

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE INSTALLATION GUIDELINES

**NUTRIENT MANAGEMENT**

(ac.)  
CODE 590

**GUIDELINES APPLICABLE FOR ALL PURPOSES**

Nutrient management activities shall comply with all applicable, federal, state, and local laws and regulations. Review and comply with the minimum set back requirements in the current South Dakota General Water Pollution Control Permit for Concentrated Animal Feeding Operations when dealing with permitted facilities. Nutrient management plans shall be compatible with other components of a conservation plan and include appropriate management techniques and conservation practices to reduce environmental risk.

Persons who review or approve plans for nutrient management shall be certified through a certification program acceptable to Natural Resources Conservation Service (NRCS).

Yields established in the initial nutrient management plan will be determined from yields established for purchasing multi-peril crop insurance; proven yields on a field-by-field or farm-by-farm basis; South Dakota Agricultural Statistics Service using the published continuous five-year average yield plus ten percent or the NRCS Crop Yield Tables (Productivity Indexes and South Dakota Agricultural Statistics Service Information) plus 10 percent.

Yield goals established in annual nutrient management plans should be no greater than the yield determined by adding five years of yield data, subtracting the highest and lowest yields, averaging the remaining three years and multiplying by 1.1. If long-term data for an individual field is not available, use yield data from similar soil, cropping, and management conditions elsewhere on the farm or local area.

**FIELD RISK ASSESSMENT (ON ALL FIELDS)**

Plans for nutrient management will include a determination of the vulnerability of the application site to leach nitrates to an aquifer and the vulnerability for phosphorus loss to surface waters. Use the following guidance to make the vulnerability determinations:

**Vulnerability for nitrate leaching to an aquifer.**

Fields located over shallow aquifers as defined in SDCL 34A-3A-24 will be considered highly vulnerable for nitrate leaching. Use the following materials as available to identify shallow aquifers in each county in South Dakota. Hard copy or on line South Dakota Geological Survey (SDGS) aquifer map information <http://www.sdgs.usd.edu/digitalpubmaps/index.html>, SDGS available well log information [http://jurassic2.sdgs.usd.edu/cold\\_fusion/lithdb/search\\_lith.cfm](http://jurassic2.sdgs.usd.edu/cold_fusion/lithdb/search_lith.cfm) or additional NRCS compiled soils and well log maps located in Section I of the South Dakota Technical Guide (SDTG). For permitted facilities in South Dakota contact Department of Environment and Natural Resources (DENR) for further conformation of application fields where aquifer determinations are questionable.

**Vulnerability for phosphorus loss to surface waters.**

For surface water protection, areas of fields within 100 feet of a lake, river, stream, non cropped wetland, or a conveyance to these waters should be considered highly vulnerable to potential surface water contamination. A conveyance may be defined as a ditch, tile inlet, intermittent stream, waterway, or un-vegetated channel. A lake is a pond, reservoir, or other body of water, created by either natural or artificial means. A cropped wetland is not included in this definition of a lake. A pond or appurtenance that is used for the treatment and disposal of wastes and that is permitted for such uses is not a lake.

## **SOIL SAMPLING AND LABORATORY ANALYSIS (TESTING)**

Nutrient planning shall be based on current soil test results developed in accordance with South Dakota State University (SDSU) guidance. Current soil tests used for nitrogen recommendations will be those less than one year old. Soil tests for immobile nutrients are those that are no older than two years.

Soil samples shall be collected and prepared according to SDSU guidance. Soil samples will be taken as per land grant university recommendations found on the back of the SDSU Soil Testing Laboratory soil sample information sheet. Soil test analyses shall be performed according to the analytical procedures in the "Recommended Chemical Soil Test Procedures for the North Central Region (NCR-221)." Soil test analyses for phosphorus shall be limited to Bray and Kurtz P-1 or Olsen ( $\text{NaHCO}_3$ ) methods performed according to the analytical procedures in the "Recommended Chemical Soil Test Procedures for the North Central Region (NCR-221)."

## **MANURE OR ORGANIC BY-PRODUCT TESTING**

If animal manure is to be applied, test the manure for total N, inorganic N, total P, and total K. Use sample procedures described in SD-NRCS-FS-36, "Sampling Manure for Nutrient Management."

## **PLANT TISSUE TESTING**

Tissue sampling and testing, where used, shall be done in accordance with SDSU standards or recommendations.

## **NUTRIENT APPLICATION RATES**

Recommended nutrient application rates shall be based on SDSU EC750 "Fertilizer Recommendations Guide" using current soil test results, realistic yield goals and management capabilities.

In South Dakota, soil amendments are considered to be those materials which are applied to improve the physical, chemical or other characteristics of the soil or improve crop production excluding unmanipulated animal and vegetable manure, pesticides, commercial fertilizer, lime, or lime sludge produced by a municipality, sewage sludge, or compost (SDCL 38-19A-1(14)). Soil amendment products must be applied according to the manufacturer's product label instructions or guidelines established by SDSU. State law requires registration of soil amendment products with the South Dakota Department of Agriculture (SDDA) prior to distribution in the state. Soil amendment products not currently registered shall not be included as part of a nutrient management plan developed within the guidelines of this practice. If significant levels of plant available nitrogen or phosphorus are delivered to a field from the use of a soil amendment according to label instructions, those nutrients must be considered in the nutrient management plan.

## **APPLICATION METHODS**

Nutrients shall not be applied to frozen, snow-covered, or saturated soil if the potential risk for runoff exists. In situations where a catastrophic system failure is imminent; animal waste may be applied to soils with slopes less than four percent provided that a 100 ft. buffer is maintained to a water conveyance.

## **ADDITIONAL CRITERIA APPLICABLE TO MANURE OR ORGANIC BY-PRODUCTS APPLIED AS A PLANT NUTRIENT SOURCE**

Nutrient values of manure and organic by-products (excluding sewage sludge) shall be determined prior to land application based on laboratory analysis or, acceptable values agreed to by NRCS, SDSU, South Dakota Department of Environment and Natural Resources (DENR), and South Dakota Department of Agriculture (SDDA).

**NUTRIENT APPLICATION RATES** - The planned rates of nitrogen and phosphorus application recorded in the plan shall be determined based on the following guidance:

**Nitrogen Application** - When the application plan is being implemented on a nitrogen standard, manure or other organic by-products shall be applied at rates based on SDSU recommendations.

Manure or other organic by-products may be applied on legumes at rates equal to the estimated removal of nitrogen in harvested plant biomass minus soil test  $\text{NO}_3\text{-N}$ .

**Phosphorus Application** - When manure or other organic by-products are used, the planned rates of application shall be based on soil test phosphorus, potential sheet/rill erosion, and the presence of perennial vegetation consistent with Table 1. In situations where manure applications will be based of phosphorus crop removal, an additional nitrogen application, from non-organic sources, may be required to supply the recommended amounts of nitrogen.

**TABLE 1**

Nitrogen need/Phosphorus Crop Removal Manure Application Determination						
Soil Test Phosphorus (ppm)		Predicted Soil Loss - Sheet and Rill Erosion (tons per acre per year)				
		Less than 4		4 to 6		Greater than 6
		100 Foot Vegetated Buffer		100 Foot Vegetated Buffer		
Olsen	Bray-1	Yes	No	Yes	No	
0-25	0-35	Nitrogen Need	Nitrogen Need	Nitrogen Need	Nitrogen Need	No application
26-50	36-75	Nitrogen Need	Nitrogen Need	Nitrogen Need	Phosphorus crop removal <sup>1</sup>	No application
51-75	76-110	Nitrogen Need	Phosphorus crop removal	Phosphorus crop removal	Phosphorus crop removal	No application
76-100	111-150	Phosphorus crop removal	Phosphorus crop removal	Phosphorus crop removal	Phosphorus crop removal	No application
Greater than 100	Greater than 150	No application	No application	No application	No application	No application

<sup>1</sup> Phosphorus crop removal is the amount of phosphorus a crop removes in one crop year.

A single application of phosphorus applied as manure may be made at a rate equal to the recommended phosphorus application or estimated phosphorus removal in harvested plant biomass for the crop rotation or multiple years in the crop sequence. When such applications are made, the application rate shall:

- not exceed the recommended nitrogen application rate during the year of application, or
- in the case of legumes, not exceed the estimated nitrogen removal in harvested plant biomass minus soil test  $\text{NO}_3\text{-N}$  during the year of application.

## HEAVY METALS MONITORING

When waste materials or sewage sludge is applied, the accumulation of potential pollutants (including arsenic, cadmium, copper, lead, mercury, selenium, and zinc), in the soil shall be monitored in accordance with the US Code, Reference 40 CFR, Parts 403 and 503, and/or any applicable state and local laws or regulations.

## ADDITIONAL CRITERIA TO MINIMIZE AGRICULTURAL NON-POINT SOURCE POLLUTION OF SURFACE AND GROUND WATER RESOURCES

Plans developed to minimize agricultural non-point source pollution of surface or ground water resources shall include the following practices and/or management activities that can reduce the risk of nitrogen or phosphorus movement from the field.

**IF A FIELD IS DETERMINED HIGHLY VULNERABLE FOR NITRATE LEACHING TO AN AQUIFER, ALL OF THE FOLLOWING MANAGEMENT ACTIVITIES WILL BE IMPLEMENTED.**

Prior to the application of nitrogen above starter application rates, a nitrate nitrogen test (0 to 2-ft. and 2 to 4 ft. sample) will be taken and analyzed. Soil samples (0-6 inches) should also be included and analyzed for P and K. Soil samples will be taken as per land grant university recommendations found on the back of the South Dakota State University (SDSU) Soil Testing Laboratory soil sample information sheet. Provide the requested information on the soil sample information sheet and send along with soil samples to the laboratory. Information sheets and soil sample bags are available at county Extension offices.

An acceptable alternative to the 0-4 ft. sampling method would be to take a 0-2 ft. sample as recommended by SDSU prior to nitrogen applications above starter rates and within 4 weeks after crop harvest.

If animal manure is to be applied, test the manure for total N, inorganic N, total P, and total K. Use sample procedures as described in SD-NRCS-FS-36, "Sampling Manure for Nutrient Management."

Use a soil fertility analysis and manure analysis as the primary tools in deciding what nutrients will be applied and the rate of application. Apply nitrogen at rates recommended by the SDSU EC750 "Fertilizer Recommendations Guide" and based upon a realistic yield goal.

Annually sample and obtain a laboratory analysis to determine the concentration of nitrate nitrogen (NO<sub>3</sub>-N) in irrigation water. The sample shall be taken in the spring prior to irrigation water application. Credit that amount of nitrogen delivered to the crop with the irrigation water.

Apply nutrients as close to the time of plant utilization as is possible. Apply no nitrogen in the fall, with the exception of incidental N in commercial phosphorus applications or organic wastes.

**IF AREAS OF THE FIELD ARE DETERMINED TO BE HIGHLY VULNERABLE FOR PHOSPHORUS LOSS TO SURFACE WATERS, THE FOLLOWING MANAGEMENT ACTIVITIES AND/OR CONSERVATION PRACTICES WILL BE IMPLEMENTED ON THE FIELD.**

Soil samples will be taken and analyzed for phosphorus at least every two years at a depth of 0-6 inches. Take soil samples as per SDSU recommendations found on the back of the SDSU Soil Testing Laboratory Soil Sampling Information Sheet. Provide the requested information on the soil sample information sheet and send along with soil samples to the laboratory. Information sheets and soil sample bags are available at county Extension offices.

If animal manure is to be applied, test the manure for total N, inorganic N, total P, and total K. Use sample procedures described in SD-NRCS-FS-36, "Sampling Manure for Nutrient Management."

Use a soil fertility analysis and manure analysis as the primary tools in deciding what nutrients will be applied and the rate of application.

In situations where building soil test phosphorus levels is desirable for crop production:

- a) Commercial fertilizer applications will be based on the rate recommended in the EC-750. For soil test P levels which are low or very low, broadcast commercial fertilizer applications can be made to build soil test phosphorus levels that will not exceed 20 pounds  $P_2O_5$  for each ppm below a medium soil test.
- b) Manure or organic by-products applications will be planned according to Table 1 shown under "Additional Criteria Applicable to Manure or Organic By-Products Applied as a Plant Nutrient Source."

In no case shall commercial fertilizer and/or manure application rates exceed the rates of nitrogen recommended by EC 750 with the exception of organic wastes applied to legumes which may be applied at rates equal to crop removal minus soil test  $NO_3-N$ .

Commercial fertilizer phosphorus sources should be placed below the soil surface. However, surface application of commercial fertilizer is permitted on no-till cropland, pastureland or hayland within 100 feet of a surface water or conveyance. In all other cropland tillage systems, commercial fertilizer phosphorus sources will be placed below the soil surface within 100 feet of a surface water or conveyance.

In no case shall manure or organic by product applications (broadcast or incorporated) be made within 100 feet of a surface water or conveyance; 35 feet if a perennial grass filter strip is established and maintained.

A minimum of a 35-foot wide perennial grass filter strip is required in all cases on the edges of fields that border a lake, river, or intermittent/perennial stream.

In selected cases, depending on soil test phosphorus and estimated soil loss in a field, a perennial grass filter strip is required within 100 feet of a surface water or conveyance if manure is applied based on nitrogen needs of a crop and not crop removal of phosphorus (see Table 1).

At a minimum, conservation practices will be implemented to control erosion to the soil loss tolerance.

## PLANS AND SPECIFICATIONS

- Plans and specifications will be prepared for specific field sites based on this standard. Plans and specifications include job sheets, narrative statements in conservation plans, and appropriate forms.

## OPERATION AND MAINTENANCE

If spillage, leakage, or release should occur the event is required by state regulations to be reported to the DENR or the South Dakota Department of Agriculture (SDDA);

It is the responsibility of the crop producer, or the agent of the producer, to maintain records that document the implementation of plans for nutrient management including calibration of application equipment to ensure uniform distribution of nutrients at planned rates.

As applicable, records include:

- Soil test reports and recommendations;
- Manure test analysis;
- Crops planned and realistic yield goals;
- Quantities and sources of nutrients applied;
- Dates and method of nutrient application;
- Identity of fields on which nutrients were applied.

Records should be maintained for five years; or for a period longer than five years if required by other federal, state, or local ordinances, or program/contract requirements.

All chemigation is required by South Dakota law to have an effective check valve interlock, low pressure drain, and vacuum relief. See South Dakota Codified Law 34-2A-3, Administrative Rules of South Dakota, Chapter 74:02:09, Chemigation, for specific requirements. For questions concerning

South Dakota law, contact the DENR, Division of Water Management at 605-773-3352, or the SDDA at 605-773-3724.

## **REFERENCES:**

SDSU-EC 750, "Fertilizer Recommendations Guide"  
SDSU-Extra 8009, "Quantities of Nutrients Contained in Crops"  
SDSU Soil Testing Laboratory: Soil Sampling Information Sheet  
SD-NRCS-FS-36 "Sampling Manure for Nutrient Management"  
SD-NRCS-FS-38 "Using Manure Analysis Results"  
SD-NRCS-FS-43 "Calibrating Manure Spreader application Rates"  
USGS/SDGS – Geology, Water Resources or Aquifer Reports,  
<http://www.sdgs.usd.edu/digitalpubmaps/index.html>,  
[http://jurassic2.sdgs.usd.edu/cold\\_fusion/lithdb/search\\_lith.cfm](http://jurassic2.sdgs.usd.edu/cold_fusion/lithdb/search_lith.cfm)  
USDA – NRCS: Agricultural Waste Management Field Manual

South Dakota Codified Law - Shallow aquifers as defined in SDCL 34A-3A-24  
<http://legis.state.sd.us/statutes/index.cfm?FuseAction=DisplayStatute&FindType=Statute&txtStatute=34A-3A-24>

South Dakota Codified Law – Soil Amendments as defined in SDCL 38-19A-1(14)  
<http://legis.state.sd.us/statutes/index.cfm?FuseAction=DisplayStatute&FindType=Statute&txtStatute=38-19A>