Nutrient Management

Florida Planning and Guidance for Nutrient Mgt. Code 590

Natural Resources Conservation Service (NRCS) November 2012

PURPOSE

The purpose of this guidance is to provide additional information for the Nutrient Management Code 590.

GENERAL CRITERIA

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

Do not directly apply nutrients to areas such as sinkholes, wells, gullies, ditches, and surface inlets.

Address the amount of nutrients lost to erosion, runoff, irrigation and drainage, as needed.

To avoid salt damage, the rate and placement of applied nitrogen and potassium in starter fertilizer must be consistent with University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) guidelines, or industry practice recognized by UF/IFAS.

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) can only receive nutrients consistent with the setback restrictions.

Applications of irrigation water must minimize the risk of nutrient loss to surface and groundwater. See Florida NRCS conservation practice standard, Irrigation Water Management, Code 449, for further guidance.

Persons reviewing or approving plans for nutrient management must be certified through a certification program acceptable to Florida NRCS.

Realistic yield goals need to be established based on soil productivity information, historical yield data, climatic conditions, level of management, 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.

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

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. A cumulative record needs to be developed and maintained until a consistent (maintaining a certain nutrient concentration with minimal variation) level of nutrient values is realized. Base the nutrient allocation to fields on the average of results contained in the operation's cumulative manure analyses history.

Nutrient Sources.

Determine the planned rates of nutrient application, as documented in the nutrient budget, based on the following guidance:

- **Nitrogen Application** - Planned nitrogen application rates must match the recommended rates as closely as possible. When manure or other organic by-products are a source of nutrients, see "Additional Criteria Applicable to Properly Utilize

Manure or Organic By-Products as a Plant Nutrient Source."

- **Phosphorus Application -** Planned phosphorus application rates must match the recommended rates as closely as possible. When manure or other organic by-products are a source of nutrients, see "Additional Criteria Applicable to Properly Utilize Manure or Organic By-Products as a Plant Nutrient Source."

- **Potassium Application** – Potassium application rates must be accounted for in the nutrient budget. Potassium should not be applied in situations in which excess (greater than soil test potassium recommendation) causes unacceptable nutrient imbalances in crops or forages. If high levels of potassium in the forage are associated with milk fever or other forage quality problems, reduce potassium application rates to an acceptable level.

- **Other Plant Nutrients -** The planned rates of application of other nutrients must be consistent with UF/IFAS guidance or industry practices recognized by UF/IFAS.

- **Starter Fertilizers** – Starter fertilizers must be included in the overall nutrient budget and applied in accordance with UF/IFAS recommendations, or industry practice recognized by UF/IFAS.

Additional Criteria to Minimize Agricultural Non-point Source Pollution of Surface and Groundwater

Buffers. Buffers may need supplemental fertilization, which will be based on a soil test and on UF/IFAS recommendations.

For protection of water quality, provide buffers between the area receiving nutrients and the area to be protected. Buffers need to be constructed and/or maintained at the minimum buffer widths in Table 1 when applying manures and organic by-products, unless written justification is provided.

When applying commercial fertilizer the minimum buffer width will be based on the criteria found in the conservation practice standard for the type of buffer that is used.

Buffers include, but are not limited to Florida NRCS conservation practice standards; Filter Strip, Code 393; Riparian Forest Buffer, Code 391; Contour-Buffer Strips, Code 332; Grassed Waterway, Code 412; Field Border, Code 386.

CONSIDERATIONS

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

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 Florida NRCS conservation practice standard, Code 592, Feed Management.

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.

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

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.

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.

Nutrient deficiencies may be induced in plants due to excessive levels of other nutrients or soil chemistry. Consider additional practices and combinations of practices such as Florida NRCS conservation practice standards: 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 391; Conservation Crop Rotation, Code 328; Cover Crop, Code 340; and Residue Management, Codes 329, 345, or 346, and 344 to improve nutrient storage, water storage, infiltration, aeration, soil tilth, diversity of soil organisms, and to protect or improve water quality.

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.

Consider ways to modify the chemistry of animal manure, including modification of the animal's diet to reduce the manure nutrient content and/or 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).

Areas that contribute to the excess nutrients in surface and/or groundwater are considered sensitive areas. Realize 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.

If increases in soil test phosphorus levels are expected, consider using 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.

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.

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

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

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

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.

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

Use bioreactors and multistage drainage strategies when approved by UF/IFAS.

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, but may also increase leaching of 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,
- 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.
- Banded applications of nitrogen and/or phosphorus to improve nutrient availability,
- Drainage water management to reduce nutrient discharge through drainage systems,
- Applying nutrient materials uniformly to application areas or as prescribed by precision agricultural techniques,
- 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.

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).

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 603, and Windbreak/Shelterbelt Establishment, Code 380).

When applying manure with irrigation equipment, adjustments such as reducing the pressure, using drop down tubes for center pivots, etc., 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. Nitrogen volatilization from manure in a surface irrigation system will be reduced when applied under a crop canopy.

When planning nutrient applications and tillage operations consider using no-till or strip-till operations, which lessens soil disturbance and encourages soil carbon buildup while discouraging
greenhouse gas emissions (e.g., nitrous oxide N_2O, carbon dioxide CO_2).

Make nutrient applications associated with irrigation systems in accordance with the requirements of Florida NRCS conservation practice standard, Irrigation Water Management, Code 449.

CAFO operations seeking permits under USEPA regulations (40 CFR Parts 122 and 412) should consult with Florida Department of Environmental Regulation for additional criteria.

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.

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

REFERENCES

Follet, 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.

"A Review Of The Scientific Literature On Riparian Buffer Width, Extent And Vegetation", Institute of Ecology, University of Georgia

Florida NRCS Conservation Practice Standards:
- Conservation Cover, Code 327
- Conservation Crop Rotation, Code 328
- Contour Buffer Strips, Code 332
- Cover Crop, Code 340
- Field Border, Code 386
- Filter Strips, Code 393
- Grassed Waterway, Code 412
- Herbaceous Wind Barriers, Code 603
- Irrigation Water Management, Code 449
- Residue Management, Codes 329, 345, and 344
- Riparian Forest Buffer, Code (391),
- Riparian Herbaceous Cover, Code 390
- Windbreak/Shelterbelt Establishment, Code 380

Table 1 **-** Non-Application Buffer Widths when applying manures and organic by-products[1/]

Object, Site	**Situation**	**Base Buffer Width from Object, Site** (ft.)
Ag Well, non-potable	No permanent or insufficient vegetated setback[5/]	100
	Permanent vegetated setback[5/]	35
Waterbody, Stream[2/], sinkhole or wetland	No permanent or insufficient vegetated setback[5/]	100
	Permanent vegetated setback[5/]	35
Well, potable	Located up-slope of application site	150
	Located down-slope of application site provided conditions warrant application	300
	Dairies in the Okeechobee Basin[4/] Commerical Egg Production Facility[4/]	200
Well, potable – private	Class A or Class B biosolids[6/]	300
Well, potable – public	Class A or Class B biosolids	500
Class I Water body, Outstanding Florida Water or Outstanding National Resource Water	Class A or Class B biosolids	1000
Other surface water	Class A or Class B biosolids surface applied Class A or Class B biosolids injected or incorporated into the soil	200 100
Subsurface fractures, solution cavities, sinkholes, excavation core holes, abandoned wells or any other natural or man-made conduits	Class A or Class B biosolids	200

Building occupied by the general public	Class B biosolids Class B biosolids injected or written permission from the building owner	300 100
Property lines	Class B biosolids	75

[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.

[4/] These setbacks are in the State of Florida DEP 62-670 Rule Feedlot and Dairy Wastewater Treatment and Management Requirements for all dairy farms in the Okeechobee basin that originated after June 3, 1987. These setbacks are also required of Commercial Egg Production Facilities – Statewide. http://www.dep.state.fl.us/legal/Rules/wastewater/62-670.pdf

[5/] If a livestock operation has been designated a CAFO then these setbacks will be followed. http://www.epa.gov/npdes/regulations/cafo_fedrgstr_part412.pdf

[6/] These setbacks are in State of Florida DEP 62-640 Rule Biosolids http://www.dep.state.fl.us/legal/Rules/wastewater/62-640.pdf

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