NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

(Acre)
CODE 590

DEFINITION

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

PURPOSES

This practice may be applied as part of a resource management system to support one or more of the following purposes:

- 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 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 except for small plots where nutrient and soil amendment application is limited (*e.g.*, wildlife food plots less than one acre).

CRITERIA

General Criteria Applicable to All Purposes

Plans for nutrient management shall comply with all applicable Federal, state, and local laws, rules, and regulations, (*e.g.*, 1994 amendment to the Florida Fertilizer Law Chapter 576, Florida Statue (F.S.), Domestic Wastewater Residuals, Chapter 62-640 Florida Administrative Code (F.A.C.), Disposal of Septage, Chapter 64E-6 F.A.C.)

Plans for nutrient management shall be developed in accordance with requirements of the Natural Resources Conservation Service (NRCS) General Manual Title 450, Part 401.03 (Technical Guides, Policy and Responsibilities) and Title 190, Part 402, Nutrient Management; technical requirements of the NRCS Field Office Technical Guide (FOTG); procedures contained in the National Planning Procedures Handbook (NPPH), and the NRCS National Agronomy Manual (NAM) Section 503.

Persons who review or approve plans for nutrient management shall be certified through any certification program acceptable to Florida NRCS.

A review of the nutrient management plan shall be performed, as a minimum, every five years. An annual review is encouraged. A person properly certified shall approve all revisions.

Plans for nutrient management that are elements of a more comprehensive conservation plan shall recognize other requirements of the conservation plan and shall be compatible with those other requirements.

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, wastewater, 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 and cropping systems, and soil and manure/organic by-products tests. For new crops or varieties, industry yield recommendations may be used until documented yield information is available.

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

Conservation practices to prevent erosion and reduce runoff shall be installed on fields that receive nutrients. These practices will be applied as needed to meet the quality criteria of Section III of the FOTG.

Soil Sampling and Laboratory Analysis (Testing). Nutrient planning shall be based on current soil test results developed in accordance with University of Florida, Institute of Food and Agricultural Sciences (IFAS) guidance or industry practice recognized as acceptable by IFAS.

A current soil test is one that is no older than **one** year for all land uses where nutrients or organic by-products are applied. For pasture and hayland where nutrients are applied at maintenance levels, then a current soil test will be no older than **five** years.

Soil samples shall be collected and prepared according to IFAS guidance or standard industry procedure. Soil sample analysis shall be performed by laboratories that are accepted in a State Certified Programs, or The North American Proficiency Testing Program (Soil Science Society of America), and laboratories whose tests are perfomed by the same method and guidelines as IFAS.

Soil testing shall include analysis for any nutrients for which specific information is needed to develop, revise or monitor the nutrient management plan, (*e.g.,* pH, electrical conductivity (EC), soil organic matter, nitrogen, phosphorus, and potassium).

Plant Tissue Testing. Tissue sampling and testing, where used, shall be conducted in accordance with IFAS standards or recommendations.

Nutrient Application Rates. Recommended nutrient application rates for commercial fertilizer shall be based on IFAS recommendations (the latest version of the SL – 129 and/or industry practice where calibration curves have been developed and meets IFAS approval) that considers current soil test results, realistic yield goals and landowner management capabilities. See “Additional Criteria Applicable to Properly Utilize Manure or Organic By-Products Applied as a Plant Nutrient Source” section for recommended nutrient application rates for manure or organic by-products.

If IFAS does not provide specific recommendations, application shall be based on realistic yield goals and associated plant nutrient uptake rates.

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

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

- **Nitrogen Application** - Planned nitrogen application rates shall be less than or equal to the recommended rates as closely as possible, except when manure or other organic by-products are a source of nutrients. When manure or other organic by-products are a source of nutrients, see “Additional Criteria Applicable to Properly Utilize Manure or Organic By-Products Applied as a Plant Nutrient Source.”

- **Phosphorus Application -** Planned phosphorus application rates shall be less than or equal to the recommended rates as closely as possible, except when manure or other organic by-products are a source of nutrients. When manure or other organic by-products are a source of nutrients, see “Additional Criteria Applicable to Properly Utilize Manure or Organic By-Products Applied as a Plant Nutrient Source.”

- **Potassium Application** – Potassium application rates will be accounted for in the nutrient budget. If high levels of potassium in the forage are associated with milk fever or

other forage quality problems, the rates will be reduced to an acceptable level.

- **Other Plant Nutrients -** The planned rates of application of other nutrients shall be consistent with IFAS guidance or industry practices recognized by IFAS.
- **Starter Fertilizers** - Starter fertilizers containing nitrogen, phosphorus and potassium may be applied in accordance with IFAS recommendations, or industry practice recognized by IFAS. When starter fertilizers are used, they shall be included in the nutrient budget.

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, and field accessibility.

Nutrients shall not be applied to saturated soil if the potential risk for runoff exists.

Nutrient Application Methods. Nutrient applications associated with irrigation systems (chemigation) shall be applied in accordance with the requirements of Florida NRCS conservation practice standard Irrigation Water Management, Code 449.

The application rate (in/hr) for material applied through irrigation systems shall not exceed the soil intake/infiltration rate. The water applied per application shall not exceed the field capacity of the soil.

Areas of Concern. Application sites located in geographic areas that have been identified by statute or rule of Florida Department of Environmental Protection (FDEP) as being subject to restrictions on phosphorus loading (such as the Everglades Protection Area, Lake Apopka, Lake Okeechobee, and the Green Swamp Area) shall follow any additional requirements required in Chapter 62-640 F.A.C.

In areas with an 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/or Phosphorus Index, or other assessment tools approved by the State Conservationist may be used to make these assessments. The results of these assessments and recommendations shall be discussed with the producer and included in the nutrient management plan.

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

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

Nutrient Values. Nutrient values of manure and organic by-products shall be determined prior to land application. Nutrient values shall be based on laboratory analysis, acceptable “book values” recognized by NRCS and/or IFAS, or historic records for the operation, if they accurately estimate the nutrient content of the material. Book values recognized by NRCS may be found in the Agricultural Waste Management Field Handbook (AWMFH), Chapter 4 - Agricultural Waste Characteristics.

Nutrient Budget. The determination to apply nutrients according to a nitrogen based budget or a phosphorus-based budget will be determined by using the field risk assessment “Florida Phosphorus Index (P Index).”

Nutrient management plans shall include

(1) a record of the assessment for each field or sub-field, and

(2) information about conservation practices and management activities that can reduce the potential for phosphorus movement from the site.

When such assessments are completed, the results of the assessment and recommendations shall be discussed with the producer during the development of the nutrient management plan.

Nutrient Application. Recommended nutrient application rates for manure or organic by-products shall be based on waste utilization rate from crop removal data. There are several sources of crop removal data that can be used. Crop removal data sources are found in the Agricultural Waste Management Field Handbook (AWMFH), Chapter 6 – Nutrient Removal by Harvesting of Crop.

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

- **Phosphorus Application -** When manure or other organic by-products are used, the planned rates of phosphorus application shall be consistent with any one of the following options:

  (1) Index.

  a) Use nitrogen based management budget on sites rated Low or Medium Risk .

  b) Use phosphorus based management budget on sites rated High Risk.

  c) Use phosphorus based management budget at less than crop removal or no manure application for sites rated Very High Risk.

  (2) Soil Test**.** Phosphorus may be applied at rates based on IFAS recommendations from an accepted soil test.

  Acceptable phosphorus based manure application rates shall be determined as a function of soil test recommendation or estimated phosphorus removal in harvested plant biomass. Guidance for developing these acceptable rates is found in the NRCS General Manual, Title 190, Part 402, Nutrient Management, and the National Agronomy Manual, Section 503.

  (3) Florida Department of Environmental Protection (FDEP). Nitrogen based budget sites in hydrological Unit Areas (HUA) and/or application sites contributing to specific water bodies identified by FDEP where additional phosphorus application will not negatively impact that system. Areas identified by FDEP are located in Section I of the FOTG.

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

  (1) (a) not exceed the recommended nitrogen application rate during the year of application,

  or

  (b) not exceed the estimated nitrogen removal in harvested plant biomass during the year of application when there is no recommended nitrogen application,

  and,

  (2) not be made on sites considered vulnerable to off-site phosphorus transport unless appropriate conservation practices, best management practices, or management activities are used to reduce the vulnerability to an acceptable level.

- **Nitrogen Application –** When nitrogen is applied using a phosphorus-based budget, manure or other organic by-products shall be applied at rates consistent with the phosphorus budget. In such situations, the total nutrient budget will address additional nitrogen application, from non-organic sources, to supply the recommended amounts of nitrogen to achieve the planned production.

  When application of inorganic nitrogen is supplied to supplement the organic nitrogen using the phosphorus-based budget, nitrogen rates applied will not include luxury consumption values of the crop.

  Manure or other organic by-products may be applied on legumes at rates equal to the estimated utilization and removal of nitrogen in harvested plant biomass.

When domestic waste residuals are applied, Domestic Wastewater Residuals, Chapter 62-640 F.A.C shall be followed.

When septage is applied, Disposal of Septage, Chapter 64E-6 F.A.C. will be followed.

Additional Criteria to Minimize Agricultural Non-point Source Pollution of Surface and Ground Water Resources

Buffers. For protection of water quality, buffers shall be provided between the area receiving nutrients and the area to be protected. The minimum buffer widths in Table 1 will be constructed and/or maintained unless written justification is provided. Buffers include but are not limited to NRCS conservation practice standards; Filter Strip, Code 393; Riparian Forest Buffer, Code

391A; Contour Buffer Strips, Code 332; Grassed Waterway, Code 327; Field Border, Code 386.

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

Nutrients shall be applied in such a manner as not to degrade the soil's structure, chemical properties, or biological condition.

Nutrients shall not be applied to flooded or saturated soils when the potential for soil compaction and creation of ruts is high.

Table 1 - Non-Application Buffer Widths[1/]

Object, Site	Situation	Base Buffer Width from Object, Site (ft.)
Well, potable	Located up-slope of application site	150
Well, potable	Located down-slope of application site provided conditions warrant application	300
Waterbody, Stream[2/], sinkhole or wetland	Good vegetation [3/]. Add 2 feet for each 1% slope for slopes up to 8%.	50 (+)
Waterbody, Stream[2/], sinkhole or wetland	Poor vegetative cover or Predominant slope > 8%[3/]	100
Public Road – roadside ditch	Irrigated wastewater or solids applied with spreader	30

[1/] Research has shown that forested or forest/grass buffers are more effective at removing phosphorus. Grass buffers are more effective at removing nitrogen. Every effort should be made to reduce phosphorus inputs at their sources. If phosphorus is managed responsibly on-site, buffers can store significant amounts of the excess; but if phosphorus is uncontrolled buffers can quickly become saturated and over whelmed. Even with their limits, buffers still perform a valuable service by displacing phosphorus-producing activities away from streams and regulating the flow of phosphorus. Taken in part from "A Review Of The Scientific Literature On Riparian Buffer Width, Extent And Vegetation", Institute of Ecology, University of Georgia.

[2/] Waterbody includes pond, lake, or open sinkhole. Open sinks include paleo sinks without a confining layer within 80 inches of the surface. Stream includes both perennial and intermittent streams and canals.

[3/] Good vegetation refers to a well-managed, dense stand that is not overgrazed.

CONSIDERATIONS

Areas that contribute to the excess nutrification of surface and/or groundwater are considered sensitive areas. Consider that some areas may be considered sensitive on some sites where they may not be sensitive on other sites, *e.g.*, paleo sinks may have restrictive soil layers.

Application of waste/wastewater should not be applied in defined drainageways that carry concentrated flow within 3 days of likely rainfall or during periods of frequent rainfall. It may be applied to newly constructed grass waterways if incorporated immediately.

Consider induced deficiencies of nutrients available to plants due to excessive levels of other nutrients or soil chemistry. Consider additional practices and combinations of practices such as NRCS conservation practices Conservation Cover, Code 327, Grassed Waterway, Code 412, Contour Buffer Strips, Code 332, Filter Strips, Code 393, Field Border, Code 386, Irrigation Water Management, Code 449, Riparian Herbaceous Cover, Code 390, Riparian Forest Buffer, Code 391A, Conservation Crop Rotation, Code 328, Cover and Green Manure, Code 340, and Residue Management, Codes 329A, 329B, or 329C, and 344 to improve nutrient storage, water storage, infiltration, aeration, soil tilth, diversity of soil organisms, and to protect or improve water quality.

Consider cover crops whenever possible to utilize and recycle residual nitrogen.

Where phosphorus is a potential water quality concern, consider planting crops with the capability of maximum removal of phosphorus.

Consider application methods and timing that will reduce the risk of nutrients being transported to ground and surface waters, or volatilizes into the atmosphere. Suggestions include:

- split applications of nitrogen to provide nutrients at the times of maximum crop utilization,
- applying nutrients based on plant physiology and climate factors. i.e., avoid winter nutrient applications for spring seeded crops, avoid application to dormant crops, apply so the stage of the planned crop can utilize the nutrients.
- band applications of phosphorus near the seed row,
- applying nutrient materials uniformly to application areas or as prescribed by precision agricultural techniques,
- immediate incorporation of land applied manures or organic by-products,
- delaying field application of animal manures or other organic by-products if precipitation is capable of producing runoff and erosion is forecast within 24 hours of the time of the planned application.

Consider potential problems from odors associated with land application of animal manure, especially when applied near or upwind of residences.

Table 2, provides suggested non-application buffer areas. Use of one or more wind buffer conservation practices should be considered when establishing buffers for odor control (*e.g.,* Herbaceous Wind Barriers, Code 422A, and Windbreak/Shelterbelt Establishment, Code 654).

Table 2 – Suggested Non-Application Buffer Widths for odor control

Object, Site	**Situation**	**Base Buffer Width from Object or Site** (ft.)
Public Road and Property Lines	Irrigated wastewater and solids applied with spreader truck	50
Dwelling	Other than Producer	300
Public Use Area	All	300

Consider nitrogen volatilization and other losses associated with the land application of animal manure. Volatilization losses can become significant, if manure is not immediately incorporated into the soil after application.

Consider annual reviews to determine if changes in the nutrient budget are needed for the next planned crop.

On sites where there are special environmental concerns, consider other sampling techniques, (*e.g.*, 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).

Consider ways to modify the chemistry of animal manure, including modification of the animal's diet to reduce the manure nutrient content, to enhance the producer's ability to manage manure effectively, (*e.g.*, adding alum to waste, feeding high phytase corn to poultry, switching to a pasture based grazing system, grow more on-site feed or reducing the amount of phosphorus in the feed ration for dairy cows, and/or poultry).

PLANS AND SPECIFICATIONS

Plans and specifications 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 water quality

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

(1) aerial photograph or map and a soil map of the site, with location of fields where nutrients are to be applied,

(2) current and/or planned plant production sequence or crop rotation,

(3) results of soil, plant, water, manure or organic by-product sample analyses,

(4) realistic yield goals for the crops in the rotation,

(5) quantification of all nutrient sources,

(6) recommended nutrient rates, timing, form, and method of application and incorporation,

(7) location of designated sensitive areas or resources and the associated nutrient management restriction,

(8) guidance for implementation, operation, maintenance, recordkeeping, and

(9) complete nutrient budget for nitrogen, phosphorus, and potassium for the rotation or crop sequence.

In addition to the requirements described above, nutrient management plans shall also include:

- discussion about the relationship between nitrogen and phosphorus transport and water quality impairment. The discussion about nitrogen should include information about nitrogen leaching into shallow ground water and potential health impacts. The discussion about phosphorus should include information about phosphorus accumulation in the soil, the increased potential for phosphorus transport in soluble form, and the types of water quality impairment that could result from phosphorus movement into surface water bodies.
- discussion about how the plan is intended to prevent the nutrients (nitrogen and phosphorus) supplied for production purposes from contributing to water quality impairment.
- a statement that the plan was developed based on the requirements of the current standard and any applicable Federal, state, or local rules, regulations or policies; and that changes in any of these requirements may necessitate a revision of the plan.

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

- that the land owner was informed that the soil's ability to retain phosphorus may be limited and that future rules or regulations may limit the amount of phosphorus that can be applied,
- the amount of land required for application based on a phosphorus budget of the planned cropping system,
- the relationship between soil phosphorus levels and potential for phosphorus transport from the field, and
- the potential for soil phosphorus removal from the production and harvesting of crops.

When applicable, plans shall include appropriate conservation practices or management activities as determined by specific regulation, program requirements, or producer goals.

OPERATION AND MAINTENANCE

The land owner/client is responsible for safe operation and maintenance of this practice including all equipment used in storage, transport, and/or application of nutrients. Operation and maintenance shall address the following:

- An annual review of the nutrient management plan to determine if adjustments or modifications to the plan are needed. As a minimum, plans will be reviewed and revised when changes in animal numbers, plant production system, and/or soil analysis occur.
- Protection of fertilizer and organic by-products 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 or exceed the recommended and planned rates, records will indicate the reasons for the differences.
- Maintaining records to document plan implementation. As applicable, records include:

  (1) soil test results and recommendations for nutrient application,

  (2) quantities, analyses and sources of nutrients applied,

  (3) dates and method of nutrient applications,

(4) crops planted, planting and harvest dates, yields, and crop residues removed,

(5) results of water, plant, and organic by-product analyses, and

(6) dates of nutrient management plan review and person performing the review, and recommendations that resulted from the review.

Records will be maintained for a minimum of five years or longer if required by other Federal, state, or local ordinances, or program or contract requirements.

Workers should be protected from and avoid unnecessary contact with chemical fertilizers and organic by-products. Protection should include the use of protective clothing when working with plant nutrients. Extra caution must be taken when handling ammonia sources of nutrients, or when dealing with organic wastes stored in unventilated enclosures.

The disposal of material generated from cleaning nutrient application equipment should be accomplished properly. Excess material should be collected and stored or field applied in an appropriate manner. Excess material should not be applied on areas of high potential risk for runoff and/or leaching.

The disposal or recycling of nutrient containers shall be in accordance with state and local guidelines or regulations.

REFERENCES

"A Review Of The Scientific Literature On Riparian Buffer Width, Extent And Vegetation", Institute of Ecology, University of Georgia
Chapter 62-640 F.A.C.
Chapter 64E-6 F.A.C.
Florida Fertilizer Law Chapter 576, F.S.
NRCS FOTG, Section I and Section III
Phosphorus Index, Exhibit 1, Chapter 9, Florida Agronomy Field Handbook
NRCS General Manual Title 450, Part 401.03 and Title 190, Part 402
NRCS National Planning Procedures Handbook (NPPH)
NRCS National Agronomy Manual (NAM) Section 503.
NRCS Agricultural Waste Management Field Handbook, Chapters 4, 6, and 11
NRCS Conservation Practice Standards:
Conservation Cover, Code 327
Conservation Crop Rotation, Code 328
Contour Buffer Strips, Code 332
Cover and Green Manure, Code 340
Field Border, Code 386
Filter Strips, Code 393
Grassed Waterway, Code 412
Herbaceous Wind Barriers, Code 422A
Irrigation Water Management, Code 449
Residue Management, Code 329A, 329B, or 329C, and 344
Riparian Forest Buffer, Code (391A),
Riparian Herbaceous Cover, Code 390
Windbreak/Shelterbelt Establishment, Code 654