

# NATURAL RESOURCES CONSERVATION SERVICE

## CONSTRUCTION SPECIFICATIONS

### NUTRIENT MANAGEMENT

#### 1. Scope

Manage the amount, source, placement, form, and timing of the application of nutrients and soil amendments. To supply nutrients for plant production, properly utilize manure or organic by-products as a plant nutrient source, minimize agricultural non-point source pollution of surface and ground water resources, and maintain or improve the physical, chemical, and biological condition of soil.

#### 2. Minimum Specifications

The following components shall be included in the nutrient management plan. Those items marked with an asterisk (\*) will be recorded as minimum documentation requirements.

- \*Document resource concerns, problems, and practice objective.
- \*An aerial photograph or map, and a soil map of the site.
- \*Extent in acres.
- \*Current and/or planned plant production sequence or crop rotation.

The crop sequence or rotation should describe the sequence of crops for at least five years. Start with last year's crop and project the crop rotation for the next four years. Circle the current crop.

- \*Results of soil sample analyses.

Follow guidance at the end of this specification for soil sample collection. Enter the soil test values for nitrogen, phosphorous, potassium, and other constituents as given on the report from the soil test laboratory. Indicate whether the nutrient values are in parts per million (ppm) or pounds per acre (lbs/ac). See: "Soil Test Interpretations and Nutrient Recommendations" by Kansas State University (KSU), Department of Agronomy. <http://www.ksre.ksu.edu/bookstore/pubs/mf2586.pdf>

- Results of manure or organic by-product sample analyses (Required if land applied.)

Follow guidance in standard for additional criteria applicable to manure or organic by-products applied as a plant nutrient source.

- Results of plant or water analyses

Follow guidance in standard for plant tissue testing. For irrigation nutrient credits, follow the table below:

NITROGEN CONTRIBUTION FROM IRRIGATION WATER

N IN WATER (PPM)	Water Application Rate (ACRE-FEET)			
	0.5	1.0	1.5	2.0
	LBS N/ACRE			
2	3	5	8	11
4	5	11	16	22
6	8	16	24	32
8	11	22	32	43
10	13	27	40	54

- \*Realistic yield goals for the crops in the rotation

Determine a realistic expected yield using historical records using the guidelines in the standard. It is important not to overestimate yields to minimize potential pollution sources and excess fertilizer costs.

When utilizing the Soil Nutrient Assessment Program (SNAP) <https://research.brc.tamus.edu>, be sure to enter all pertinent data in the program such as State, County, Crop, and Yield goal from the producer for documentation. Place a print out in with the soil test results. The outcome will need to be within 50-100%, to use as a realistic yield goal in place of actual data from the producer.

- \*Quantification of all nutrient sources

Record all sources of nutrients and the amounts to be applied to supply the requirements of the crop. This will include total nutrient credits, amounts of commercial fertilizer applied, and manure or organic by-products, if applied. If the [Form KS-ECS-590](#), Nutrient Management, is used, all nutrient sources will be recorded in the Crop Nutrient Requirements and Fertilizer Applications section of the form.

- \*Recommended nutrient rates, timing, form, method of application and incorporation

When using the [Form KS-ECS-590](#), nitrate-nitrogen (NO<sub>3</sub>-N) will be recorded in parts-per-million (ppm). Profile NO<sub>3</sub>-N will be soil samples annually collected from the 0 (zero) to 24-inch soil depth. Consider application methods and timing that reduce the risk of nutrients being transported to ground and surface waters, or into the atmosphere. Suggestions include:

- If soil leaching potential is HIGH, it is recommended to split-apply nitrogen, use a slow release nitrogen source, or apply nitrogen as close as possible to crop nutrient utilization
- Avoiding winter nutrient application for spring seeded crops
- Subsurface band applications of phosphorus near the seed row
- Applying nutrient materials uniformly to application areas or as prescribed by precision agricultural techniques
- Delaying field application of animal manure or other organic by-products if precipitation capable of producing runoff and erosion is forecast within 24 hours of the time of the planned application
- Applying nutrients as close as possible to time of use to reduce potential for surface and ground water contamination
- Consider negative impacts, when soil pH is not in balance for proper nutrient interactions in the availability of nutrients in the soil solution, and other plant growth needs
- In times of drought, a profile nitrate test is suggested to determine the amount of unused nitrate in the soil prior to planting

### **Manure Nitrogen Application Rates**

- When manure or organic by-products are used, the nitrogen availability of the planned application rates shall match plant uptake characteristics as closely as possible, taking into consideration the timing of nutrient application(s), in order to minimize leaching and atmospheric losses

- Management activities and technologies shall be used that effectively utilize mineralized nitrogen, and that minimize nitrogen losses through denitrification, leaching, and ammonia volatilization
- Manure or organic by-products may be applied on legumes at rates equal to 1.5 times the phosphorus removal rate in harvested plant biomass
- When the nutrient management plan component is being implemented on a phosphorus basis, manure or organic by-products shall be applied at rates consistent with a phosphorus limited application rate. In such situations, any additional nitrogen application, from non-organic sources, may be required to supply but not exceed, the recommended amounts of nitrogen in any given year
- **The use of the Haney Soil Test is permissible to detect and determine nitrogen use efficiency in field. Follow the regular soil testing procedures for the Haney Soil Test and use realistic yield goals. Use the recommendations provided with the realistic yield goal to determine the adequate amount of Nitrogen to be applied. When considering the cover crop recommendation, and you are in the semi-arid west, less than 26 inches average annual rainfall, monitor the C:N score you receive on the Haney Soil Test and try to keep it in the higher range of 20:1, to limit wind erosion. Choose higher C:N ratio plants to achieve this goal**

### Phosphorus Application Rates

When manure or organic by-products are used, the planned rates of phosphorus application shall be consistent with the table on page 1 of this specification.

The 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
- Not exceed the estimated nitrogen removal in harvested plant biomass during the year of application when there is no recommended nitrogen application
- Not be made on sites considered vulnerable to off-site phosphorus transport unless appropriate conservation practices, best management practices, or management activities are used to reduce the vulnerability
- \*Field Risk Assessment

Follow guidance in standard for field risk assessment. Nutrients shall not be applied to frozen, snow covered, or saturated soil if the potential risk for runoff exists. Potential runoff risk will be determined using the Revised Universal Soil Loss Equation, Version 2 (RUSLE2) with site specific cropping system data. Procedures for RUSLE2 can be found in Section I of the Field Office Technical Guide (FOTG). If ephemeral and gully erosion are present, they will be included as all forms of water erosion. Soil leaching potential will be documented in the conservation plan. Procedures for determining soil leaching potential can be found in Section II of the FOTG, or in ArcMap, using the soil interpretation layer in your geodata folder. Procedures for determining phosphorus loss to surface waters will be assessed through the use of the Kansas Site Assessment Index – Phosphorus, Section II of the FOTG.

- \*Location of designated sensitive areas or resources and the associated nutrient management restriction

When using the [Form KS-ECS-590](#), designated sensitive areas will be recorded in the Environmental Risk Assessment section of the form. As a minimum, the sketch map section of the [Form KS-ECS-590](#) will be used to locate sensitive areas, but an aerial photograph is preferred.

- \*Guidance for implementation, operation, maintenance, and record keeping

Follow guidance in standard for implementation, operation, maintenance, and record keeping.

### 3. Recording Procedure

The minimum specifications for this practice will be recorded in the conservation plan narrative, appropriate job sheet, or the conservation assistance notes.

### 4. Guidelines for Soil Sampling

The value of a soil sample is to determine the average nutrient status of a field. Sampling procedures should also identify nutrient variability in the field to accommodate nutrient application adjustments that will reduce costs and potential nutrient loss from the field.

The sampling procedure determines the quality and usefulness of the soil test information. The guidelines indicate minimum soil sampling guidelines.

#### Divide Fields:

The sampling zones or grids should represent uniform areas such as soil type, slope, cropping history, known crop differences, or other factors that would indicate or influence nutrient levels in the soil.

- Samples shall represent no more than 40 acres unless field nutrient history has been established with evidence of at least two prior soil tests.\*
- Separate samples by topographic features:
  1. Hilltops represented by one sample.
  2. Side slopes or eroded areas represented by one sample.
  3. Low areas represented by one sample.
- Separate samples by cropping history, manure applications, cultural differences in the field, yield responses (i.e., yield maps or visual observation), soil type, or any other features that might influence crop nutrient response.

#### Sampling Depth:

- Surface Samples 0" to 6" (i.e., P, K, pH and OM)
  1. In long-term reduced or no-till systems, samples of 0" to 3" may reveal a potential soil acidity (pH) change from nutrient application methods.
  2. When sampling for mobile nutrients such as nitrate, sulfur, and chloride (minimum 10 cores per 20 surface cores), collect a separate 0" to 24" sample.

#### Core Collection:

- Maintain consistent core depth by marking collection tool.
- 15 to 20 cores per sample.
- Random core collection to represent the entire area being sampled, avoid loading and feeding areas, dead furrows, old fence rows, etc., that would give unusual results.
- Collect cores in a clean plastic container.
- Collect a continuous core that will represent the entire sample layer.
- Collect sample from compressed or firm soil to assure consistence, e.g. from vehicle track.

- Thoroughly mix sample, keep cool or air dry at room temperature, and immediately submit samples to the laboratory.

#### Timing of Sampling:

Early enough to use for nutrient management plan development. At least 2 to 4 weeks prior to planting or fertilizing of the intended crop.

#### Frequency:

- A sample is considered current if no older than three years for P, K, pH and Zn.
- Sample at least once during each crop rotation cycle until field history is established.
- When sampling for mobile nutrients (i.e., nitrates), annually sample prior to planting crops where N will be applied. \*\*

\*Prior soil samples would have taken field variability into consideration, and should establish that the field uniformly responds to nutrient applications, and there are no differences in management strategies, or cropping sequences since the field history was established.

\*\*For example, in a wheat, sorghum, soybean rotation: sample in the fall prior to planting wheat, and sample in late winter or spring prior to sorghum, and sampling for the soybeans is not required since they “fix” the amount of N needed for growth.

TABLE 1:		BASIS FOR NUTRIENT APPLICATION RATES FOR LIVESTOCK MANURE	
Soil Test P (ppm P)			N and P Nutrient Application Rates
Bray-1 or Mehlich-3	Olsen	P Index Rating Category	
0-50	0-33	All	Legume Crops -- Agronomic P Rate or 1.5 X Crop Removal
0-50	0-33	All	Non-Legume Crops -- Agronomic N Rate
			All Crops
51-150	34-100	Very Low, Low, Medium	1.5 X Crop P Removal
		High, Very High	1.0 X Crop P Removal
151-200	101-133	Very Low, Low, Medium	1.5 X Crop P Removal
		High, Very High	None
201+	134+	Very Low, Low, Medium	1.0 X Crop P Removal
		High, Very High	None

#### Notice:

**\*When applying nutrients based on P205 removal, do not exceed the recommended N application for the crop.**

**\*\*When applying swine waste, do not exceed recommendations established by the Kansas Department of Agriculture's Regulations when pertaining to K.S.A. 65-1, 178 et. Seq.**