10 rate range on irrigated corn and at or below the 0.15 MRTN on dryland corn would have positive water-quality impacts. Based on nitrogen rate distribution data gathered from area fertilizer dealers, computer modeling estimates an 18% reduction in losses below irrigated corn and 13% below dryland corn if nitrogen fertilizer is applied at or below these rates. Similarly, the use of precision nitrogen management or on-farm rate trials help identify optimal nitrogen rates and further protect groundwater.

AMTs have great potential to reduce nitrate leaching losses. The LAT acknowledged the protective potential of these practices. Currently 52% of annual row crop acres have a cover crop planted in the fall. Where possible, maintaining or increasing the adoption of cover crops is encouraged. Funding to support the adoption of these practices would help increase adoption.

Based on the information provided above, the MDA believes that the recommended nitrogen management practices for Wing River Township are appropriate, and that maximizing use of these practices over the long term will prevent increases in nitrogen loss below cropland. These recommendations are available on the [Wing River Township](http://mda.state.mn.us/wingriver-twp) webpage (mda.state.mn.us/wingriver-twp). Additionally, further reductions to nitrogen loss are possible with the increased use of AMTs where they are practicable and economical, recognizing that promotion and additional funding are needed to increase their adoption.

In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651-201-6000. TTY users can call the Minnesota Relay Service at 711. The MDA is an equal opportunity employer and provider.