Best Management Practices for the Rockwood Estates Drinking Water Supply Management Area (DWSMA)

Published: 7-15-2025

This document is a list of the University of Minnesota nitrogen (N) fertilizer best management practices (BMPs) that apply within the Rockwood Estates Drinking Water Supply Management Area (DWSMA). The BMPs are from the following University of Minnesota resources:

- Best Management Practices for Nitrogen on Coarse Textured Soils,
- Best Management Practices for Nitrogen Use in South-Central Minnesota,
- Best Management Practices for Irrigated Potatoes,
- Fertilizing Corn in Minnesota, and
- University of Minnesota Extension webpage Crop-Specific Nutrient Needs (https://extension.umn.edu/nutrient-management/crop-specific-needs)

Considerations when reading the BMP tables

- The BMPs listed below are either applicable to all soils or specific to coarse textured soils. All cropland soils within the Rockwood Estates DWSMA are classified as coarse-textured.
- A Rockwood Estates DWSMA Map (https://tinyurl.com/DWSMARockwood) identifies where coarse soils exist.
- The BMPs on the final list must be implemented on 80% of the cropland (excluding soybean acres) in the DWSMA.
- Nitrogen management records need to be provided to show that a practice was adopted. If a responsible party does not provide or provides insufficient documentation showing a practice has been implemented, it counts as non-implemented during the MDA's evaluation/survey of nitrogen fertilizer BMP implementation.
- Some BMPs may not apply to all cropping systems, such as, incorporation of urea with tillage in no-till systems. If a BMP is agronomically or technically unsuitable for a specific field based on soil type, topography, crop or management system, a suitable BMP or Alternative Management Tool (AMT) can be selected in its place.
- See the companion document "Definitions of Terms in the University of Minnesota Nitrogen Fertilizer BMPs" for definitions of terms related to the BMPs. This document is available at the Rockwood Estates DWSMA webpage (www.mda.state.mn.us/rockwoodestatesmhp-dwsma)

Considerations regarding nitrogen rate

- Based on survey data MDA collected within the Rockwood Estates DWSMA, producers growing irrigated corn following potatoes apply at rates lower than the University of Minnesota 0.10 price ratio maximum return to nitrogen (MRTN). To protect groundwater below the cropland in this DWSMA the MDA expects that growers will continue to apply nitrogen to corn following potatoes at their current rates. The nitrogen rates listed below provide a reference for future BMP evaluations and MDA approved alternative management tools (AMT).
- The MDA's computer modeling of nitrogen loss below the crop root zone is based on the nitrogen rates being applied.
- The strategy for protecting groundwater in this DWMSA, including the nitrogen BMPs listed below, is predicated on producers continuing to apply nitrogen at their current corn nitrogen rates.

Questions or Comments?

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Best Management Practices (BMPs)

The BMPs numbered 1 – 3 apply to all soil types and are the most important BMPs to reduce nitrate losses.

BMP	Nitrogen Rate BMPs	Applies to
1	Nitrogen rates are based on the nitrogen fertilizer application guidelines from the University of Minnesota[1]. **Irrigated corn following soybeans:** at or below the MRTN of the 0.10 price ratio (currently at 180 lbs. N/ac) [1,2] **Irrigated corn following edible beans or peas:** at or below the MRTN of the 0.10 price ratio MRTN (currently at 190 lbs. N/ac)[1,2] **Irrigated corn following corn or potatoes:** at or below the MRTN of the 0.10 price ratio MRTN (currently at 210 lbs. N/ac) [1,2] **Dryland corn following corn or potatoes:** at or below the MRTN of the 0.125 price ratio MRTN (currently at 175 lbs. N/ac) [1,2] **Dryland corn following corn or potatoes:** at or below the MRTN of the 0.125 price ratio MRTN (currently at 140 lbs. N/ac) [1,2] For other crops grown in the DWSMA, nitrogen rates must follow the current University of Minnesota guidance applicable to that crop[3]	All agronomic crops on all soils
2	Include N supplied in a starter, weed and feed program, and contributions from phosphorus fertilizers such as MAP and DAP when calculating total N rate[4]	All agronomic crops on all soils
3	Take appropriate N credit for previous legume crops and manure used in the crop rotation[5]	All agronomic crops on all soils

[1] Corn nitrogen rate guidelines from the University of Minnesota https://extension.umn.edu/crop-specific-needs/fertilizing-corn-minnesota or its successor.

[2] The implementation of approved alternative management tools may allow a higher nitrogen rate provided that the field specific data indicates this is appropriate.

[3] All crops listed at the University of Minnesota Extension webpage Crop-Specific Nutrient Needs at https://extension.umn.edu/nutrient-management/crop-specific-needs or its successor.

[4] Total N rate should also include any AMS or other inorganic fertilizers containing nitrogen.

[5] In addition to legumes and manure, total N rate should also include nitrogen from organic sources with a known nitrogen availability factor (i.e. research-based nitrogen availability table or laboratory analysis, including first and second year credits) such as biosolids and industrial by-products.

BMP	Nitrogen Placement, Timing and Source BMPs on Coarse Textured Soils	Applies to
4	Use split applications of nitrogen fertilizer [6,7]	Corn and edible beans on coarse textured soils

[6] This split application BMP only applies to corn and edible bean acres that receive commercial nitrogen fertilizer. If manure is the only source of nitrogen, this BMP does not apply.

[7] The MDA will refer to the definition of split application in the companion document "Definition of Terms in the University of Minnesota Nitrogen Fertilizer BMPs". Practices that meet this definition will be considered meeting this BMP.

BMP	Nitrogen Placement, Timing and Source BMPs on Coarse Textured Soils	Applies to
5	Use N stabilizer on labeled crops when early sidedress is used [8]	Corn and edible beans on coarse textured soils

[8] For corn, this BMP applies to situations when a portion of the total nitrogen fertilizer is applied preplant and the remainder is applied as a single sidedress application early in the growing season. Early growing season is defined as the period from crop emergence through the V4 growth stage. This BMP does not apply to situations when there are more than one sidedress application within the growing season. For edible beans early sidedress is defined as within 17 days after planting.

The BMPs for **irrigated potatoes** are listed in the tables below.

BMP	Nitrogen Rate BMPs for irrigated potatoes only	Applies to
6	Base N rate on variety, harvest date, and realistic yield goals[9]	Irrigated Potatoes
7	Account for nitrogen from previous crop (take N credits from legumes)	Irrigated Potatoes
8	Test irrigation water for N content and adjust N fertilizer accordingly	Irrigated Potatoes

BMP	Timing BMPs for irrigated potatoes	Applies to
9	Do not use more than 40 lbs N/A in the starter for mid/late season varieties[10]	Irrigated Potatoes
10	Do not use more than 60lbs N/A in the starter for early harvested varieties[10]	Irrigated Potatoes
11	Nitrogen applied through the hilling stage should be cultivated/incorporated into the hill	Irrigated Potatoes
12	Plan the majority of soluble N inputs from 10 to 50 days after emergence	Irrigated Potatoes
13	Use petiole analysis to aid in making post-hilling nitrogen applications	Irrigated Potatoes

BMP	Source BMPs for irrigated potatoes only	Applies to
14	Do not use fertilizers containing nitrate in the starter	Irrigated Potatoes
15	For mid to late season varieties, apply ESN no later than emergence[10]	Irrigated Potatoes
16	ESN for early harvested potatoes is not recommended due to slow release of N	Irrigated Potatoes

BMP	Other BMPs for irrigated potatoes only	Applies to
17	Follow proven water management strategies to provide effective irrigation and minimize leaching	Irrigated Potatoes
18	Establish a cover crop following potatoes whenever possible[11]	Irrigated Potatoes

[9] Yield refers to total yield, not harvestable yield

[10] Early = vines killed or green dug before August 1st; Mid = vines killed or green dug August 1-August 31; Late = vines killed or green dug after September 1.

[11] Establish a cover crop following potatoes harvested before September 1. Potatoes harvested on or after this date need a cover crop established unless the soil is too wet for seeding, weather is too cold or it is too late in the growing season for cover crop growth. These and other reasons for not planting cover crops will be considered on a case-by-case basis.

Maintaining records of nitrogen fertilizer use is especially important and enables the MDA to review the rate of adoption within this DWSMA during the MDA's evaluation of nitrogen fertilizer BMPs. If records are insufficient or not provided surveyed cropland will be counted as not implementing the published nitrogen fertilizer BMPs. An example record keeping form can be found on the Rockwood Estates DWSMA webpage (www.mda.state.mn.us/rockwoodestatesmhp-dwsma).

Record Keeping	Applies to
Keep records of nitrogen use, including rates, crediting of nitrogen sources, timing, placement and source. MDA will provide guidance on record keeping requirements.	All agronomic crops on all soils

Additional Practices and Alternative Management Practices (AMTs)

The tables below are additional practices and alternative management tools (AMTs). These have been discussed with the local advisory team (LAT) and the team acknowledges the protective potential of these practices. Adoption of these practices is not required in a Mitigation Level 2 DWSMA however each of the listed practices could be protective of groundwater or provides useful information to guide the use of nitrogen fertilizer. Farmers are encouraged to consider these practices although some may not be appropriate or applicable to every farm.

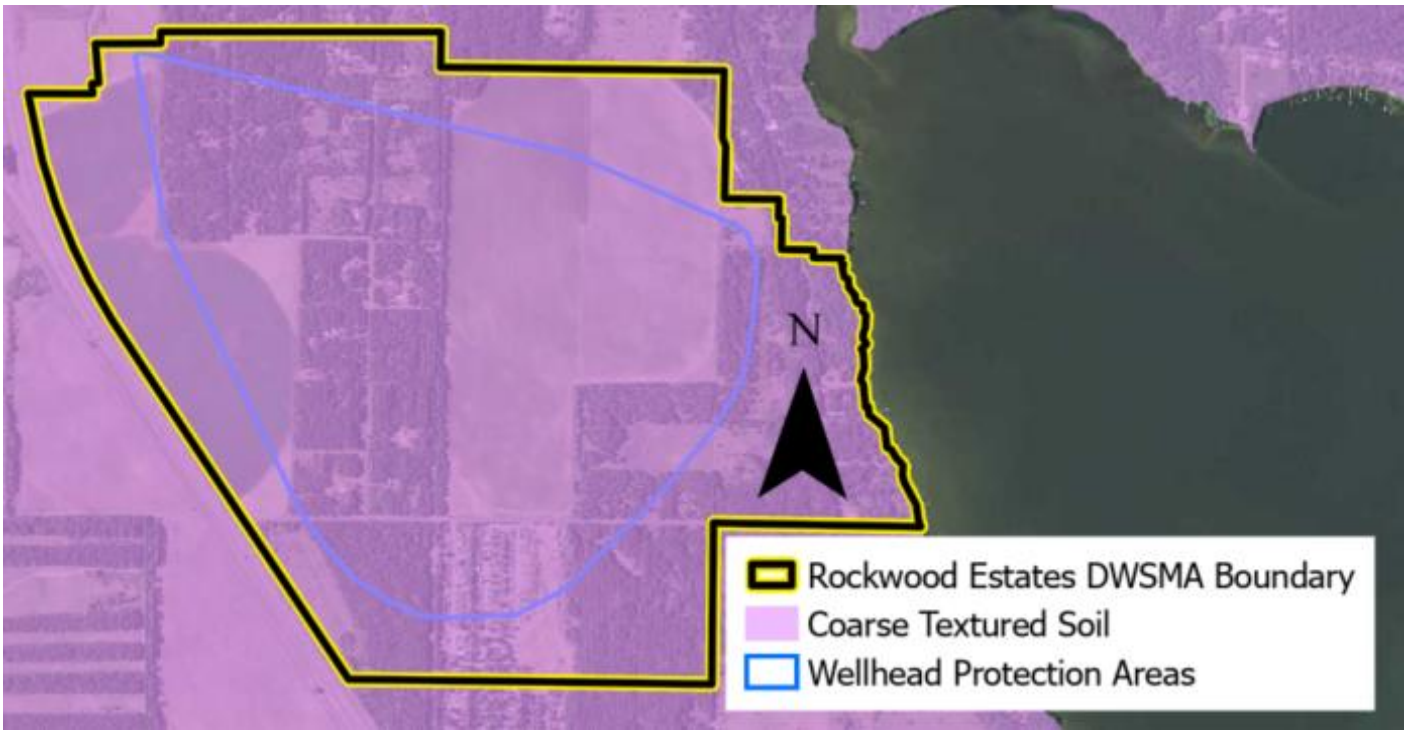
Additional Practices	**Applies to**
Convert corn-dry bean-potato rotation to corn-dry bean-potato-peas/forage-dry bean-potato 103 acres adopting this change reduces the total nitrogen loss below cropland by 6.0%	Corn
Attend educational activities approved by the MDA	All agronomic crops on all soils
Field testing to determine nitrogen requirement for specific crops	All agronomic crops on all soils
Test manure using a lab approved or certified by MDA	All agronomic crops on all soils
Test as needed to monitor nitrate-nitrogen concentrations in the groundwater	All agronomic crops on all soils
Develop irrigation, fertilizer chemigation, water, manure, or nutrient management plans with a qualified professional	All agronomic crops on all soils
Replace spring applied manure with preplant urea	All agronomic crops on all soils

AMTs provide additional protection from the loss of nitrogen below cropland. The MDA will work together with the LAT, local soil and water conservation district staff, and other state agencies to seek out funding to support the adoption of these AMTs within the Rockwood Estates DWSMA.

Producers can voluntarily adopt these AMTs. During the MDA's evaluation of nitrogen fertilizer BMPs in a Mitigation Level 2 DWSMA some AMTs can substitute for a BMP. However, AMT adoption is not required to pass the BMP evaluation in a Mitigation Level 2 DWSMA.

Alternative Management Tools (AMTs)
Perennial Vegetation Converting 204 acres of corn-dry bean-potato rotation to corn-dry bean-potato-alfalfa (x3) reduces nitrogen loss below cropland by 24.0%
Minnesota Ag Water Quality Certification Program
Land Conservation Programs
Increasing Continuous Cover: Cover Crops
Intermediate Wheatgrass (Kernza)
On Farm Nitrogen Rate Trials
Precision Nitrogen Management

Map of Coarse Soils within the Rockwood Estates Drinking Water Supply Management Area (DWSMA)



This map shows the boundary of the Rockwood Estates DWSMA. The black and yellow line marks the DWSMA boundary. Within this area, adoption of the BMPs listed on pages 2-4 is needed. The pink areas are coarse soils. Where the coarse soils are the dominant soil type within a field, the BMPs for coarse soils should be followed.