CHANGES TO THE NUTRIENT MANAGEMENT STANDARD AND CREATION OF THE SPECIFICATIONS

1) Louisiana is adopting, as-is, the new national Nutrient Management Standard.

2) A new Louisiana Nutrient Management Specifications document has been created. This document is composed of guidance from:
    a. Louisiana-specific instructions from the old Louisiana Nutrient Management Standard. The majority of this guidance is derived from LSU AgCenter publications (topics include sampling methodology, calculating average yield, lab accreditation and recommendations, etc...).
    b. Sections of the Waste Management Standard. All nutrient-related guidance has been removed from this engineering standard and has been moved into the Nutrient Management Standard (at a national level) and into the Louisiana Nutrient Management Specifications (at a local level). The majority of the information addresses proper use of animal manure.
    c. The new National Nutrient Management Standard. Items that needed clarification and emphasis are mentioned in the Louisiana Nutrient Management Specifications.

3) The Phosphorus Index (PI) has been updated to include:
    a. A new variable – Leaching Index. This is required by policy (National Instruction – **NI-190-302.2 (C)**). The minimum number of points has been assigned to each of the different Louisiana Leach ratings – 0, 1, and 2.
    b. The new interpretations of P Loss Ratings as required by the Nutrient Management standard. A significant change has occurred at the MODERATE rating. At a MODERATE rating, nitrogen-based applications have been replaced with P-based crop requirement rates. At a HIGH rating, application of manure is still allowed at crop removal rates, but the text now matches what is in the standard. The VERY HIGH rating still does not allow any more application of manure (above-and-beyond standard) and serves as our point at which no further application should be made. A cut-off level is required by **NI-190-302.2 (C)**.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

(Ac.)

CODE 590

DEFINITION

Managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments.

PURPOSE

- To budget, supply, and conserve nutrients for plant production.
- To minimize agricultural nonpoint source pollution of surface and groundwater resources.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To protect air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen), and the formation of atmospheric particulates.
- To maintain or improve the physical, chemical, and biological condition of soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied. This standard does not apply to one-time nutrient applications to establish perennial crops.

CRITERIA

General Criteria Applicable to All Purposes

A nutrient budget for nitrogen, phosphorus, and potassium must be developed that considers all potential sources of nutrients including, but not limited to, green manures, legumes, crop residues, compost, animal manure, organic by-products, biosolids, waste water, organic matter, soil biological activity, commercial fertilizer, and irrigation water.

Enhanced efficiency fertilizers, used in the State 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.

For nutrient risk assessment policy and procedures see Title 190, General Manual (GM), Part 402, Nutrient Management, and Title 190, National Instruction (NI), Part 302, Nutrient Management Policy Implementation.

To avoid salt damage, the rate and placement of applied nitrogen and potassium in starter fertilizer must be consistent with land-grant university guidelines, or industry practice recognized by the land-grant university.

The NRCS-approved nutrient risk assessment for nitrogen must be completed on all sites unless the State NRCS, with the concurrence of State water quality control authorities, has determined specific conditions where nitrogen leaching is not a risk to water quality, including drinking water.

The NRCS-approved nutrient risk assessment for phosphorus must be completed when:

- phosphorus application rate exceeds land-grant university fertility rate guidelines for the planned crop(s), or
- the planned area is within a phosphorus-impaired watershed (contributes to 303d-listed water bodies), or
- the NRCS and State water quality control authority have not determined specific conditions where the risk of phosphorus loss is low.

A phosphorus risk assessment will not be required when the State NRCS, with concurrence of the State water quality control authority, has determined specific conditions where the risk of phosphorus loss is low. These

fields must have a documented agronomic need for phosphorus; based on soil test phosphorus (STP) and land-grant university nutrient recommendations.

On organic operations, the nutrient sources and management must be consistent with the USDA's National Organic Program.

Areas contained within minimum application setbacks (e.g., sinkholes, wellheads, gullies, ditches, or surface inlets) must receive nutrients consistent with the setback restrictions.

Applications of irrigation water must minimize the risk of nutrient loss to surface and groundwater.

Soil pH must be maintained in a range that enhances an adequate level for crop nutrient availability and utilization. Refer to State land-grant university documentation for guidance.

Soil, Manure, and Tissue Sampling and Laboratory Analyses (Testing).

Nutrient planning must be based on current soil, manure, and (where used as supplemental information) tissue test results developed in accordance with land-grant university guidance, or industry practice, if recognized by the university.

Current soil tests are those that are no older than 3 years, but may be taken on an interval recommended by the land-grant university or as required by State code. The area represented by a soil test must be that acreage recommended by the land-grant university.

Where a conservation management unit (CMU) is used as the basis for a sampling unit, all acreage in the CMU must have similar soil type, cropping history, and management practice treatment.

The soil and tissue tests must include analyses pertinent to monitoring or amending the annual nutrient budget, e.g., pH, electrical conductivity (EC) and sodicity where salts are a concern, soil organic matter, phosphorus, potassium, or other nutrients and test for nitrogen where applicable. Follow land-grant university guidelines regarding required analyses.

Soil test analyses must be performed by laboratories successfully meeting the requirements and performance standards of the North American Proficiency Testing Program-Performance Assessment Program (NAPT-PAP) under the auspices of the Soil Science Society of America (SSSA) and NRCS, or other NRCS-approved program that considers laboratory performance and proficiency to assure accuracy of soil test results. Alternate proficiency testing programs must have solid stakeholder (e.g., water quality control entity, NRCS State staff, growers, and others) support and be regional in scope.

Nutrient values of manure, organic by-products and biosolids must be determined prior to land application.

Manure analyses must include, at minimum, total nitrogen (N), ammonium N, total phosphorus (P) or P_2O_5, total potassium (K) or K_2O, and percent solids, or follow land-grant university guidance regarding required analyses.

Manure, organic by-products, and biosolids samples must be collected and analyzed at least annually, or more frequently if needed to account for operational changes (feed management, animal type, manure handling strategy, etc.) impacting manure nutrient concentrations. If no operational changes occur, less frequent manure testing is allowable where operations can document a stable level of nutrient concentrations for the preceding three consecutive years, unless federal, State, or local regulations require more frequent testing.

Samples must be collected, prepared, stored, and shipped, following land-grant university guidance or industry practice.

When planning for new or modified livestock operations, acceptable "book values" recognized by the NRCS (e.g., NRCS Agricultural Waste Management Field Handbook) and the land-grant university, or analyses from similar operations in the geographical area, may be used if they accurately estimate nutrient output from the proposed operation.

Manure testing analyses must be performed by laboratories successfully meeting the requirements and performance standards of the Manure Testing Laboratory Certification program (MTLCP) under the auspices of the Minnesota Department of Agriculture, or other NRCS-approved program that considers laboratory performance and proficiency to assure accurate manure test results.

Nutrient Application Rates.

Planned nutrient application rates for nitrogen, phosphorus, and potassium must not exceed land-grant university guidelines or industry practice when recognized by the university.

At a minimum, determination of rate must be based on crop/cropping sequence, current soil test results, realistic yield goals, and NRCS-approved nutrient risk assessments.

If the land-grant university does not provide specific guidance that meets these criteria, application rates must be based on plans that consider realistic yield goals and associated plant nutrient uptake rates.

Realistic yield goals must be established based on historical yield data, soil productivity information, climatic conditions, nutrient test results, level of management, and local research results considering comparable production conditions.

Estimates of yield response must consider factors such as poor soil quality, drainage, pH, salinity, etc., prior to assuming that nitrogen and/or phosphorus are deficient.

For new crops or varieties, industry-demonstrated yield, and nutrient utilization information may be used until land-grant university information is available.

Lower-than-recommended nutrient application rates are permissible if the grower's objectives are met.

Applications of biosolids, starter fertilizers, or pop-up fertilizers must be accounted for in the nutrient budget.

Nutrient Sources.

Nutrient sources utilized must be compatible with the application timing, tillage and planting system, soil properties, crop, crop rotation, soil organic content, and local climate to minimize risk to the environment.

Nutrient Application Timing and Placement.

Timing and placement of all nutrients must correspond as closely as practical with plant nutrient uptake (utilization by crops), and consider nutrient source, cropping system limitations, soil properties, weather conditions, drainage system, soil biology, and nutrient risk assessment results.

Nutrients must not be surface-applied if nutrient losses offsite are likely. This precludes spreading on:

- frozen and/or snow-covered soils, and
- when the top 2 inches of soil are saturated from rainfall or snow melt.

Exceptions for the above criteria can be made for surface-applied manure when specified conditions are met and adequate conservation measures are installed to prevent the offsite delivery of nutrients. The adequate treatment level and specified conditions for winter applications of manure must be defined by NRCS in concurrence with the water quality control authority in the State. At a minimum, the following site and management factors must be considered:

- slope,
- organic residue and living covers,
- amount and form of nutrients to be applied, and
- adequate setback distances to protect local water quality.

Additional Criteria to Minimize Agricultural Nonpoint Source Pollution of Surface and Groundwater

Planners must use the current NRCS-approved nitrogen, phosphorus, and soil erosion risk assessment tools to assess the risk of nutrient and soil loss. Identified resource concerns must be addressed to meet current planning criteria (quality criteria). Technical criteria for risk assessments can be found in NI-190-302.

When there is a high risk of transport of nutrients, conservation practices must be coordinated to avoid, control, or trap manure and nutrients before they can leave the field by surface or subsurface drainage (e.g., tile). The number of applications and the application rates must also be considered to limit the transport of nutrients to tile.

Nutrients must be applied with the right placement, in the right amount, at the right time, and from the right source to minimize nutrient losses to surface and groundwater. The following nutrient use efficiency strategies or technologies must be considered:

- slow and controlled release fertilizers
- nitrification and urease inhibitors

- enhanced efficiency fertilizers
- incorporation or injection
- timing and number of applications
- soil nitrate and organic N testing
- coordinate nutrient applications with optimum crop nutrient uptake
- Corn Stalk Nitrate Test (CSNT), Pre-Sidedress Nitrate Test (PSNT), and Pre-Plant Soil Nitrate Test (PPSN)
- tissue testing, chlorophyll meters, and spectral analysis technologies
- other land-grant university recommended technologies that improve nutrient use efficiency and minimize surface or groundwater resource concerns.

Additional Criteria Applicable to Properly Utilize Manure or Organic By-Products as a Plant Nutrient Source

When manures are applied, and soil salinity is a concern, salt concentrations must be monitored to prevent potential crop damage and/or reduced soil quality.

The total single application of liquid manure:

- must not exceed the soil's infiltration or water holding capacity
- be based on crop rooting depth
- must be adjusted to avoid runoff or loss to subsurface tile drains.

Crop production activities and nutrient use efficiency technologies must be coordinated to take advantage of mineralized plant-available nitrogen to minimize the potential for nitrogen losses due to denitrification or ammonia volatilization.

Nitrogen and phosphorus application rates must be planned based on risk assessment results as determined by NRCS-approved nitrogen and phosphorus risk assessment tools.

For fields receiving manure, where phosphorus risk assessment results equate to LOW risk, additional phosphorus and potassium can be applied at rates greater than crop requirement not to exceed the nitrogen requirement for the succeeding crop. For fields receiving manure, where phosphorus risk assessment results equate to MODERATE risk, additional phosphorus and potassium may be applied at a phosphorus crop requirement rate for the planned crops in the rotation. When phosphorus risk assessment results equate to HIGH risk, additional phosphorus and potassium may be applied at phosphorus crop removal rates if the following requirements are met:

- a soil phosphorus drawdown strategy has been implemented, and
- a site assessment for nutrients and soil loss has been conducted to determine if mitigation practices are required to protect water quality.
- any deviation from these high risk requirements must have the approval of the Chief of the NRCS.

Manure or organic by-products may be applied on legumes at rates equal to the estimated removal of nitrogen in harvested plant biomass, not to exceed land grant university recommendations.

Manure may be applied 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 at one time. When such applications are made, the application rate must not exceed the acceptable phosphorus risk assessment criteria, must not exceed the recommended nitrogen application rate during the year of application or harvest cycle, and no additional phosphorus must be applied in the current year and any additional years for which the single application of phosphorus is supplying nutrients.

Additional Criteria to Protect Air Quality by Reducing Odors, Nitrogen Emissions and the Formation of Atmospheric Particulates

To address air quality concerns caused by odor, nitrogen, sulfur, and/or particulate emissions; the source, timing, amount, and placement of nutrients must be adjusted to minimize the negative impact of these emissions on the environment and human health. One or more of the following may be used:

- slow or controlled release fertilizers
- nitrification inhibitors
- urease inhibitors
- nutrient enhancement technologies
- incorporation

- injection
- stabilized nitrogen fertilizers
- residue and tillage management
- no-till or strip-till
- other technologies that minimize the impact of these emissions

Do not apply poultry litter, manure, or organic by-products of similar dryness/density when there is a high probability that wind will blow the material offsite.

Additional Criteria to Improve or Maintain the Physical, Chemical, and Biological Condition of the Soil to Enhance Soil Quality for Crop Production and Environmental Protection

Time the application of nutrients to avoid periods when field activities will result in soil compaction.

In areas where salinity is a concern, select nutrient sources that minimize the buildup of soil salts.

CONSIDERATIONS

Elevated soil test phosphorus levels are detrimental to soil biota. Soil test phosphorus levels should not exceed State-approved soil test thresholds established to protect the environment.

Use no-till/strip-till in combination with cover crops to sequester nutrients, increase soil organic matter, increase aggregate stability, reduce compaction, improve infiltration, and enhance soil biological activity to improve nutrient use efficiency.

Use nutrient management strategies such as cover crops, crop rotations, and crop rotations with perennials to improve nutrient cycling and reduce energy inputs.

Use variable-rate nitrogen application based on expected crop yields, soil variability, soil nitrate or organic N supply levels, or chlorophyll concentration.

Use variable-rate nitrogen, phosphorus, and potassium application rates based on site-specific variability in crop yield, soil characteristics, soil test values, and other soil productivity factors.

Develop site-specific yield maps using a yield monitoring system. Use the data to further diagnose low- and high- yield areas, or zones, and make the necessary management changes. See Title 190, Agronomy Technical Note (TN) 190.AGR.3, Precision Nutrient Management Planning.

Use manure management conservation practices to manage manure nutrients to limit losses prior to nutrient utilization.

Apply manure at a rate that will result in an "improving" Soil Conditioning Index (SCI) without exceeding acceptable risk of nitrogen or phosphorus loss.

Use legume crops and cover crops to provide nitrogen through biological fixation and nutrient recycling.

Modify animal feed diets to reduce the nutrient content of manure following guidance contained in Conservation Practice Standard (CPS) Code 592, Feed Management.

Soil test information should be no older than 1 year when developing new plans.

Excessive levels of some nutrients can cause induced deficiencies of other nutrients, e.g., high soil test phosphorus levels can result in zinc deficiency in corn.

Use soil tests, plant tissue analyses, and field observations to check for secondary plant nutrient deficiencies or toxicity that may impact plant growth or availability of the primary nutrients.

Use the adaptive nutrient management learning process to improve nutrient use efficiency on farms as outlined in the NRCS' National Nutrient Policy in GM 190, Part 402, Nutrient Management.

Potassium should not be applied in situations where an excess (greater than soil test potassium recommendation) causes nutrient imbalances in crops or forages.

Workers should be protected from and avoid unnecessary contact with plant nutrient sources. Extra caution must be taken when handling anhydrous ammonia or when dealing with organic wastes stored in unventilated enclosures.

Material generated from cleaning nutrient application equipment should be utilized in an environmentally safe manner. Excess material should be collected and stored or field applied in an appropriate manner.

Nutrient containers should be recycled in compliance with State and local guidelines or regulations.

Considerations to Minimize Agricultural Nonpoint Source Pollution of Surface and Groundwater.

Use conservation practices that slow runoff, reduce erosion, and increase infiltration, e.g., filter strip, contour farming, or contour buffer strips. These practices can also reduce the loss of nitrates or soluble phosphorus.

Use application methods and timing strategies that reduce the risk of nutrient transport by ground and surface waters, such as:

- split applications of nitrogen to deliver nutrients during periods of maximum crop utilization,
- banded applications of nitrogen and/or phosphorus to improve nutrient availability,
- drainage water management to reduce nutrient discharge through drainage systems, and
- incorporation of surface-applied manures or organic by-products if precipitation capable of producing runoff or erosion is forecast within the time of planned application.

Use the agricultural chemical storage facility conservation practice to protect air, soil, and water quality.

Use bioreactors and multistage drainage strategies when approved by the land-grant university.

Considerations to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere.

Avoid applying manure and other by-products upwind of inhabited areas.

Use high-efficiency irrigation technologies (e.g., reduced-pressure drop nozzles for center pivots) to reduce the potential for nutrient losses.

PLANS AND SPECIFICATIONS

The following components must be included in the nutrient management plan:

- aerial site photograph(s)/imagery or site map(s), and a soil survey map of the site,
- soil information including: soil type surface texture, pH, drainage class, permeability, available water capacity, depth to water table, restrictive features, and flooding and/or ponding frequency,
- location of designated sensitive areas and the associated nutrient application restrictions and setbacks,
- for manure applications, location of nearby residences, or other locations where humans may be present on a regular basis, and any identified meteorological (e.g., prevailing winds at different times of the year), or topographical influences that may affect the transport of odors to those locations,
- results of approved risk assessment tools for nitrogen, phosphorus, and erosion losses,
- documentation establishing that the application site presents low risk for phosphorus transport to local water when phosphorus is applied in excess of crop requirement.
- current and/or planned plant production sequence or crop rotation,
- soil, water, compost, manure, organic by-product, and plant tissue sample analyses applicable to the plan,
- when soil phosphorus levels are increasing, include a discussion of the risk associated with phosphorus accumulation and a proposed phosphorus draw-down strategy,
- realistic yield goals for the crops,
- complete nutrient budget for nitrogen, phosphorus, and potassium for the plant production sequence or crop rotation,
- listing and quantification of all nutrient sources and form,
- all enhanced efficiency fertilizer products that are planned for use,
- in accordance with the nitrogen and phosphorus risk assessment tool(s), specify the recommended nutrient application source, timing, amount (except for precision/variable rate applications specify method used to determine rate), and placement of plant nutrients for each field or management unit, and

- guidance for implementation, operation and maintenance, and recordkeeping.

In addition, the following components must be included in a precision/variable rate nutrient management plan:

- Document the geo-referenced field boundary and data collected that was processed and analyzed as a GIS layer or layers to generate nutrient or soil amendment recommendations.
- Document the nutrient recommendation guidance and recommendation equations used to convert the GIS base data layer or layers to a nutrient source material recommendation GIS layer or layers.
- Document if a variable rate nutrient or soil amendment application was made.
- Provide application records per management zone or as applied map within individual field boundaries (or electronic records) documenting source, timing, method, and rate of all applications that resulted from use of the precision agriculture process for nutrient or soil amendment applications.
- Maintain the electronic records of the GIS data layers and nutrient applications for at least 5 years.

If increases in soil phosphorus levels are expected (i.e., when N-based rates are used), the nutrient management plan must document:

- the soil phosphorus levels at which it is desirable to convert to phosphorus based planning,
- the potential plan for soil test phosphorus drawdown from the production and harvesting of crops, and
- management activities or techniques used to reduce the potential for phosphorus transport and loss,
- for AFOs, a quantification of manure produced in excess of crop nutrient requirements, and
- a long-term strategy and proposed implementation timeline for reducing soil P to levels that protect water quality,

OPERATION AND MAINTENANCE

Conduct periodic plan reviews to determine if adjustments or modifications to the plan are needed. At a minimum, plans must be reviewed and revised, as needed with each soil test cycle, changes in manure volume or analysis, crops, or crop management.

Fields receiving animal manures and/or biosolids must be monitored for the accumulation of heavy metals and phosphorus in accordance with land- grant university guidance and State law.

Significant changes in animal numbers, management, and feed management will necessitate additional manure analyses to establish a revised average nutrient content.

Calibrate application equipment to ensure accurate distribution of material at planned rates.

Document the nutrient application rate. When the applied rate differs from the planned rate, provide appropriate documentation for the change.

Records must be maintained for at least 5 years to document plan implementation and maintenance. As applicable, records include:

- soil, plant tissue, water, manure, and organic by-product analyses resulting in recommendations for nutrient application,
- quantities, analyses and sources of nutrients applied,
- dates, and method(s) of nutrient applications, source of nutrients, and rates of application,
- weather conditions and soil moisture at the time of application; lapsed time to manure incorporation; rainfall or irrigation event,
- crops planted, planting and harvest dates, yields, nutrient analyses of harvested biomass, and crop residues removed,
- dates of plan review, name of reviewer, and recommended changes resulting from the review, and

- all enhanced efficiency fertilizer products used.

Additional records for precision/variable rate sites must include:

- maps identifying the variable application source, timing, amount, and placement of all plant nutrients applied, and
- GPS-based yield maps for crops where yields can be digitally collected.

REFERENCES

Association of American Plant Food Control Officials (AAPFCO). 2011. AAPFCO Official Publication no. 64. AAPFCO Inc., Little Rock, AR.

Follett, R.F. 2001. Nitrogen transformation and transport processes. *In* Nitrogen in the environment; sources, problems, and solutions, (eds.) R.F. Follett and J. Hatfield, pp. 17-44. Elsevier Science Publishers. The Netherlands. 520 pp.

Schepers, J.S., and W.R. Ruan, (eds.) 2008. Nitrogen in agricultural systems. Agron. Monogr. no. 49, American Society of Agronomy (ASA), Crop Science Society of America (CSSA), Soil Science Society of America (SSSA). Madison, WI.

Sims, J.T. (ed.) 2005. Phosphorus: Agriculture and the environment. Agron. Monogr. no. 46. ASA, CSSA, and SSSA, Madison, WI.

Stevenson, F.J. (ed.) 1982. Nitrogen in agricultural soils. Agron. Series 22. ASA, CSSA, and SSSA, Madison, WI.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2010. Agronomy Technical Note, (TN) 190-AGR-3, Precision Nutrient Management Planning. Washington, DC.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2011. Title 190, General Manual, (GM), Part 402, Nutrient Management. Washington, DC.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2011, Title 190, National Instruction (NI), Part 302, Nutrient Management Policy Implementation. Washington, DC.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

CODE 590

SPECIFICATIONS

Planning Nutrient Management

Producers that apply nutrients must follow a Nutrient Management Plan. This includes a nutrient budget for nitrogen, phosphorus and potassium that considers all significant sources including, but not limited to, animal manure and organic and nonorganic by-products, waste water, commercial fertilizers, crop residues, legume credits and irrigation water. Nutrient budgets shall be developed using the **Nutrient Management Job Sheet tool** spreadsheet found in eFOTG, Section IV.

One-time applications of nutrients, for the establishment of perennial vegetation, do not require Nutrient Management Plans. Producers must be given clear guidance, however, as to how to interpret soil recommendation reports and follow them to both reduce the possibility of mistakes and minimize the chance of off-site movement of nutrients.

Realistic yield goals shall be established based on soil productivity information, historical yield data, climatic conditions and level of management. Rates of nutrient application established by the LSU AgCenter will be adjusted according to yield goals. In Louisiana, expected yields will be based on the past five crop years. To estimate expected yields, eliminate the extreme low and high yields and take the average of the three remaining yields. Add five percent to the average for prospective favorable weather conditions. For new crops or varieties, industry recommendations may be used until research recommendations are available.

Soil Testing

Nutrient planning shall be based on current soil and tissue (where used as a supplement) test results developed in accordance with LSU AgCenter Soil Testing and Plant Analysis Laboratory (STPAL) guidance. It is acceptable if other accredited laboratories are utilized as specified by the Nutrient Management Standard. Also, recommendations made by crop consultants and other laboratories are acceptable if they are based on International Plant Nutrient Institute (IPNI)-published crop uptake rates. Current soil test results are those that are no older than three (3) years old, or in the case of sugarcane, no older than the length of the rotation. Soil samples shall be taken every three (3) years or at the beginning of a different cropping rotation, whichever is longer (i.e., sugarcane fallow year).

A minimum of one composite soil sample should be submitted for each combination of soils, crops-forages, and management systems on the farm or ranch. Each composite sample should be composed of 20-30 (no less than 10) cores taken at random from the area the sample represents. Soil should be collected from a 0-6 inch level. The subsamples should be mixed thoroughly. Approximately one (1) pint of the mixed subsamples labeled with the field number and accompanied by a completed information sheet should be submitted for laboratory analysis.

Soil testing shall include analysis for nutrients for which specific information is

needed to develop the nutrient plan. **Basic analysis plus organic matter are the minimum soil test requirements for Louisiana**. Soil analysis for nitrogen in humid environments is thought by most scientists to be unreliable and is not required.

Precision Agriculture

If precision applications of nitrogen, phosphorus, potassium, and lime are to be made, and the information specified in the Nutrient Management Statement of Work has been provided, no other information is needed to satisfy the requirement for a nutrient budget. Nitrogen is not typically precision applied, however, requiring the nitrogen section of the Nutrient Balance sheets to be completed. As always, the method, form, and timing of nutrient applications must be specified. Precision fertilizer recommendations must also reference soil samples collected, at a minimum, on a 4-acre grid or using electrical conductivity zones.

Nutrient Application Rates

Soil amendments shall be applied, as needed, to adjust soil reaction (pH) to the specific range of the crop for optimum availability and utilization of nutrients.

Nutrient application rates shall be based on LSU Agricultural Center recommendations that consider current soil test results, soil texture, realistic yield goals and management capabilities. In cases where the STPAL does not provide specific recommendations, applications shall be based on realistic yield goals and associated plant nutrient uptake rates.

Application of Animal Waste

Any application of animal waste, regardless of whether it is by the generator or not, must have a Comprehensive Nutrient Management Plan (CNMP) and must be instructed as to how to implement and maintain it. The Nutrient Management Plan is part of a CNMP. The **Nutrient Management Jobs Sheet tool** spreadsheet must be used to prepare the Nutrient Management Plan. **The official NRCS CNMP format, found in Section III of eFOTG must be used.** Also, a Producer Activity Document (PAD), which is a summary of the CNMP and provides specific instructions to carry out the land application of manure, must be offered to the producer. If requested, the PAD must be prepared and will accompany the finished CNMP.

Use of agricultural wastes shall be based on an annual analysis of the material during the time it is to be used. In the case of daily spreading, the waste shall be sampled at least once each year. As a minimum, the waste analysis should identify moisture content and N, P and K concentrations. Where the metal content of municipal waste water, sewage sludge, septage and other agricultural waste is a concern, the analysis shall also include determining the concentration of metals in the material.

Preliminary design and planning decisions may be based on "book values" acceptable to NRCS and/or the LSU AgCenter if they accurately estimate the amount and content of the waste material produced. Book values recognized by NRCS may be found in the Agricultural Waste Management Field Handbook, Chapter 4.

The planned rate of nitrogen and phosphorus in the final plan shall be determined based on annual laboratory analysis of the material being applied minus adjustments for volatilization, leaching, and denitrification. Agronomy Technical Note 93 and Waste Management Technical Note 2 can be helpful in planning for the utilization of broiler litter.

The LSU Callegari Lab can provide analyses of the most common animal wastes generated in Louisiana. If a producer does choose to use this laboratory, suggested analyses include:

Liquids and flowable sludges:

Anions – EPA 300.0 (~$15) -This is primarily to pick up Nitrate and Nitrite

Total Kjeldahl N – EPA 351.4 (~$15) -This is necessary to pick up Organic, Ammonium, and Ammonia-N

Total Solids – EPA 160.3 (~$10) -This could be helpful if the material ever lost moisture – we could easily check moisture again and know the nutrient concentration

Metals and trace metals by ICP (w/digestion) – EPA 200.7 (~$15) -We would use this to primarily pick up P and K (and other secondary nutrients)

Solids (like bedding):

Total Nitrogen – TMECC 04.02-D (~$10)

Total Solids and Moisture – TMECC 03.09-A (~$10)

ICP-AES/ICP-MS analysis for Metals – TMECC 04.14-B (w/digestion) (~$20)

Analytical results must be converted to units in order to accurately calculate how much P and K is required based on crop recommendations. Total P and K must be multiplied by 2.29 and 1.2, respectively, in order to convert them to units (or fertilizer form) of P_2O_5 and K_2O (**see Exhibit 2, Line 9**).

Where agriculture wastes are to be spread on land not owned or controlled by the producer the CNMP and PAD, as a minimum, shall document the amount of waste to be transferred and who will be responsible for the environmentally acceptable use of the waste. In Louisiana, transfer of agriculture waste shall be documented using the Agriculture Waste Transfer Certification Letter (see Exhibit 2). Each Agriculture Waste Transfer Certification Letter shall be accompanied by a copy of the Agriculture Waste Land Application Guidelines (Exhibit 1 of this standard).

Conservation planners and producers should always attempt to apply nutrients at recommended levels. If necessary, however, animal waste may be applied in excess of recommended values if the risk of off-site phosphorus movement is acceptable. The evaluation of Phosphorus loss will be conducted using the Louisiana Phosphorus Index (PI). This index can be found on eFOTG under Section IV, Conservation Practices, Nutrient Management. The ratings are as follows:

TABLE 1. PHOSPHORUS INDEX

Rating	Phosphorus Application
Low Risk	N Based
Medium Risk	P Based (crop uptake)
High Risk	P Based (crop removal)
V High Risk	No Application

Crop uptake rates and removal rates can be found at the end of Nutrient Management Specifications (**Exhibit 4**) or in the Animal Waste Management Field Handbook (AWMFH) Chapter 6.

The nitrogen application rate may never exceed the recommended rate for a single crop year. If no recommendation is available, the nitrogen application rate will not exceed the removal rate in harvested plant biomass.

In areas with identified or designated nutrient related water quality impairment, an assessment shall be completed of the potential for nitrogen and/or phosphorus transport from the field. The Leaching Index (LI) and PI are the recognized assessment tools used to make the assessments. The LI is contained in Section II-C of the NRCS Field Office Technical Guide (FOTG). Assessment results and recommendations, presented in Table 2, shall be discussed with the producer and documented in the plan.

Plans developed to minimize agricultural nonpoint source pollution of surface and ground water resources shall include practices and/or management activities that

can reduce the risk of nitrogen or phosphorus movement from the field.

TABLE 2. LEACHING INDEX

Low (1) -will probably not contribute to soluble nutrient leaching below the rootzone

Medium (2) -may contribute to soluble nutrient leaching below the rootzone and nutrient management should be considered

High (3) -will contribute to soluble nutrient leaching below the rootzone. Nutrient management practices should be intense, soluble nutrients should not be applied, or conservation practices that minimize infiltration should be installed.

Producers applying municipal biosolids should be especially careful with heavy metal loading in the soil. Element such as arsenic, cadmium, copper, lead, mercury, selenium, and zinc all have loading limits. More information can be found in US Code Reference 40 CFR, Parts 403 and 503, and/or applicable state and local laws or regulations.

Producers using poultry litter as a source of nutrients should be especially careful about copper and zinc buildups in their soils. They are included in poultry feed as medication. They can accumulate in the soil and should be monitored closely.

EXHIBIT 1

Land Application Guidelines

1. Land application of animal manure and other organic by-products should be based on soil test results and recommendations for the crop(s) to be grown.

2. A risk assessment reviewing the potential for transport of phosphorus from the fields to nearby water bodies will be conducted. The current LA Phosphorus Index (PI) will be utilized. This is important when phosphorus, above what is recommended for a crop, must be land applied.

3. Animal manure or other organic by-products shall not be applied within 100 feet of a stream or waterbody or within 35 feet of a stream or waterbody where a well established vegetative buffer (natural or constructed) exists between the application site and stream or waterbody.

4. Animal manure or other organic by-products shall not be applied to actively eroding land areas except as specified in the conservation practice standard Critical Area Planting (342).

5. Animal manure and other organic by-products shall not be applied to soils with the following characteristics:

   - On soils with a water table within 2 feet of the surface
   - On soils which are frozen, snow covered or saturated
   - On soils with less than 10 inches to unconsolidated soil material
   - On soils subject to frequent flooding or overflow during times when flooding is expected. Frequently flooded sites may be used for land application between May 1 and November 15.

6. Application of animal manure and other organic by-products shall be delayed if precipitation capable of producing runoff and/or erosion is forecast within 24 hours of the time of the planned application.

7. Animal manure and other organic by-products shall not be applied in winter for spring seeded crops. Apply only to actively growing crops or forages.

8. Animal manure and other organic by-products shall not be applied within 100 feet of waterwells.

9. Animal manure and other organic by-products shall not be applied when wind direction and velocity would cause odors and/or particulate matter to drift toward residences, public areas or roads. The impact of odors can be minimized by applying wastes when temperatures are cool and when wind direction is away from neighbors.

10. Animal manure and other organic by-products associated with irrigation shall not be applied at rates in excess of the soil's infiltration rate.

11. Animal manure and other organic by-products shall be protected from the weather, accidental leakage or spillage. The material may be stored in temporary waste storage facilities (dry stack), pole barns or on the ground covered by 6 mil. polyurethane secured with weights (old tires, etc.) or in silage bags. If stored outside on the ground more than 30 days, the ground should first be covered with an impervious liner to prevent nitrogen leaching into ground water.

12. Manure spreaders or similar equipment shall be calibrated to ensure uniform application of material at planned rates.
13. Animal manure and other organic by-products shall be sampled at least once annually. Wastes shall be analyzed for moisture content, N, P and K as a minimum.

14. Soil samples shall not be more than three (3) years old. Annual soil testing, where animal manure and other organic by-products are land applied, is highly recommended.

15. Records shall be kept for a minimum of five (5) years which document implementation of plans for nutrient management and waste utilization. As applicable, records shall include:
    - Quantity of manure and other agricultural waste produced and their nutrient content
    - Soil test results (no more than 3 years old)
    - Dates and amounts of waste application where land applied and the dates and amounts of waste removed for energy production or export from the operation (**see Exhibit 1**)
    - Waste application method
    - Crops grown and yield (both yield goals and measured goals)
    - Other tests such as determining the nutrient content of the harvested product
    - Calibration of application equipment

EXHIBIT 2

AGRICULTURAL WASTE TRANSFER CERTIFICATION LETTER

Name & Address of Producer:

_____

_____

_____

Name & Address of Transferee:

_____

_____

_____

I, _____, Transferee, agree that the _____ (amount, lbs., tons, gallons, yards) of _____ (type of waste) I remove from this site will be handled and applied in accordance with accepted and approved best management practices, and that all applicable federal, state and local regulations will be followed in the transportation, storage and land application of these materials.

I agree to follow the attached Agricultural Waste Land Application Guidelines when applying waste to the land as a soil amendment.

_____ _____

Signature of Transferee Date

EXHIBIT 3

ESTIMATE OF LAND AREA NEEDED FOR ANIMAL WASTE APPLICATION

Name of Producer _____

Animal Type and Number Planned _____

Animal Units _____

Percent Confinement _____

Percent Separation _____

Type of Waste _____

Method of Application _____

Phosphorus Index Rating _____

Cropping System _____

1. Daily nutrient production per A.U. (1000 lbs) (Chapter 4, AWMFH) N P K _____
2. Annual nutrient production per A.U. (1000 lbs) (Value from 1 X 365 days) _____
3. Total nutrient production (Value from 2 X No. A.U.s X % confinement) _____
4. Nutrients available following Separation (As per NRCS Internal FAX) _____
5. Nutrients available following treatment/storage (Table 11-5, AWMFH) _____
6. Nitrogen available following application losses (Table 11-6, AWMFH) _____
7. Nitrogen available following leaching losses (Table 11-7, AWMFH) _____

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EXHIBIT 3

	N	P_2O_5	K_2O
8. Nitrogen available following denitrification losses (Table 11-8 AWMFH)			
9. Nutrients available for crop use (Convert P & K to fertilizer form)			
10. Nutrients recommended by soil test analysis (Use if PI is low or medium)			
11. Nutrients removed in harvested portion of crop (See Standard 633, Exhibit 3. Use if PI is High)			
12. Acres needed to utilize nutrients (Line 9 ÷ Line 10 or 11)			
13. Leaching Potential Evaluation (acres) (High = Line 12 X 1.25)			

Comments

EXHIBIT 4

PLANT NUTRIENT UPTAKE BY SPECIFIED CROP AND REMOVAL IN THE HARVESTED PART OF THE CROP FOR MACRO AND SECONDARY PLANT NUTRIENTS[1]								
CROP	DRY WT.	*TYPICAL*	AVERAGE AMOUNT OF NUTRIENTS					
	LB./BU.	*YIELD/ACRE*	N	P[2]	K[3]	Ca	Mg	S
		PLANT PART						
GRAIN CROPS								
CORN	56	120 bu.	108	19	27	1	7	8
		4.5 T. stover	100	18	120	26	20	14
OATS	32	80 bu.	50	9	13	2	3	5
		2 T. straw	25	6	66	8	8	9
RICE	45	5500 Lbs.	76	13	13	4	6	4
		2.5 T straw	30	5	58	9	5	NA
RYE	56	30 bu.	35	4	8	2	3	7
		1.5 T.straw	15	4	21	8	2	3
SORGHUM	56	60 bu.	56	12	14	4	6	6
		3 T. stover	65	9	79	29	18	8
WHEAT	60	40 bu.	50	15	12	1	6	3
		1.5 T. straw	20	2	29	6	3	5
OIL CROPS								
PEANUTS	22-30	2800 lbs.	101	5	14	1	3	7
		2.2 T. vines	103	11	77	44	17	16
RAPESEED	50	35 bu.	63	14	13	A	12	NA
(CANOLA)		3T. Straw	269	26	202	88	4	41
SOYBEANS	60	35 bu.	131	13	40	6	6	4
		2 T. stover	90	9	42	40	18	10
SOYBEANS	60	25 bu.	94	10	29	4	4	3
		1.1 T. stover	50	5	23	22	10	6
SUNFLOWERS	25	1100 lbs.	39	18	12	2	4	2
		4 T. stover	120	14	234	138	7	3
FIBER CROPS								
COTTON	1 bale	1333 SC	36	8	11	2	4	3
		1.1 T. stalks	39	5	32	31	9	17

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EXHIBIT 4

CROP	*DRY WT*	*TYPICAL*	AVERAGE AMOUNT OF NUTRIENTS					
	LB./BU	YIELD/ACRE	N	P^2	K^3	Ca	Mg	S
		PLANT PART						
COTTON	1.5	2000 SC	53	12	17	3	5	4
	bales	1.7 T. stalks	60	7	49	48	14	25
COTTON	2 bales	2667 SC	71	15	22	3	7	5
		2.25 T. stalks	79	10	65	63	18	34
FOREST[4]								
PINE	5,200 lbs.	per cord	6	1	3			
	16,000 lbs.	per 1,000 mbf	19	3	10			
HARDWOOD	5,700 lbs	per cord	11	1	6			
	19,000 lbs	per 1000 mbf	38	4	19			
FORAGE CROPS								
BAHIAGRASS		3T	76	8	104	26	15	12
BERMUDAGRASS		4T	150	15	112	30	12	18
CLOVER/GRASS		6T	182	32	83	110	34	18
DALLISGRASS		3T	115	12	103	34	24	NA
BERMUDAGRASS (hybd)		8T	301	30	224	59	24	35
RED CLOVER		2.5T	100	11	83	69	17	7
RYEGRASS		5T	167	27	142	65	35	NA
TALL FESCUE		3.5T	138	14	140	21	13	NA
SWITCHGRASS		3T	6	6	114	17	15	NA
INDIANGRASS		3T	60	51	72	9	NA	NA
BIG BLUESTEM		3T	59	51	105	NA	12	NA
LITTLE BLUESTEM		3T	66	51	87	NA	12	NA
LESPEDEZA		3T	140	13	64	67	16	20
SILAGE CROPS								
CORN SILAGE		20T (wet)	154	35	153	50	25	21
(35% dm)								
SORGHUM SILAGE		20T (wet)	173	23	122	44	37	13
(30% DM)								
SORGHUM SUDAN SILAGE		10T (wet)	136	16	145	43	34	4
(50% DM)								

EXHIBIT 4

SUGAR CROPS								
SUGAR CANE		30T	96	24	222	30	24	24
CROP	*DRY WT*	*TYPICAL*	AVERAGE AMOUNT OF NUTRIENTS					
	LB./BU	YIELD/ACRE	N	P^2	K^3	Ca	Mg	S
		PLANT PART						
FRUIT CROPS								
PEACHES		15T	36	9	57	3	9	3
TOMATOES		22T	132	18	145	9	13	18
VEGETABLE CROPS								
BELL PEPPER		9T	72	22	88	NA	7	NA
CABBAGE		20T	132	16	108	20	8	44
CUCUMBERS		10T	40	14	66	NA	4	NA
ONIONS		18T	108	22	79	25	4	43
PEAS		1.5T	110	12	27	2	7	7
POTATOES		14.5T	96	23	151	3	9	9
SNAP BEANS		3T	53	16	58	3	6	7
SWEET CORN		5.5T	98	26	64	NA	8	7
SWEET POTATOES		7T	42	6	59	4	8	6

[1] For crops and/or yields not listed above, see the nutrient uptake calculations and Table 6-6, Chapter 6, AWMFHB.

[2] To convert to P_2O_5 multiply by 2.29

[3] To convert to K_2O multiply by 1.2

[4] Weights provided for pine and hardwood timber are Doyle Scale, legal log rule for Louisiana