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

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This document is a list of the University of Minnesota nitrogen (N) fertilizer best management practices (BMPs) that apply within the Perham 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: Irrigated Potatoes,
- Fertilizing Corn in Minnesota, and
- Fertilizer Guidelines for Agronomic Crops in Minnesota.
- University of Minnesota Extension webpage Crop-Specific Nutrient Needs (extension.umn.edu/nutrient-management/crop-specific-needs)

Considerations when reading the BMP tables

- The BMPs listed are either for coarse-textured soils or applicable to all soils. There are both coarse and fine textured soils across the cropland within the Perham DWSMA.
- The Perham DWSMA Map (tinyurl.com/DWSMAPerham) 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 on the Perham DWSMA webpage (mda.state.mn.us/perham-dwsma).

Additional considerations for the Perham DWSMA

- Planting of a new crop variety with a lower nitrogen demand in this DWSMA is estimated to reduce nitrogen loss below modeled cropland by 8.1%. This change in the primary crop variety which began in 2020 applies to 29% of the cropland during the years that crop is grown in the rotation. If in the future this primary cropping decision were to change, review of the approved nitrogen fertilizer BMPs for this DWSMA may be needed and a new list of nitrogen fertilizer BMPs approved.

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	Corn nitrogen rates are based on the nitrogen fertilizer application guidelines from the University of Minnesota[1]. **Irrigated corn following soybean:** at or below the high end of the 0.10 price ratio range (currently at 195 lbs. N/ac)[1,2] **Irrigated corn following edible beans:** at or below the high end of the 0.10 price ratio range (currently at 205 lbs. N/ac)[1,2] **Irrigated corn following corn or potatoes**: at or below the high end of the 0.10 price ratio range (currently at 225 lbs. N/ac)[1,2] **Dryland corn following soybean:** at or below the 0.125 MRTN (currently at 140 lbs. N/ac)[1,2] **Dryland corn following corn:** at or below the 0.125 MRTN (currently at 175 lbs. N/ac)[1,2] **Edible Beans:** follow the University of Minnesota guidance based on yield goal, previous crop and soil organic matter (currently up to 120 lbs. N/ac) **For other crops grown** in the DWSMA, 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 Fertilizing corn in Minnesota (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 (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 tables, laboratory analysis, including first and second year credits) such as biosolids and industrial by-products.

BMP	Placement, Timing and Source BMPs for Corn and Edible Beans on Coarse Textured Soils	Applies to
4	Use split applications of N fertilizer	Corn and edible beans on coarse textured soils

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

[6] At the time this list was published, the highest University of Minnesota nitrogen rate guidelines were 250 lbs. N/acre. Higher nitrogen rates may be used if using a petiole analysis.

[7] Yield refers to total yield, not harvestable yield.

BMP	Timing BMPs for irrigated potatoes only	Applies to
8	Do not use more than 40 lbs N/acre in the starter for mid/late season varieties[8]	Irrigated Potatoes
9	Do not use more than 60 lbs N/acre in the starter for early harvested varieties[8]	Irrigated Potatoes
10	Nitrogen applied through the hilling stage should be cultivated/incorporated into the hill	Irrigated Potatoes
11	Plan the majority of soluble N inputs from 10 to 50 days after emergence	Irrigated Potatoes
12	Use a petiole analysis to aid in making post-hilling nitrogen applications	Irrigated Potatoes

BMP	Source BMPs for irrigated potatoes only	Applies to
13	Do not use fertilizers containing nitrate (e.g., UAN) in the starter	Irrigated Potatoes
14	For mid to late season varieties[8], apply ESN no later than emergence	Irrigated Potatoes
15	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
16	Follow proven water management strategies (irrigation scheduling) to provide effective irrigation and minimize leaching	Irrigated Potatoes
17	Establish a cover crop following potatoes whenever possible[9]	Irrigated Potatoes

[8] Early = vines killed or green dug before August 1; Mid = vines killed or green dug August 1 – August 31; late = vines killed or green dug after September 1.

[9] 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 collection form can be found on the Perham DWSMA webpage (mda.state.mn.us/perham-dwsma).

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

Additional Practices and Alternative Management Tools (AMTs)

The tables below are additional practices and Alternative Management Tools (AMTs). Adoption of these practices is not required in a Mitigation Level 2 DWSMA. However, each of the listed practices could be protective of groundwater.

Below is a list of additional practices that could be protective of groundwater. These additional practices have been discussed with the LAT and they acknowledge the protective potential of these practices. The primary crop variety change is a commitment a group of producers has made for groundwater protection within the DWSMA. The use of nitrification inhibitors in addition to split applications of nitrogen fertilizer is a protective practice LAT members support. The practice of using a nitrification inhibitor with early season nitrogen applications in addition to in-season split applications is different than the University of Minnesota's BMP for inhibitor use on coarse-textured soils; however, this is an additional practice with potential to reduce nitrogen loss below cropland. Deficit irrigation scheduling was reviewed briefly with the LAT, but technical review of modeling results indicates this practice has the potential to reduce nitrogen loss. In the future the MDA will work with the LAT, DWSMA cropland farmers and local partners to demonstrate, evaluate, and adopt this practice where possible.

These additional practices can be adopted voluntarily by producers, but they are not required to pass the BMP evaluation in a Mitigation Level 2 DWSMA.

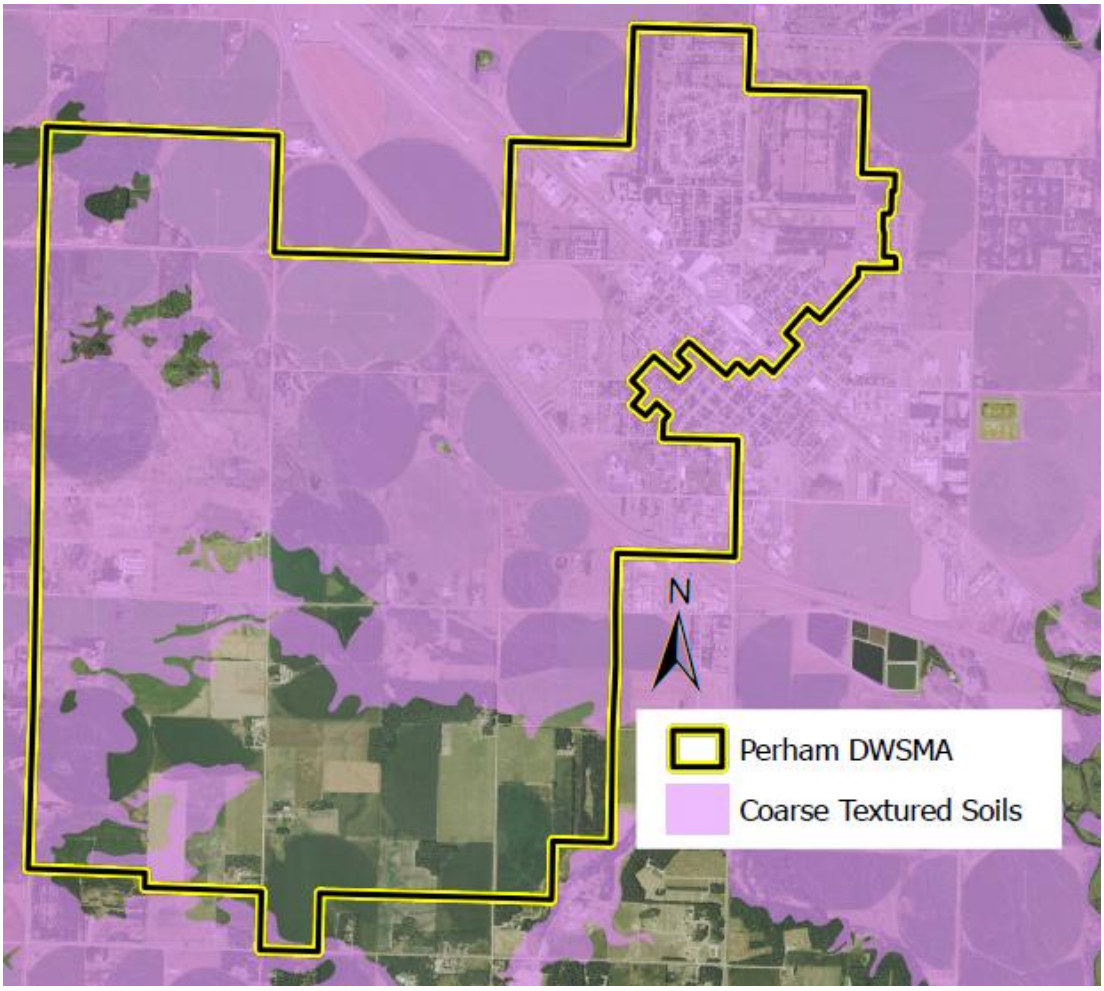
Additional Practices	**Applies to**
Primary crop variety change 971 acres adopting this change when this crop is grown in the rotation reduces the total nitrogen loss below the crop root zone by 8.1%	29% of cropland in the DWSMA
The use of nitrification inhibitor products with early season nitrogen applications in addition to in-season split applications of nitrogen fertilizer	Edible beans, corn, potatoes
Testing of manure using a certified laboratory	Acres receiving manure
Deficit Irrigation scheduling 1142 acres adopting this change is estimated to reduce nitrogen loss below the crop root zone by 7.7%	Irrigated cropland in the DWSMA

AMTs provide additional protection from the loss of nitrogen below cropland. The following is a list of AMTs that have been discussed with the LAT. The MDA will work together with the LAT, Perham cropland owners and producers, local Soil and Water Conservation District staff, and other state agencies to seek out funding to support the adoption of these AMTs within the Perham 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. AMT adoption is not required to pass the BMP evaluation in a Mitigation Level 2 DWSMA.

Alternative Management Tools (AMTs)
Minnesota Ag Water Quality Certification Program
Land Conservation Programs
Increasing Continuous Cover: Cover Crops
Intermediate Wheatgrass (Kernza)
Perennial Vegetation
On Farm Nitrogen Rate Trials
Precision Nitrogen Management

Perham Drinking Water Supply Management Area (DWSMA)



This map shows the boundary of the Perham DWSMA. The yellow and black line marks the DWSMA boundary. Within this area, adoption of the BMPs listed on pages 2-3 are needed. The pink areas are coarse soils. Where the coarse soils are the dominant soil type within a field, the BMPs for coarse textured soils should be followed.