



CONSERVATION ENHANCEMENT ACTIVITY

E590A

CONSERVATION STEWARDSHIP PROGRAM

Improving nutrient uptake efficiency and reducing risk of nutrient losses

Conservation Practice 590: NUTRIENT Management

APPLICABLE LAND USE: Crop (annual & mixed); Crop (perennial)

RESOURCE CONCERNS: Water, Air

ENHANCEMENT LIFE SPAN: 1 year

Enhancement Description

Nutrient management encompasses managing the amount, source, placement, and timing of the application of plant nutrients and soil amendments. Nutrients are currently being applied on the farm based on the 4R nutrient stewardship principles. Enhanced nutrient use efficiency strategies or technologies are utilized to improve nutrient use efficiency and reduce risk of nutrient losses to surface and groundwater and reduce risks to air quality by reducing emissions of greenhouse gases (GHGs).

Criteria

- Documentation of producer’s record of nutrient management meeting all NRCS Conservation Practice Standard Nutrient Management (CPS 590) general criteria and additional criteria to minimize agricultural nonpoint source pollution of surface and groundwater.
- For Nitrogen, Phosphorus, and Potassium (N-P-K), rates of application are to be agronomic application rate (based on soil test and yield goal).
- Minimize soil surface disturbance during nutrient placement.
- **Utilize two or more nutrient use efficiency strategies or technologies** to reduce nutrient loss risk and improve nutrient use efficiency. Select two or more of the strategies and technologies below:

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- Use Enhanced Efficiency Fertilizer (EEF) products with 1 or more nutrient applications.
  - Nitrogen or phosphorous EEF products recommended by state Land Grant University (LGU) and concurred with by NRCS on all treatment acres to supply at least 50% of the pre-emergent and early post emergent LGU recommended nitrogen or phosphorous requirements for the crop(s) grown.
- Use in-season soil nitrate sampling.
  - Use pre-sidedress soil nitrate test (PSNT) to determine the need and/or amount of additional nitrogen to be applied during sidedress/topdress N application. Conduct a PSNT on a selected crop (e.g. corn) to test if additional N fertilizer is needed.
- Use in-season plant tissue sampling and analysis as a complement to soil testing.
  - Follow local LGU and/or laboratory guidelines for interpretations of the results and appropriate adjustments in the application of N and other nutrients. *End of season stalk nitrate testing is not applicable if the enhancement is only contracted for one year, as results must be used to evaluate and adjust nutrient management in the following year, as needed.*
- Split nutrient applications.
  - Apply no more than 50% of total crop nitrogen needs within 30 days prior to planting (or in the case of hay or pasture after green up of dormant grasses). Apply the remaining nitrogen after crop emergence (or green up).
  - Post emergent nitrogen may be reduced based on crop scouting, in-season soil sampling/analysis, or plant tissue sampling/analysis.
- Time nutrient application timing to match nutrient uptake timing.
  - Apply nutrients no more than 30 days prior to planting date of annual crops.
- Nutrient placement below soil surface.
  - Nutrients are injected or incorporated at time of application.
- Use of nitrification inhibitors to delay the nitrification process, by eliminating the bacteria *Nitrosomonas* in the area where ammonium is to be present.



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- Materials must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.
  - Application timing, method, N source, soil texture, and tillage regime are all factors that should be evaluated to determine where nitrification inhibitors should be used. Before buying an inhibitor make sure scientific evidence backs up all claims. Producers and/or consultants should be wary of any product that does not have solid scientific data demonstrating that the inhibitor activity matches the advertised benefit.
- Use of urease inhibitors to temporarily reduce the activity of the urease enzyme and slow the rate at which urea is hydrolyzed.
- Materials must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.
  - Application timing, method, N source, soil texture, and tillage regime are all factors that should be evaluated to determine where urease inhibitors should be used. Before buying an inhibitor make sure scientific evidence backs up all claims. Producers and/or consultants should be wary of any product that does not have solid scientific data demonstrating that the inhibitor activity matches the advertised benefit.



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## Documentation and Implementation Requirements

### Participant will:

- Prior to implementation, provide documentation for review by NRCS showing a record of implementing nutrient management meeting all applicable NRCS Conservation Practice Standard Nutrient Management (CPS 590) general criteria and additional criteria to minimize agricultural nonpoint source pollution of surface and groundwater.
- Prior to implementation, develop and document a planned nutrient budget, yield goal, and applications (pounds/acre active ingredient, nutrients must include at a minimum N-P-K).
- Prior to implementation, select two or more of the nutrient use efficiency strategies or technologies. **Selections:** \_\_\_\_\_
- During implementation, keep records to document actual nutrient applications (pounds/acre active ingredient, nutrients must include at a minimum N-P-K).
- During implementation, minimize soil surface disturbance during nutrient placement.
- During implementation, notify NRCS of any planned changes to verify the planned system meets the enhancement criteria.
- During implementation, additional record keeping requirements for specific strategy or technology:
  - In-season soil nitrate sampling. Records and documentation must include results (including reference strips) and adjustments in nutrient management based on results.
  - In-season plant tissue sampling and analysis. Records and documentation must include type of test used (stalk, leaf, chlorophyll, infrared, or other plant tissue), results (including reference strips), and adjustments in nutrient management based on results.
  - Nutrient placement below soil surface. Records and documentation must include method of injection or incorporation and depth.
- After implementation, make documentation and records available for review by NRCS to verify implementation of the enhancement.

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**NRCS will:**

- As needed, provide technical assistance to meet the criteria of the enhancement.
- Prior to implementation, provide and explain NRCS Conservation Practice Standard Nutrient Management (CPS 590) as it relates to implementing this enhancement.
- Prior to implementation, review documentation to verify a record of implementing nutrient management meeting all NRCS Conservation Practice Standard Nutrient Management (CPS 590) general criteria and additional criteria to minimize agricultural nonpoint source pollution of surface and groundwater.
- Prior to implementation, verify the development of a planned nutrient budget, yield goal, and planned nutrient applications.
- Prior to implementation, verify the selection of two or more nutrient use efficiency strategies or technologies.
- During implementation, evaluate any planned changes to verify the planned system meets the enhancement criteria.
- After implementation, review documentation and records to verify implementation of the enhancement.

**NRCS Documentation Review:**

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name \_\_\_\_\_ Contract Number \_\_\_\_\_

Total Amount Applied \_\_\_\_\_ Fiscal Year Completed \_\_\_\_\_

\_\_\_\_\_  
NRCS Technical Adequacy Signature

\_\_\_\_\_  
Date

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# SOUTH DAKOTA (SD) SUPPLEMENT TO CONSERVATION ENHANCEMENT ACTIVITY

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## E590A

### Additional Criteria for South Dakota:

In addition to the criteria specified in the national job sheet E590A, the following additional criteria apply in SD:

- Enhanced efficiency phosphorus fertilizers will not qualify for this enhancement.
- For fall planted crops such as winter wheat 50 percent (%) of the actual nitrogen applied must be an enhanced efficiency or controlled release fertilizer. For spring planted cool season crops such as spring wheat, a minimum of 25% of the actual nitrogen must be a controlled release fertilizer. For spring planted warm season crops, such as corn or sunflowers a minimum of 50% of the actual nitrogen must be a controlled release fertilizer. Split applications of nitrogen fertilizers are allowed as long as the minimum percentages of controlled release fertilizer applied are met. Because this enhancement is for pre-emergent and early post emergent nitrogen fertilizer, application of liquid nitrogen products applied later in the growing season do not apply to this enhancement.
- **Acceptable EEF products must contain one of the following materials:**

Material	Mechanism	Category
Dimethylenetriurea (DMTU)	Uncoated slowly available nitrogen	Slowly available nitrogen**
Isobutylidene Diurea (IDBU)	Uncoated slowly available nitrogen	Slowly available nitrogen**
Methylene Urea(s) MU, polymethylene urea(s)	Uncoated slowly available nitrogen	Slowly available nitrogen**
Methylenediurea (MDU)	Uncoated slowly available nitrogen	Slowly available nitrogen**
Oximide (C <sub>2</sub> H <sub>4</sub> N <sub>2</sub> O <sub>2</sub> )	Uncoated slowly available nitrogen	Slowly available nitrogen**
Polymer Coated Urea (PCU)	Coated slow release nitrogen	Slowly available nitrogen** (Coated slow release fertilizer)
Sulfur Coated Urea (SCU)	Coated slow release nitrogen	Slowly available nitrogen** (Coated slow release fertilizer)



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Methylene Coated Urea	Coated slow release nitrogen	Slowly available nitrogen** (Coated slow release fertilizer)
Ureaform Fertilizer Materials	Uncoated slowly available nitrogen	Slowly available nitrogen**
Urea-Formaldehyde Products	Uncoated slowly available nitrogen	Slowly available nitrogen**
Urea-Triazone Solution	Uncoated slowly available nitrogen	Slowly available nitrogen**

\*\* **Slowly available nitrogen** materials must be listed above and specified on the fertilizer label.

- **Acceptable nitrification or urease inhibitors must contain one of the following materials:**

Material	Mechanism	Category
N-(n-butyl) thiophosphoric triamide (NBPT)	Nitrogen stabilizer	Urease inhibitor*
Nitrapyrin [2-chloro-6-(trichloromethyl)-pyridine]	Nitrogen stabilizer	Nitrification inhibitor*
Dicyandiamide (DCD) (C <sub>2</sub> H <sub>4</sub> N <sub>4</sub> )	Nitrogen stabilizer	Nitrification inhibitor*

Land Grant University research available for review regarding crop yield response and effectiveness of nitrification inhibitor products: Franzen, D.W. SF-1581, Sept 2011, **N Extenders and Additives**, NDSU: <http://www.ag.ndsu.edu/pubs/plantsci/soilfert/sf1581.pdf>.

Matt Ruark, Dept. of Soil Science, WI FFVC, 1/17/2012, **Advantages and disadvantages of controlled-release fertilizers**: [https://soilsextension.webhosting.cals.wisc.edu/wp-content/uploads/sites/68/2014/02/Overview\\_of\\_fertilizer\\_technologies\\_2012\\_WIFFVC.pdf](https://soilsextension.webhosting.cals.wisc.edu/wp-content/uploads/sites/68/2014/02/Overview_of_fertilizer_technologies_2012_WIFFVC.pdf), slides 15-25.





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- **Information on pre-sidedress soil nitrate test (PSNT)**

Refer to SB1001 [Recommended Chemical Soil Test Procedures for the North Central Region](#) Chapter 5, Nitrate-Nitrogen, Pre-sidedress Soil Nitrate Test for Corn.

- **Information on in-season plant tissue sampling**

Use these links to access tissue sampling techniques and guidelines from several local Land Grant Universities:

University of Minnesota: [Understanding plant analysis for crops](#)  
<https://extension.umn.edu/testing-and-analysis/understanding-plant-analysis-crops>

University of Minnesota: [Plant Analysis Sampling and Interpretation FO-3176-B](#)



Plant Analysis Sampling and Interpretation

Iowa State: [Corn Stalk Testing to Evaluate Nitrogen Management \(PM1584\)](#)



IA\_Stalk\_Nitrate\_Test\_CROP3154.pdf

University of Nebraska: [The Corn Stalk Nitrate Test \(NF01-491\)](#)

<https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2027&context=extensionhist>

University of Wisconsin: [SAMPLING FOR PLANT ANALYSIS](#)



WISC\_Plant Analysis\_Sampling.pdf

**These links provides information on chlorophyll meters:**

Using Chlorophyll Meter Results to Improve Nitrogen Management: UNL G1632  
<http://ianrpubs.unl.edu/live/g1632/build/g1632.pdf>.

Penn State—[Agronomy Facts 53 The Early Season Chlorophyll Meter Test for Corn](#)

Purdue University—Determining Nitrogen Fertilizer Sidedress Application Needs in Corn Using a Chlorophyll Meter (AY-317-W)



Purdue\_Chlorophyll Meter\_AY-317-W.pdf





- Soil Sampling depths and methods need to follow SDSU guidelines. See Recommended Soil Sampling Methods for South Dakota – FS935

<https://extension.sdstate.edu/sites/default/files/2019-09/P-00132.pdf>

- The SDSU Fertilizer Recommendations Guide can be found at:

[https://extension.sdstate.edu/sites/default/files/2019-03/P-00039\\_0.pdf](https://extension.sdstate.edu/sites/default/files/2019-03/P-00039_0.pdf)

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