

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

NUTRIENT MANAGEMENT

(acre)
CODE 590

DEFINITION

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

these guidelines. Possible differences include nutrient extraction methods, soil sampling depths and frequency, and recommended nutrient application rates and volumes specified in this standard.

PURPOSES

This practice is to be applied as part of a conservation management system to support one or more of the following:

Nutrients will be applied to meet crop requirements based on the intended purpose. When nutrient management plans are designed to meet a specific nutrient application (e.g. P), other nutrients (e.g. N) will be applied as required to meet crop needs.

- To supply plant nutrients for the optimum forage and crop yields.
- Provide nutrients to quickly obtain and maintain adequate vegetation for conservation cover, critical areas, grassed waterways, vegetative buffers, or wildlife habitat.
- Minimize entry of nutrients to surface and ground water.
- To maintain or improve chemical and biological conditions of the soil.

Erosion control, runoff control, and water quality practices shall be installed to reduce soil loss and runoff that may carry dissolved or attached nutrients into ground or surface water. Erosion control will be determined by the use of the appropriate current erosion prediction technology.

Nutrient management plans initially will be developed using a current soil test (not over 1-year-old) which will serve as the baseline soil nutrient availability. Subsequently, the frequency of soil tests will be based on the primary purpose given in Appendix 1.

CONDITIONS WHERE PRACTICE APPLIES

On land where plant nutrients are applied.

Follow current soil sample collection guidance provided by the Soil, Water, and Forage Testing Laboratory, Soil and Crop Sciences, Texas A&M University, Texas Agricultural Extension Service (TAEX) and provide complete information pertaining to yield goals, previous application of lime, manures and/or fertilizers, crop history, soil series and texture. Sampling depths will depend on cropping system, tillage system, and fertilizer application method. Appendix 2 contains the soil sampling depths based on tillage practices. Soil testing shall include analyses for any nutrients for which specific information is needed to develop the nutrient plan. Request analyses pertinent to monitoring or amending the annual nutrient budget,

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

A nutrient management plan will be developed to specify the kind, source, amount, timing, and application method of nutrients to meet crop needs. Nutrient applications will be made in accordance with this standard and other applicable state or local regulations. **NOTE:** State regulations for application of animal wastes take precedence over

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

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e.g. pH, electrical conductivity (EC) or salinity, nitrate-nitrogen, and extractable phosphorus and potassium. For additional guidance, refer to TAEX Bulletin, L-5175, Managing Crop Nutrients through Soil, Manure, and Effluent Testing, dated 11/98.

Total nitrogen applied in any given year shall not exceed the crop requirement for the realistic yield goal based on a soil test recommendation or a nutrient budget. The realistic yield goal is defined as the estimated yield within 125% of highest yield of the last 10 years or in lieu of yield history, consult a Nutrient Management Specialist.

Nitrogen shall be applied as close to planting as possible. Pre-plant nitrogen application should not precede the normal planting date of the target crop in the FOTG by more than 120 days if incorporated within 48 hours and 30 days if surface applied.

Inorganic nitrogen and phosphorus applications shall not exceed soil test recommendations by more than 10% (allowance for fertilizer application variations and calculation errors). Pre-plant starter fertilizer may be knifed in or injected when no nutrient(s) has (have) been recommended based on the soil test recommendations. Nutrient planning shall be based on current soil test results developed in accordance with TAEX soil fertility guidance or industry practice if recognized by TAEX. Soil analyses shall be performed by laboratories that are accepted in one or more of the following: North American Proficiency Testing Program under the Soil Science Society of America umbrella or laboratories whose tests are accepted by TAEX as listed in Appendix 3. A list of TAEX and accepted surrounding State Land Grant University (Arkansas and Oklahoma, Mehlich III; Louisiana, Bray II; Kansas, Bray I; New Mexico, Olsen) soil test methods, numerical breaking points, and ratings is found in Appendix 3. The soil test results and recommendation are to be reviewed with the producer by TAEX, NRCS, or other Nutrient Management Specialist certified by Texas NRCS.

For all purposes, except maintaining vegetative cover, a nutrient budget (using data from Appendix 4) may be used to set application rates during years between soil tests. When the nutrient budget worksheet is used, a recent soil test with cropping and fertility history is required to provide the baseline condition. Refer to the Nutrient Management Conservation Practice Job Sheet referenced in Appendix 5.

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Annual phosphorus application rates will follow guidance in Appendix 6. The Phosphorus Index (PI), Agronomy Technical Note Number TX - 15, will be used when animal wastes are applied.

Phosphorus from animal wastes may be applied up to twice the rate listed in Appendix 6 every other year. This double rate shall not exceed the annual nitrogen rate. When this double rate has been used, no additional phosphorus fertilizer or animal wastes may be applied in the alternate year.

EXCEPTION: In nutrient non-impaired water segments where the phosphorus runoff potential estimated from the PI is very low to medium, manure or other organic sources of nutrients may be applied up to two times the nitrogen rate. No additional phosphorus or nitrogen may be applied during the year of application and the next year.

The multiple year rates of animal waste may be applied only if erosion and runoff control practices are installed to minimize risk of nutrient movement.

Animal wastes applied to land will be analyzed for total N, P, and K content. Applications will be made based on a current (within the last 12 months) manure sample or an analysis history for at least two years. For further information and guidance, refer to the NRCS Agricultural Waste Management Field Handbook and/or Waste Utilization Standard, 633, in the FOTG. **EXCEPTION:** In lieu of current manure analysis or history, published NRCS values for N, P, and K from the Waste Utilization Standard (633), may be used for the initial plan.

If the application of manure, wastewater, or other organic material does not supply the proper balance or amount of nutrients to achieve the desired yield goal in the application area additional inorganic nutrients shall be applied.

ADDITIONAL CRITERIA TO SUPPLY PLANT NUTRIENTS FOR OPTIMUM FORAGE AND CROP YIELDS.

Nutrients will be recommended for all crops, pasture, and hayland based on realistic yield goals, normal soil moisture and climatic conditions, individual management capabilities, planned cropping system, and soil productivity of the site.

Appendix 4 of this standard and/or current specific crop production guidelines will be used for nutrient

planning and balance purposes after the soil test baseline has been established. Application rates, timing, and methods may be adjusted during the growing season in response to changing environmental conditions or production factors. Refer to TAEX Nutrient Management Fact Sheets, specific crop production guidelines, such as Rice Production Guidelines, for current guidance.

ADDITIONAL CRITERIA TO MINIMIZE ENTRY OF NUTRIENTS INTO SURFACE AND GROUND WATER.

The effects of nutrient application on water quality will be assessed. Water quality criteria will be used when the acreage is in a water body segment identified on the Clean Water Act § 303 (d) list as impaired by agricultural non-point source nutrients. In areas where surface water quality concerns need to be addressed, phosphorus application rates will follow the guidance in Appendix 7. Nutrient screening tools, such as PI, NLEAP, Leaching Index, etc. will be used, when appropriate, to assess movement potential of applied nutrients.

When the PI is used, nutrient management plans shall include:

- A record of the site vulnerability ratings for each field impaired by nutrients.
- Information about conservation practices and management actions that can reduce the potential for phosphorus movement from the field.
- Adjustment for P application will be based on the above information.

Limit nutrient application to the amount needed to produce a realistic yield. Use split applications of inorganic N and other techniques to minimize any potential nutrient loss. Use nutrient timing, form, and method of application which are least susceptible to nutrient movement.

When ground water quality concerns for nitrate-nitrogen are present, nitrogen will be applied in split applications at a rate not to exceed 100 pounds of actual nitrogen or 50% of the annual soil test recommendation or nutrient budget per application, **WHICHEVER IS GREATER.**

On coarse textured soils in recharge areas defined by TNRCC as sensitive aquifers, areas defined by NRCS as subject to frequent flooding, and areas with high water tables, not perched, apply the **LESSER** of: 100 pounds of actual nitrogen or 50% of the annual soil test recommendation or nutrient budget recommendation per application.

Additional management practices, e.g. Residue Management-Mulch Till (329b), Residue Management-Ridge Till (329c), Filter Strip (393), Contour Buffer Strips (332), Grassed Waterway (412), Field Border (386), Vegetative Barriers (601), Cross Wind Trap Strips (589B), Herbaceous Wind Barriers (422A), Windbreaks / Shelterbelts (380), Sediment Basin (350) or other appropriate conservation practices in the FOTG will be installed to address the appropriate surface water quality concerns.

Use chemigation and foliar application techniques to provide nutrients where appropriate. Maintain properly calibrated equipment in good working order. For more information on chemigation, refer to TAEX bulletins Chemigation Equipment and Safety, L-2422; and Chemigation Workbook, B-1652.

ADDITIONAL CRITERIA TO QUICKLY OBTAIN AND MAINTAIN ADEQUATE VEGETATIVE COVER FOR CONSERVATION COVER, CRITICAL AREAS, GRASSED WATERWAYS, VEGETATIVE BUFFERS, OR WILDLIFE HABITAT.

FOR ESTABLISHMENT:

- Follow current soil test recommendations.
EXCEPTION: These rates may be modified by a Nutrient Management Specialist certified by Texas NRCS when native species are being established alone or in combination with aggressive, introduced species.

For soils with a historically low pH, take a soil test and follow its recommendations or use a field pH test and apply lime in accordance with a soil test lime requirement method.

At or near planting, incorporate all nutrient applications to a depth of 3-6 inches, except in areas where a dead litter crop is present, then do not incorporate. Nitrogen applications will not exceed

40 lbs./ac at the time of seedbed preparation and seeding. Additional nitrogen will be applied according to the current soil test or stand maintenance (Appendix 8) recommendations after the plant root and top growth have been established.

FOR MAINTENANCE:

Apply additional nutrients as needed in subsequent seasons until the vegetative cover is adequate to accomplish its intended purpose.

Use a current soil test or nutrient balance worksheet to determine the fertility needs to reach the desired production goal. Use a soil test when vegetative criteria of the practice (stand density, plant height, growing condition, or species diversity) has not been achieved.

APPENDIX 8 of this Standard **WILL ONLY BE USED** for conservation cover, critical areas, grassed waterways, vegetative buffers, or wildlife habitat **WHEN** the **VEGETATIVE STAND DOES NOT** provide adequate cover to meet the resource concern. **NOTE:** For other Land Resource Areas not identified in Appendix 8, fertilizer is not normally needed for stand maintenance

ADDITIONAL CRITERIA TO MAINTAIN OR IMPROVE CHEMICAL AND BIOLOGICAL CONDITIONS OF THE SOIL.

When yields exceed goals by more than 10% or termination of a non-legume crop, cover crop, or green manure crop, additional nitrogen will be applied to supplement for the nitrogen used by soil microbes for the breakdown of the non-legume crop residue, cover, or green manure crop.

Estimated nitrogen amounts needed per ton of crop residue are:

- Add 10 lbs. N per ton of dry residue from non-legume crops.
- Add 5 lbs. N per ton non-legume cover or green manure crop produced.

Soil pH, as an indicator of potential aluminum toxicity to plants, is of critical importance in proper nutrient management maximizing the benefits of fertilizer application. Lime will be applied to soils

when the soil reaction falls below the optimum pH range of the managed crop. Refer to a current soil test for liming recommendations.

CONSIDERATIONS

The following considerations are management guidelines that, when used alone or in combination with structural or cultural practices and controls, will assure the desired crop requirements and prevent or reduce the risk of non-point source water quality impacts of agricultural production. These guidelines may be modified to adapt to changing environmental conditions and crop management systems.

1. A nutrient budget may be calculated and used to aid in making adjustments. Appendix 4 will be used to estimate crop nutrient needs based on yield goal. The Nutrient Management Conservation Practice Job Sheet (Appendix 5) may be used to document nutrient budget calculations.
2. Additional soil tests should be considered after years of extremely high or low production. This is $\pm 30\%$ of the realistic yield goal.
3. Plant tissue analysis may be used as part of a complete nutrient management system. Follow sampling and mailing instructions provided by the selected testing laboratory.
4. Management practices such as winter cover crops and deep-rooted crops can be used to take up residual nutrients applied previously to rotational crops preventing the movement of these nutrients out of the root zone.
5. When feasible, apply phosphorus fertilizers (P_2O_5) in bands 3-6 inches deep and 2-3 inches to the side of the crop row. If phosphorus is broadcast on cropland, incorporate to 2-6 inches or have surface soil conditions that reduce runoff and erosion.
6. When nitrogen is applied, split applications will be considered. When ground water quality is a concern, split application of nitrogen is recommended.
7. When using liquid fertilizers in standing crops, exercise care to avoid foliar damage.
8. When the soil analysis shows the pH is adequate, but the soil is low in available

- calcium, an amendment with calcium such as calcium sulfate (gypsum) may be used to provide the needed calcium without affecting soil pH.
9. Alternatives to reduce the use of commercial fertilizers to meet crop demands include:
 - A. Properly inoculated legumes can reduce the need for commercially applied nitrogen by providing nitrogen to the following crop. Further guidance on the use of legumes as fertilizers can be found in the Standard for Cover and Green Manure Crops (340).
 - B. Properly applied animal wastes may be substituted for commercial fertilizer. Further guidance on the utilization of animal wastes for nutrients can be found in the NRCS Agricultural Waste Management Field Handbook and the NRCS Waste Utilization Standard (633).
 10. On sites where soil salinity is a concern, the Potassium application rate should not exceed 100% of the requirement needed over the entire crop rotation, or three years for perennial crops.

PLANS AND SPECIFICATIONS

Specifications for the application of Nutrient Management shall be prepared for each field according to the Criteria, Considerations, and Operations and Maintenance described in this standard.

The individual field specifications shall be documented on specification sheets, job sheets, narrative statements in conservation plans, or other appropriate documentation.

Plans and specifications shall include these items:

- Purpose of Nutrient Management Plan
- Yield goal
- Crop rotation
- Sampling and shipping procedures for soil, manure, effluent, and plant tissue
- Soil test results and/or nutrient budget
- Nutrient application
 - * rate
 - * form/sources
 - * timing
 - * method of application

- Factors that may have environmental impacts (slope, soils, karst topography, tile drainage, irrigation, etc.)
- Appropriate considerations
- Operation and Maintenance requirements
 - * frequency of soil tests
 - * calibration of equipment
 - * disposal of excess materials

OPERATION AND MAINTENANCE

Nutrient applications will be made according to a soil test, which serves as the baseline soil condition.

The producer should review the nutrient management plans on an annual basis. Nutrient management plans should also be reviewed with a Nutrient Management Specialist immediately after soil test samples and recommendations have been completed as specified in Appendix 1.

Nutrient management plans should be revised when:

- crop rotation changes
- changes occur in farming operations or management systems
- changes occur in technology and/or available data
- new soil test analyses with revised recommendations are received.

Application equipment should be regularly calibrated to deliver within 10 percent of the intended application rate to achieve a uniform distribution pattern.

Do not use anhydrous ammonia unless loose soil is available, and soil moisture conditions are adequate to insure proper closure of the furrow. Appropriate mechanical devices (packer wheels, harrows, etc.) may be used as needed to close the applicator furrow.

Avoid unnecessary contact with fertilizers and organic wastes. Where the label specifies a precaution, wear proper clothing, footwear, respirator, and gloves as stated on the label. Extra caution should be maintained to prevent skin and eye contact or exposure to ammonia fumes.

When cleaning equipment after nutrient application, remove and save fertilizers or waste in an

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appropriate manner. The saved residue material may be utilized on another crop as part of the fertilization program. If the equipment is flushed, keep wastewater away from high runoff areas, ponds, lakes, streams, wells and other water bodies.

Dispose of fertilizer containers according to any applicable label directions and state, federal, and local laws.

APPENDIX 1

SOIL TEST FREQUENCIES (in years)¹

Purposes	Rainfall < 25"	Irrigation + Rainfall > 25"	Animal Wastes
Optimum Yield	1 of 5	1 of 3	1 of 2
Vegetative Cover	Establishment only	Establishment only	1 of 2
Water Quality	1 of 5	1 of 3	1 of 2
Soil Condition	1 of 5	1 of 3	1 of 2

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.

APPENDIX 2

SOIL SAMPLING DEPTHS¹

Cropping System	Tillage System	Fertilizer Application Method	Recommended Sampling Depth (inches)
Perennial pasture and range	No till, Occasional renovation	Broadcast	0 - 6
Perennial pasture and range	All others	All others	0 - 6
Row crops	All	Injection (> 3 inches)	3 - 9
Row crops	Deep break	All	0 - 6
Row crops	All	All others	0 - 6
Tree crops	All	All	0 - 6
All other crops	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.

APPENDIX 3

SOIL TEST METHODS, NUMERICAL BREAKING POINTS, AND RATINGS.

TEXAS:

Method: Soil, Water and Forage Testing Laboratory, Texas A&M University, College Station, TX 77843-2474

P and K - 1:10 extraction ratio, 45 minute shaking time, 1.4 M ammonium acetate + 0.025 M EDTA + adjusted to pH 4.2 with 0.1 M hydrochloric acid.

NO₃-N - Cadmium reduction. Diamond, D. and A. Wielichowski. 1997. Nitrate/nitrite, nitrite in surface water, wastewater. Zellweger Analytics Lachat Instruments Division. Milwaukee, WI.

Numerical breaking points and ratings:

Nutrient	Crop	Yield	Ratings					
			V. Low	Low	Medium	High	V. High	
Nitrogen	Corn	75-99 bu/A	0-10	11-15	16-25	26-45	≥45	
		100-149 bu/A	0-15	16-25	26-50	51-75	>75	
		150-200 bu/A	0-20	21-50	51-90	91-120	>120	
	Cotton	1.0 bale/A	0-10	11-15	16-20	21-25	>25	
		1.5 bale/A	0-10	11-15	16-20	21-30	>30	
		2.0 bale/A	0-10	11-15	16-25	26-45	≥45	
		2.5 bale/A	0-10	11-15	16-25	26-45	≥45	
		Grain Sorghum	1500-2000 lb/A	0-10	11-15	16-20	21-25	>25
	Phosphorus		2000-4000 lb/A	0-10	11-15	16-25	26-45	≥45
			4000-6000 lb/A	0-10	11-20	21-40	41-60	>60
6000-8000 lb/A			0-20	21-40	41-60	61-80	>80	
Peanuts			All	0-5	6-7	8-9	10-15	>15
Wheat		20-30 bu/A	0-10	11-15	16-20	21-30	>30	
		30-40 bu/A	0-10	11-15	16-25	26-45	≥45	
		40-60 bu/A	0-10	11-20	21-40	41-60	>60	
		60-80 bu/A	0-20	21-40	41-60	61-80	>80	
		80-100 bu/A	0-20	21-50	51-90	91-120	>120	
		Hybrid Bermuda	Grazing	0-10	11-15	16-20	21-30	>30
Potassium		1 cut & grazing	0-10	11-15	16-25	26-45	≥45	
		3-6 cuts	0-10	11-15	16-25	26-45	≥45	
		Clover	All	0-5	6-7	8-9	10-15	>15
	All Others	Rice	All	0-5	6-10	11-20	21-40	≥40
		Alfalfa	All	0-5	6-10	11-20	21-40	≥40
		Annual Ryegrass	All	0-5	6-10	11-20	21-40	≥40
		Blueberry	All	0-5	6-10	11-20	21-40	≥40
		All Others	All	0-5	6-10	11-41	42-61	>61
		All	All	0-69	70-119	120-174	175-300	>300

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APPENDIX 3 CONT.

ARKANSAS:

Method: P and K: Mehlich III

See AR. Coop. Ext. Ser. Soil Test Recommendations Guide – 2000 for numerical breaking points and ratings for different crops and yields (about 100 pages). Contact Dr. Stan Chapman at 501-671-2168 to obtain guide.

OKLAHOMA:

Method: P and K: Mehlich III

N: Based upon crop and yield goal

Numerical breaking points (no ratings):

Nutrient	Numerical Breaking Points (mg/kg)				
	Phosphorus	0	10	20	40
Potassium	0	75	125	200	250

APPENDIX 3 CONT.

KANSAS:

Methods: Whitney, D.A. 1983. Soil test interpretations and fertilizer recommendations. Kansas State University, Cooperative Extension Service Publication #4-83-4M.

N: Nitrate plus ammonia extracted in KCl

P: Bray I (For soil pH values less than 6.8)

K: 1 M Ammonium acetate using a 1:5 extracting ratio

Numerical breaking points and ratings:

Crop	Area of State	Nutrient Numerical Breaking Points and Ratings				
		Very Low	Low	Medium	High	Very High
		Nitrogen (mg/kg N as nitrate + ammonia in 2-foot profile)				
Irrigated						
Corn, Sorghum, Wheat & Pasture	Entire	-	0-10	10-20	20-30	>30
Sugar Beets	Western	-	0-8	8-16	16-24	>24
Non-irrigated						
Corn	Eastern	-	0-10	10-20	20-30	>30
Sorghum	Eastern & Central	-	0-8	8-16	16-24	>24
	Western	-	0-5	5-10	10-15	>15
Small Grains	Eastern & Central	-	0-8	8-16	16-24	>24
	Western	-	0-5	5-10	10-15	>15
Pastures	Eastern & Central	-	0-8	8-16	16-24	>24
		Phosphorus (mg/kg)				
All Crops	Entire	0-5	6-12	13-25	26-50	>50
		Potassium (mg/kg)				
All Crops	Entire	0-40	41-80	81-120	121-160	>160

APPENDIX 3 CONT.

LOUISIANA:

Method: Peevey, W.J. 1972. Soil test results and their use in making fertilizer and lime recommendations. Louisiana Agric. Exp. Stn. Bull. No. 660.

N: Based upon crop yield goal

P: Bray II (for soil pH values less than 6.8)

K: 1 M ammonium acetate, pH 7.

Numerical breaking points and ratings:

General Soil Areas	Extractable P (mg/kg)		Textures and Approximate Cation Exchange Capacities		Exchangeable			
			Texture	Cation Exchange Capacity (meq/100g)	Potassium (mg/kg)			
					Very Low	Low	Medium	High
Coastal Plains	Very Low	10						
	Low	10-40	sl ¹	4	40	40-60	60-100	>100
	Medium	40-80	vfsl	6	50	50-80	80-120	>120
	High	>80						
Flatwoods	Very Low	10						
	Low	10-35	vfsl	6	50	50-80	80-120	>120
	Medium	35-70	sil	8	60	60-100	100-140	>140
	High	>70						
Mississippi Terraces and Loessial Hills	Very Low	10						
	Low	10-35	sil	8	60	60-100	100-140	>140
	Medium	35-70	sil	10	80	80-120	120-160	>160
	High	>70						
Coastal Prairies	Very Low	10						
	Low	10-30	vfsl	8	60	60-100	100-140	>140
	Medium	30-70	sil	10	80	80-120	120-160	>160
	High	>70						
Red, Ouachita & Miss. River Alluvial Soils, vfsl and sil	Very Low	40	ls	4	40	40-60	60-100	>100
	Low	40-60	vfsl	8	60	60-100	100-140	>140
	Medium	60-120	sil	10	80	80-120	120-160	>160
	High	>120	sil	15	100	100-160	160-220	>220
Red, Ouachita & Miss. River Alluvial Soils, cl and c	Very Low	60	cl(32% c)	20	140	140-200	200-300	>300
	Low	60-80	c(40% c)	25	160	160-240	240-360	>360
	Medium	80-160	c(50% c)	30	180	180-280	280-420	>420
	High	>160	c(60% c)	40	240	240-340	340-510	>510

¹ s = sand, si = silt, l = loam, c = clay, v = very, f = fine

APPENDIX 3 CONT.**NEW MEXICO:****Methods:**

N: NO₃-N by Cd reduction. Methods for chemical analysis of water and wastes. 1979. EPA 200.7, Nat. Environ. Res. Cen., Cincinnati, Ohio.

P: Olsen (for soil pH values greater than 6.8)

K: 1:5 water extract. Chicek, L.J. 1983. Interpreting soil analysis. New Mexico State University. CES Guide A-126.

Numerical breaking points and ratings: Herrera, E. Soil test interpretations. 1995. New Mexico State University. CES Guide A-122.

Nutrient	Numerical Breaking Points and Ratings			
	Very Low	Low	Moderate	High
Nitrate-Nitrogen	-	<10	10-30	>30
Phosphorus	<7	8-14	15-22	23-30
Potassium	-	<30	30-60	>60

APPENDIX 4

TAMU NUTRIENT RECOMMENDATIONS WEB SITE

Located at <http://nutrientmanagement.tamu.edu/>

Please return to this site for updates on TAMU Nutrient Management and reference materials.

APPENDIX 5

USDA NUTRIENT MANAGEMENT CONSERVATION PRACTICE JOB SHEET – 590

Located at http://www.ftw.nrcs.usda.gov/nhcp_2.html

Scroll down to Nutrient Management (AC) (590). Check frequently for updates.

APPENDIX 6

TABLE 1. ANNUAL PHOSPHORUS APPLICATION RATES FOR NUTRIENT NON-IMPAIRED WATER BODY SEGMENTS
(based on most recent soil test)

Soil Test Rating *	Commercial Fertilizer	Animal Wastes
VL, L, M	Soil Test Recommendation	Apply at Nitrogen Rate
H	Soil Test Recommendation***	≤ 2.0X Crop Requirement** or Phosphorus Index
VH	Soil Test Recommendation***	≤ 1.5X Crop Requirement** or Phosphorus Index
CRITICAL	****	****

* Land Grant University ratings (VL = very low, L = low, M = medium or moderate, H = high, VH = very high).

** Not to exceed the Nitrogen rate.

*** Usually zero unless starter P is recommended.

**** Critical soil test extractable P in Texas is 200 ppm and is approximately equal to 5 times the minimum HIGH rating of any other Land Grant University soil test P extractant method (Example: Minimum High rating is 42 in Texas, $42 \times 5 = 210$, ~ 200). **Once the Table 1 "critical" soil test rating is reached, use the Phosphorus Index to determine the phosphorus runoff potential and go to Table 2 for for P application rate.**

TABLE 2. PHOSPHORUS INDEX VULNERABILITY RATINGS AND PHOSPHORUS APPLICATION RATES FOR NUTRIENT NON-IMPAIRED WATER BODY SEGMENTS.

P Runoff Potential	P Application Rate
Very Low, Low	Nitrogen Application Rate
Medium	=2.0X Crop Requirement
High	=1.5X Crop Requirement
Very High	=1.0X Crop Requirement

APPENDIX 7

TABLE 1. ANNUAL PHOSPHORUS APPLICATION RATES FOR NUTRIENT IMPAIRED WATERSHEDS
(based on most recent soil test)

Soil Test Rating *	Commercial Fertilizer	Animal Wastes
VL, L	Soil Test Recommendation	Apply at Nitrogen Rate
M	Soil Test Recommendation	=2.0X Crop Requirement** or Phosphorus Index
H	Soil Test Recommendation***	=1.5X Crop Requirement** or Phosphorus Index
VH	Soil Test Recommendation***	=1.0X Crop Requirement** or Phosphorus Index
CRITICAL	****	****

* Land Grant University ratings (VL = very low, L = low, M = medium or moderate, H = high, VH = very high).

** Not to exceed the Nitrogen rate.

*** Usually zero unless starter P is recommended.

**** Critical soil test extractable P in Texas is 200 ppm and is approximately equal to 5 times the minimum HIGH rating of any other Land Grant University soil test P extractant method (Example: Minimum High rating is 42 in Texas, $42 \times 5 = 210$, ~ 200). **Once the Table 1 "critical" soil test rating is reached, use the Phosphorus Index to determine the phosphorus runoff potential and go to Table 2 for P application rate.**

TABLE 2. PHOSPHORUS INDEX VULNERABILITY RATINGS AND PHOSPHORUS APPLICATION RATES FOR NUTRIENT IMPAIRED WATER BODY SEGMENTS.

P Runoff Potential	P Application Rate
Very Low, Low	Apply at Nitrogen Rate
Medium	=1.5X Crop Requirement
High	=1.0X Crop Requirement
Very High	=1.0X Crop Requirement Every Other Year

APPENDIX 8

NUTRIENT MANAGEMENT

**FERTILIZER RATES FOR STAND MAINTENANCE
OF ESTABLISHED GRASSES AND LEGUMES ON CONSERVATION COVER,
CRITICAL AREAS,
GRASSED WATERWAYS, VEGETATIVE BUFFERS, AND WILDLIFE HABITAT
BLACKLAND PRAIRIE
COAST PRAIRIE, COAST SALINE PRAIRIE, AND FLATWOODS**

GRASSES	Clays, Clay Loams			Loams, Sandy Loams			Sands, Loamy Sands		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Improved Bermudagrass, Johnsongrass	40	60	0	40	60	40	40	60	60
	Once every three years			Once every three years			Once every three years		
Bahiagrass, Dallisgrass, Common Bermudagrass, Kleingrass, Fescue, Gordo or Angleton bluestem, Other Old World Bluestems	30	60	0	30	60	30	30	60	30
	Once every three years			Once every three years			Once every three years		
All other grasses	0	0	0	0	0	0	0	0	0
LEGUMES									
Over-seeded	0	60	0	0	60	60	0	60	60

EAST TEXAS TIMBERLANDS AND CLAYPAN

GRASSES	Clays, Clay Loams			Loams, Sandy Loams			Sands, Loamy Sands		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Improved Bermudagrass, Johnsongrass	40	60	0	40	60	40	40	40	40
	Once every three years			Once every three years			Once every three years		
Bahiagrass, Dallisgrass, Common Bermudagrass, Kleingrass, Fescue, Gordo or Angleton bluestem, Other Old World Bluestems	30	60	0	30	60	30	30	30	30
	Once every three years			Once every three years			Once every three years		
All other grasses	0	0	0	0	0	0	0	0	0
LEGUMES									
Over-seeded (> 35" rainfall)	0	60	0	0	60	40	0	40	40

**FOTG, Section 4
All Field Offices, TX
June, 2000**

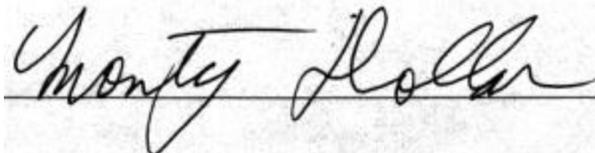
APPROVAL AND CERTIFICATION

NUTRIENT MANAGEMENT

(acre)

CODE 590

PRACTICE STANDARD APPROVED:



State Agronomist

July 5, 2000

Date

This practice standard is needed in the _____ Field Office Technical Guide.

District Conservationist

Date

CERTIFICATION:

Reviewed and determined adequate without need of revision.

Zone Agronomist

Date