NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

(Ac.)

CODE 590

DEFINITION

Managing the amount, source, placement, form and timing of the application of plant nutrients and soil amendments.

PURPOSE

- To budget and supply nutrients for plant production.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To minimize agricultural nonpoint source pollution of surface and ground water resources.
- To protect air quality by reducing nitrogen emissions (ammonia and NO_x compounds) 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.

CRITERIA

General Criteria Applicable to All Purposes

A nutrient budget for nitrogen, phosphorus, and potassium shall be developed that considers all potential sources of nutrients including, but not limited to animal manure and organic by-products, waste water, commercial fertilizer, crop residues, legume credits, and irrigation water.

Realistic yield goals shall be established based on soil productivity information, historical yield data, climatic conditions, level of management and/or local research on similar soil, cropping systems, and soil and manure/organic by-products tests.

For new crops or varieties, Texas Cooperative Extension (TCE) or industry yield projections may be used until documented yield information is available.

Plans for nutrient management shall specify the source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing movement of nutrients and other potential contaminants to surface and/or ground waters.

Areas contained within established minimum application setbacks (e.g., sinkholes, unprotected wells, gullies, ditches, surface inlets or rapidly permeable soil areas) shall not receive direct application of nutrients.

The amount of nutrients lost to erosion, runoff, irrigation and drainage, shall be addressed, as needed.

Soil and Tissue Sampling and Laboratory Analyses (Testing). Nutrient planning shall be based on current soil and tissue (where used as a supplement) test results developed in accordance with Texas A&M University guidance, or industry practice if recognized by the Texas A&M University. Current soil tests are those that do not exceed the appropriate frequency discussed in **Appendix 1**. Budgeting procedures to be used during years when soil tests are not taken are also included in Appendix 1. Soil sampling depths will vary according to cropping system and previous management. **Appendix 2** will be used to determine sampling depth.

- Soil and tissue samples shall be collected and prepared according to the Soil, Water, and Forage Testing Laboratory, Soil and Crop Sciences, Texas A&M University, TCE guidance or standard industry practice. Soil test analyses shall be performed by laboratories that use the acceptable soil test methods stated in **Appendix 3**.
- Additional Texas A&M University information can be found the links shown in **Appendix 4** or other Texas A&M University published material.

Soil and tissue testing shall include analyses for any nutrients for which specific information is needed to develop the nutrient plan. Analyses must include pH, electrical conductivity, NO_3-N, P, K, Ca, Mg, S and Na. Other analyses, such as soil organic matter content, may be pertinent to monitoring or amending the annual nutrient budget.

Nutrient Application Rates. Soil amendments shall be applied, as needed, to adjust soil pH to an adequate level for crop nutrient availability and utilization. See Agronomy Tech Note TX-13, "Liming Information and Recommendations" for guidance.

Recommended nutrient application rates shall be based on Texas A&M University recommendations (and/or industry practice when recognized by the university) that consider current soil test results, realistic yield goals and management capabilities. If Texas A&M University does not provide specific recommendations, application shall be based on realistic yield goals and associated plant nutrient requirements.

The planned rates of nutrient application, as documented in the nutrient budget, shall be determined based on the following guidance:

- Nitrogen and Phosphorus application rates shall match the recommended rates as closely as possible. When custom blended commercial fertilizers are not available, actual rates of application must match recommended rates as closely as possible. If actual application rates differ from the recommended fertilizer rates, records for the nutrient management plan shall document the reason.
- When manure or organic by-products are a source of nutrients, nitrogen and phosphorus application rates may not exactly match the recommended rates. When these are used as a source of nutrients, see "Additional Criteria" below.
- Potassium Application - Potassium shall not be applied in situations in which excess (greater than soil test potassium recommendation) causes unacceptable nutrient imbalances in crops or forages. When forage quality is an issue associated with excess potassium application, soil test magnesium levels should be maintained at high levels. Potassium to magnesium ratio should be less than 5 to 1, and the calcium to magnesium ratio should not exceed 15:1.
- Other Plant Nutrients - The planned rates of application of other nutrients shall be consistent with Texas A&M University guidance or industry practice if recognized by Texas A&M.
- Starter Fertilizers - Pre-plant starter fertilizer may be knifed in or injected when no nutrients have been recommended based on a soil test recommendation.

Nutrient Application Timing. Timing and method of nutrient application shall correspond as closely as possible with plant nutrient uptake characteristics, while considering cropping system limitations, weather and climatic conditions, risk assessment tools (e.g., leaching index, P index) and field accessibility. Pre-plant nitrogen applications must not precede the normal planting date of the target crop by more than 120 days if incorporated within 48 hours and 30 days if surface applied.

Nutrient Application Methods. Application methods to reduce the risk of nutrient transport to surface and ground water, or into the atmosphere shall be employed.

To minimize nutrient losses:

- Apply nutrient materials uniformly to application area(s).
- Nutrients shall not be applied to frozen, snow-covered or saturated soil if the potential risk for runoff exists.
- Nutrients shall be applied considering the plant growth habits, irrigation practices, and other conditions so as to maximize availability to the plant and minimize the risk of runoff, leaching, and volatilization losses.
- Nutrient applications associated with irrigation systems shall be applied in a manner that prevents or minimizes resource impairment.

Conservation Management Unit (CMU) Risk Assessment. In areas with identified or designated nutrient related water quality impairment, a CMU specific risk assessment of the potential for nutrient transport from the area shall be completed.

Use an appropriate nutrient risk assessment tool for the nutrient in question (e.g., nitrogen leaching index, phosphorus index) or other state recognized assessment tool.

Additional Criteria Applicable to Manure and Organic By-Products or Biosolids Applied as a Plant Nutrient Source

When animal manures or organic by-products are applied, a risk assessment of the potential for nutrient transport from the CMU shall be completed to adjust the amount, placement, form and timing of application of nutrient sources.

- A Phosphorus-Index will be completed on all fields that receive manures or organic by-products. See Agronomy Tech Note TX-15, “Phosphorus Assessment Tool for Texas” for guidance.
- A Nitrogen Leaching Index will be completed on CMU/fields receiving manures or organic by-products that have gravelly, sandy or loamy sand surface textures. See Agronomy Tech Note TX-11, “Nitrogen Leaching Tool for Texas” for guidance.

Nutrient values of manure and organic by-products shall be determined prior to land application, or as directed by Texas Commission on Environmental Quality (TCEQ) permit requirements. Manure sampling frequency may vary based on the operation’s manure handling strategy and spreading schedule. If there is no prior sampling history, the manure shall be analyzed at least annually for a minimum of three consecutive years. A cumulative record shall be developed and maintained until a consistent (maintaining a certain nutrient concentration with minimal variation) level of nutrient values is realized. The average of results contained in the operation’s cumulative manure analyses history shall be used as a basis for nutrient allocation to fields. Samples shall be collected and prepared according to Texas A&M University guidance or industry practice.

In planning for new operations, acceptable “book values” recognized by the NRCS and/or the Texas A&M University may be used if they accurately estimate nutrient output from the proposed operation (e.g., NRCS Agricultural Waste Management Field Handbook).

Biosolids (sewage sludge) shall be applied in accordance with TCEQ Regulations, TAC, Title 30, Chapter 312 – Sludge Use, Disposal and Transportation and any local regulations regarding the use of biosolids as a nutrient source.

Manure and Organic By-Product Nutrient Application Rates. Manure and organic by-product nutrient application rates shall be based on **Appendix 5**. As indicated above, "book values" may be used in planning for new operations. At a minimum, manure analyses shall identify total nitrogen, total phosphorus, and total potassium, and percent moisture. Salt concentration shall be monitored so that manure applications do not cause plant damage or negatively impact soil quality.

The application rate (in/hr) of liquid materials applied shall not exceed the soil intake/infiltration rate and shall be adjusted to minimize ponding and to avoid runoff. The total one time application shall not exceed the field capacity of the soil and shall be adjusted, as needed, to minimize loss to subsurface tile drains. The total annual application will not exceed the appropriate rate shown in **Appendix 5**.

Heavy Metal Monitoring. When sewage sludge (biosolids) 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 TCEQ Regulations, TAC, Title 30, Chapter 312 – Sludge Use, Disposal and Transportation and any local laws or regulations.

Additional Criteria to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

In areas with an identified or designated nutrient management related air quality concern, any component(s) of nutrient management (i.e., amount, source, placement, form, timing of application) identified by risk assessment tools as a potential source of atmospheric pollutants shall be adjusted, as necessary, to minimize the loss(es).

When tillage can be performed, surface applications of manure and fertilizer nitrogen formulations that are subject to volatilization on the soil surface (e.g., urea) shall be incorporated into the soil within 24 hours after application.

When manure or organic by-products are applied to grassland, hayland, pasture or minimum-till areas the rate, form and timing of application(s) shall be managed to minimize volatilization losses.

When liquid forms of manure are applied with irrigation equipment, operators will select weather conditions during application that will minimize volatilization losses.

Operators will handle and apply poultry litter or other dry types of animal manures when the potential for wind-driven loss is low and there is less potential for transport of particulates into the atmosphere.

Weather and climatic conditions during manure or organic by-product application(s) shall be recorded and maintained in accordance with the operation and maintenance section of this standard.

Additional Criteria to Improve the Physical, Chemical and Biological Condition of the Soil

Nutrients shall be applied and managed in a manner that maintains or improves the physical, chemical and biological condition of the soil.

Minimize the use of nutrient sources with high salt content unless provisions are made to leach salts below the crop root zone.

To the extent practical, nutrients shall not be applied when the potential for soil compaction and rutting is high.

Additional Criteria Applicable to Precision Agriculture

Use appropriate soil survey maps, topography maps, aerial images, yield monitors, and electrical conductivity shape files to identify management zones in fields for nutrient soil sampling and nutrient

prescriptions. Nutrients will be applied to management zones using variable rate technologies. Prescriptions for variable rates should be made by a Registered Professional Agronomist, Certified Crop Adviser, or Nutrient Management Specialists.

CONSIDERATIONS

The use of management activities and technologies listed in this section may improve both the production and environmental performance of nutrient management systems.

The addition of these management activities, when applicable, increases the management intensity of the system and is recommended in a nutrient management system.

Action should be taken to protect National Register listed and other eligible cultural resources.

The nutrient budget should be reviewed annually to determine if any changes are needed for the next planned crop.

Yield goal may be determined by collecting the actual yield for the past six years, dropping the highest and lowest yields in this time frame, then averaging the yields of the remaining four years.

It may be difficult to locate phosphorus fertilizer formulations that do not include nitrogen. When recommended nutrient rates cannot be matched with available formulations, it may be best to meet 100% of the phosphorus recommendation and follow-up with the remaining required nitrogen. When establishing perennial vegetation, the phosphorus application may need to be split if applying all the required phosphorus would result in an over application of nitrogen.

For sites on which there are special environmental concerns, other sampling techniques may be appropriate. These include soil profile sampling for nitrogen, Pre-Sidedress Nitrogen Test (PSNT), Pre-Plant Soil Nitrate Test (PPSN) or soil surface sampling for phosphorus accumulation or pH changes.

Additional practices to enhance the producer's ability to manage manure effectively include modification of the animal's diet to reduce the manure nutrient content, or utilizing manure amendments that stabilize or tie-up nutrients.

Forage testing or livestock supplementation may reduce the potential problems of grass tetany and milk fever which can occur due to waste application, in which potassium is often over applied. Grass tetany should not be a problem if magnesium concentrations in forage are 0.2% or more.

Excessive levels of some nutrients can cause induced deficiencies of other nutrients.

If increases in soil phosphorus levels are expected, consider a more frequent (annual) soil testing interval.

To manage the conversion of nitrogen in manure or fertilizer, use products or materials (e.g. nitrification inhibitors, urease inhibitors and slow or controlled release fertilizers) that more closely match nutrient release and availability for plant uptake. These materials may improve the nitrogen use efficiency (NUE) of the nutrient management system by reducing losses of nitrogen into water and/or air.

Considerations to Minimize Agricultural Nonpoint Source Pollution of Surface and Ground Water.

Erosion control and runoff reduction practices can improve soil nutrient and water storage, infiltration, aeration, tilth, diversity of soil organisms and protect or improve water and air quality (Consider installation of one or more NRCS FOTG, Section IV – Conservation Practice Standards).

Cover crops can effectively utilize and/or recycle residual nitrogen.

Apply nutrient materials uniformly to the application area. Application methods and timing that reduce the risk of nutrients being transported to ground and surface waters, or into the atmosphere include:

- Split applications of nitrogen to provide nutrients at the times of maximum crop utilization,
- Use stalk-test to minimize risk of over applying nitrogen in excess of crop needs.
- Avoid winter nutrient application for spring seeded crops,
- Band applications of phosphorus near the seed row,
- Avoid application when macropores are connected to the soil surface. If application must be made at that time, use tillage to close the connection between macropores and the deeper soil profile.
- Incorporate surface applied manures or organic by-products as soon as possible after application to minimize nutrient losses,
- Delay field application of animal manures or organic by-products if precipitation capable of producing runoff and erosion is forecast within 24 hours of the time of the planned application.

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

Odors associated with the land application of manures and organic by-products can be offensive to the occupants of nearby homes. Avoid applying these materials upwind of occupied structures when residents are likely to be home (evenings, weekends and holidays).

When applying manure with irrigation equipment, modifying the equipment can reduce the potential for volatilization of nitrogen from the time the manure leaves the application equipment until it reaches the surface of the soil (e.g., reduced pressure, drop down tubes for center pivots). N volatilization from manure in a surface irrigation system will be reduced when applied under a crop canopy.

When planning nutrient applications and tillage operations, encourage soil carbon buildup while discouraging greenhouse gas emissions (e.g., nitrous oxide N_2O, carbon dioxide CO_2).

Nutrient applications associated with irrigation systems should be applied in accordance with the requirements of Irrigation Water Management (Code 449).

CAFO operations seeking permits under USEPA regulations (40 CFR Parts 122 and 412) should consult with their respective state permitting authority for additional criteria.

PLANS AND SPECIFICATIONS

Plans and specifications for nutrient management shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s), using nutrients to achieve production goals and to prevent or minimize resource impairment.

Nutrient management plans shall include a statement that the plan was developed based on requirements of the current standard and any applicable Federal, state, or local regulations, policies, or programs, which may include the implementation of other practices and/or management activities. Changes in any of these requirements may necessitate a revision of the plan.

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

- aerial site photograph(s) or site map(s), and a soil survey map of the site,
- location of designated sensitive areas or resources and the associated, nutrient management restriction,
- current and/or planned plant production sequence or crop rotation,

- documentation indicating the approximate locations where soil tests will be taken, soil sampling depths, and other procedures including the time of year sampling will be conducted and the soil testing frequency,
- results of soil, irrigation water, manure and/or organic by-product sample analyses, as applicable,
- results of plant tissue analyses, when used for nutrient management,
- realistic yield goals for the crops,
- complete nutrient budget for nitrogen, phosphorus, and potassium for the crop rotation or sequence,
- listing and quantification of all nutrient sources,
- CMU specific recommended nutrient application rates, timing, form, and method of application and incorporation, and
- guidance for implementation, operation, maintenance, and recordkeeping.

If increases in soil phosphorus levels are expected, the nutrient management plan shall document:

- the soil phosphorus levels at which it may be desirable to convert to phosphorus based planning,
- results of appropriate risk assessment tools to document the relationship between soil phosphorus levels and potential for phosphorus transport from the field,
- the potential for soil phosphorus drawdown from the production and harvesting of crops, and
- management activities or techniques used to reduce the potential for phosphorus loss.

OPERATION AND MAINTENANCE

The owner/client is responsible for safe operation and maintenance of this practice including all equipment. Operation and maintenance addresses the following:

- periodic plan review to determine if adjustments or modifications to the plan are needed. As a minimum, plans will be reviewed and revised with each soil test cycle.
- significant changes in animal numbers and/or feed management will necessitate additional manure sampling and analyses to establish a revised average nutrient content.
- protection of fertilizer and organic by-product storage facilities from weather and accidental leakage or spillage.
- calibration of application equipment to ensure uniform distribution of material at planned rates.
- documentation of the actual rate at which nutrients were applied. When the actual rates used differ from the recommended and planned rates, records will indicate the reasons for the differences.
- Maintaining records to document plan implementation. 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,
    - 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, and crop residues removed,

- dates of plan review, name of reviewer, and recommended changes resulting from the review.

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 or contract requirements.

Workers should be protected from and avoid unnecessary contact with plant nutrient sources. Extra caution must be taken when handling ammoniacal nutrient sources, 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.

REFERENCES

Follett, R.F. 2001. Nitrogen Transformation and Transport Processes. pp. 17-44, In R.F. Follett and J. Hatfield. (eds.). 2001. Nitrogen in the Environment; Sources, Problems, and Solutions. Elsevier Science Publishers. The Netherlands. 520 pp.

Sims, J.T. (ed.) 2005. Phosphorus: Agriculture and the Environment. Agron. Monogr. 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.

Mallarino, A. P., D. Wittry and J. Klatt, 2001 Using the Iowa Phosphorous index and variable rate technology for effective agronomic and environmental phosphorous management. The Integrated Crop Management Conf. Proceedings. Dec 5-6 Iowa State University. Extension Ames, Iowa.

APPENDIX 1

SOIL TEST FREQUENCIES (in years) [1, 2, 3]

	Rainfall < 25”	**Irrigation + Rainfall > 25”**
Manure or Organic By-Products	Annually	Annually
Vegetative Establishment [4]	Prior to planting	Prior to planting
All Other Inorganic Fertilizer Applications	1 of 5	1 of 3

[1] **NOTE:** State regulations for application of animal wastes take precedence over these guidelines. Possible differences include nutrient extraction methods, soil sampling depths and frequency, and recommended nutrient application rates and volumes specified in this standard.

[2] For nutrient budgets between soil tests, use the following guidance:

Nitrogen – up to the crop requirement

Phosphorus and Potassium – up to the crop requirement unless the soil test level in year one is very high (VH). For Very High or Higher P or K levels, additional nutrients are not recommended in the second or third year unless banded in small amounts or used as pop-up fertility. Amounts up to the crop requirement may be used in the fourth and fifth year after the baseline soil test, if applicable. Recommended application rates will be comparable to Texas A&M soil lab recommendations for the planned yield goal.

[3] Annual soil testing is strongly encouraged especially in situations with high yield potential.

[4] After establishment year, hay and pastures will follow the appropriate purpose regarding frequency. Additional (after establishment year) soil testing for other vegetative practices will only be done if nutrient deficiency symptoms are evident.

APPENDIX 2

SOIL SAMPLING DEPTHS [1, 2]

Cropping System	Tillage System	Fertilizer Application Method	Recommended Sampling Depth (inches)
Row crops where stratification issues are anticipated	All	Injection (> 6 inches)	3 – 9
No-till systems where stratification issues are anticipated	Continuous No-Till	All	3 - 9
All other systems including pastures, range, and trees	All	All	0 – 6

[1] **NOTE:** State regulations for application of animal wastes take precedence over these guidelines. Possible differences include nutrient extraction methods, soil sampling depths and frequency, and recommended nutrient application rates and volumes specified in this standard.

[2] Sampling at additional depths may be needed if stratification or deep accumulation of nutrients are anticipated.

SOIL SAMPLING PROTOCOLS

Texas Cooperative Extension. Soil Sample Information Form. 2000. D-494, p.2.

Provin, T. L., and J. L. Pitt. 2002. Testing Your Soil: How to Collect and Send Samples. TX Cooperative Extension, L-1793. (available at http://texaserc.tamu.edu)

Texas Commission on Environomental Quality. 2003. Soil Sampling for Nutrient Utilization Plans. TX Comm. Env. Qual. Reg. Guid., Water Quality Div., RG-408. (available at http://www.tceq.state.tx.us (in "Site Search" type "RG-408" and press Go)).

APPENDIX 3

ACCEPTABLE SOIL TEST METHODS

N:	NO_3-N by Cd reduction. Methods for chemical analysis of water and wastes. 1979. EPA 200.7, Nat. Environ. Res. Cen., Cincinnati, Ohio.
P:	Mehlich III by inductively coupled plasma (ICP)
K, Ca, Mg, Na and S:	Mehlich III by inductively coupled plasma (ICP) or ammonium acetate extraction.
Fe, Mn, Zn and C:	Lindsey, W. L., and W. A. Norvell. 1978. Development of a DTPA soil test for zinc, iron, manganese, and copper. Soil Sci. Soc. Amer. J. 42:421-428.
B:	Mahler, R.L., D.V. Naylor, and M.K. Fredickson. 1983. Hot water extraction of boron from soils using sealed pouches. Unpublished. Univ. Idaho. 12.

APPENDIX 4

TAMU NUTRIENT MANAGEMENT WEB SITES

Soil Testing: http://soiltesting.tamu.edu

Nutrient Management: http://wastenotwantnot.tamu.edu

Check this site frequently for updates on Nutrient Management which include TAMU Crop Recommendations, Planning Tools, Certification Courses and Continuing Education Units, Links, and other reference materials.

APPENDIX 5

Commercial fertilizers will be applied in accordance with Texas A&M recommendations. Application of all organic soil amendments will not exceed the values in Table 1 or 2.

TABLE 1. A Nutrient Management Plan (NMP) [1/] is required where Soil Test P Level is less than 200 ppm statewide or, less than 350 ppm in arid areas [2/] with a named stream greater than one mile.

P – Index Rating	Maximum TMDL Annual P Application Rate [5/]	Maximum Annual P Application Rate	Maximum Biennial Application Rate
Very Low, Low	Annual Crop Nitrogen (N) Requirement	1.0 Times Annual Crop N Requirement	2.0 Times Annual Crop N Requirement
Medium	2.0 Times Annual Crop Phosphorus (P) Requirement [3/]	2.0 Times Annual Crop P Requirement [3/]	2.0 Times Annual Crop N Requirement
High	1.5 Times Annual Crop P Requirement [3/]	1.5 Times Annual Crop P Requirement [3/]	Double the Maximum Annual P Application Not to Exceed 2 times the Annual Crop N Requirement
Very High	1.0 Times Annual Crop P Requirement [3/]	1.0 Times Annual Crop P Requirement [3/]	Double the Maximum Annual P Application Not to Exceed 2 times the Annual Crop N Requirement

TABLE 2. A Nutrient Utilization Plan (NUP) [1/] is required where Soil Test P Level is: equal to or greater than 200 ppm in non-arid areas[2/], or equal to or greater than 350 ppm in arid areas[2/] with a named stream greater than one mile, or equal to or greater than 200 ppm in arid areas[2/] with a named stream less than one mile.

P – Index Rating	Maximum TMDL Annual P Application Rate [5/]	Maximum Annual P Application Rate	Maximum Biennial Application Rate
Very Low, Low	1.0 Times Annual Crop P Removal [4/]	Annual Crop N Removal	2.0 Times Crop N Removal
Medium	1.0 Times Annual Crop P Removal [4/]	1.5 Times Annual Crop P Removal [4/]	Double the Maximum Annual P Application Not to Exceed 2 Times the Annual Crop N Removal
High	1.0 Times Annual Crop P Removal [4/]	1.0 Times Annual Crop P Removal [4/]	Double the Maximum Annual P Application Not to Exceed 2 Times the Annual Crop N Removal
Very High or soil test P ≥ 500 ppm or above in nutrient impaired TMD: areas.[5/]	0.5 Times Annual Crop P Removal [4/]	0.5 Times Annual Crop P Removal [4/]	Double the Maximum Annual P Application Not to Exceed 2 Times the Annual Crop N Removal

Footnotes Applicable to both Tables

[1/] NMP and NUP designations are consistent with TCEQ Regulations, TAC, Title 30, §321.40.
[2/] All counties will use the 200 ppm P level limit to determine if Table 1 or Table 2 is to be used, however, in counties receiving less than 25 inches of annual rainfall the 350 ppm P level limit will apply if the field application area is greater than 1 mile from a named stream. See map in current Texas Agronomy Technical Note 15, Phosphorus Assessment Tool for Texas for county rainfall designations.
[3/] Not to exceed the annual nitrogen requirement rate.
[4/] Not to exceed the annual nitrogen removal rate.
[5/] TMDL watersheds are designated by TCEQ.

APPROVAL AND CERTIFICATION

NUTRIENT MANAGEMENT

(Ac.)

CODE 590

PRACTICE SPECIFICATIONS APPROVED:

/s/ Lori Ziehr	**07/09/2007**
State Agronomist	**Date**
/s/ Susan Baggett	**07/09/2007**
State Resource Conservationist	**Date**

CERTIFICATION:

Reviewed and determined adequate without need of revision.

Zone Agronomist	**Date**
Zone Agronomist	**Date**
Zone Agronomist	**Date**
Zone Agronomist	**Date**
Zone Agronomist	**Date**