chapter

nine

Recommending Conservation Practices in Nutrient Management Plans

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A cornerstone to nutrient management planning is making the proper recommendations for applying and handling nutrients in animal manure and inorganic fertilizers. Recommendations can be categorized into three general types:

- Appropriate Nutrient Application Rates
- Setback Distances from Critical Water Features
- Conservation Practices (*sometimes known as Best Management Practices*)

This chapter explains the nature of these recommendations.

Underlying Philosophy of a Plan

Before discussing the recommendations themselves, we need to address why a plan is being written as this can influence the recommendations that are being made. Livestock producers obtain a nutrient management plan for two main purposes: voluntarily or to meet regulatory requirements. Producers voluntarily seek plans for several reasons:

- Because they want to improve their operation and protect their own natural resources,
- To qualify and apply for financial incentive programs,
- And to meet contractual obligations with whom they are producing such as poultry or swine integrators.

Many producers now must obtain nutrient management plans to meet regulatory or permit requirements. There are several sets of regulations that require livestock operations to implement plans. They include:

- Arkansas State Regulation 5 – This law, enacted in 1994, requires all livestock and poultry operations with liquid manure handling systems to obtain a nutrient management plan as partial requirement of receiving a permit for operation. The Arkansas Department of Environmental Quality (ADEQ) has the responsibility of overseeing this law.

- The Federal Animal Feeding Operation (AFO/CAFO) Regulation – This Environmental Protection Agency regulation requires all states to permit confined animal feeding operations of a given size (Chapter 1, Table 1-1). This regulation has been incorporated into State Regulation 6 and is overseen by the ADEQ.

- Arkansas Acts 1059 and 1061 identify nutrient sensitive areas in the state (Chapter 1, Figure 1-1), designate them as Nutrient Surplus Areas, and require all nutrient applications (whether manure or commercial fertilizer, or agricultural or residential) to be done according to a nutrient management plan or an approved protective use rate. These new laws will be carried forth by the Arkansas Soil and Water Conservation Commission (ASWCC). On poultry farms with 2,500 birds or more at any given time during a year, the law requires these operations to obtain a poultry litter management plan defined as "*the documented plan for use, disposal, and storage of litter by poultry feeding operations*." The poultry litter plans include management of the nutrients within the litter.

- A lawsuit settlement between the City of Tulsa and poultry integrators in the Eucha-Spavinaw watershed in Northwest Arkansas (Benton County) requires poultry producers to obtain nutrient management plans that are written by a court-appointed non-profit company to specifications set forth by the court. Because this is a federal lawsuit and the planning protocol is more restrictive than other federal and state laws, Eucha-Spavinaw producers must adhere to the court ordered plans.

If an operation falls under more than one set of regulations, then the most restrictive set of regulations in terms of application rates and setback distances apply.

Understanding these underlying purposes for the plan will influence how a plan is written. For example, a voluntary plan may include several conservation recommendations without regard of cost of implementation. On the other hand, a nutrient management plan required by law is a legal document that may bind the producer to a particular practice regardless of their financial ability to implement such a practice. This point should not imply that practices should not be recommended, but rather they should be made in consultation with the producer prior to becoming a formal part of the plan. On this point, planners should remember that the plan is really the farmer's and not the planner's. It is the planner's role to write a plan that is consistent with the appropriate legalities and with the goals of the producer. In other words, a planner should not write a plan based on what can be done, but rather write a plan that the producer has ownership in. The more ownership that the producer has, the more likely he will implement the plan. A plan that is not implemented is a wasted effort on everyone's part.

Appropriate Manure Application Rates

Recommending the appropriate manure application rates is a critical part of nutrient management planning. Manure rates are determined by using the Phosphorus Index approach (refer to Chapter 7). Once the rate is determined, a nutrient budget (refer to Chapter 8) for a particular field should be constructed using soil test results as the guide for the total nutrients needed. Nutrients applied with manure should be subtracted from the soil test results and deficits in nitrogen and/or potassium should be made up with commercial, inorganic fertilizer. This ensures that total nutrients applied meet the needs of the forage crop while minimizing losses to the environment.

Setback Distances

Setback distances refer to the width of areas from a critical water feature that animal manure and poultry litter should not be applied because of the close proximity and the increased potential of nutrients to enter a water body. Implementing setback distances is a key component to protecting surrounding water bodies from excessive nutrients.

In karst geographical regions such that are found in Northern Arkansas, a sinkhole or an outcropping of fractured limestone is considered as if it were a water body because they offer the potential of a direct conduit to groundwater. Karst topography is characterized by limestone bedrock with caves, sinkholes, springs, and fractured bedrock.

In order to determine the need for setback distances, field-by-field surveillance should be conducted by walking each field. The area contained in the setback distances should be estimated and subtracted from the field size. Not all fields will have setback distances.

Determining proper setback distances depends on the purpose of the plan as setback distances vary with different nutrient management regulations. In the case that an operation falls under more than one set of regulations, then the most restrictive distance (larger distance) applies.

Setback distances for liquid waste applications are found in ADEQ's Regulation 5 (Table 9-1).

Table 9-1. Setback distances for liquid manure applications as set forth by ADEQ's Regulation 5

Feature	Distance, ft
Property Line	50
Critical Water Features (i.e., seasonal or perennial streams, ponds, lakes, springs, sinkholes, rock outcroppings, wells, and water supplies	100
Extraordinary resource waters, such as rock with cracks that extend from surface to groundwater supply	300
Neighboring occupied building	500

Dry litter applications are governed by State Title 22 as administered by ASWCC and by the Federal CAFO rules. Nutrient management protocol for Title 22 is the NRCS Standard 590 for the State of Arkansas. While Standard 590 does not specifically state setback distances, it does refer to two other NRCS standards, 633 Waste Management and 393 Filter Strips, that specifically state distances. In both cases, distances are dependent on the slope of an area next to a critical water feature (Table 9-2 and Table 9-3).

In the case that the purpose of a nutrient management plan is to comply with the new CAFO rules, then the setback distances are specified as follows:

- Manure, litter, and process wastewater may not be applied closer than 100 feet to any down-gradient surface waters, open tile line intake structures, sinkholes, agricultural wellheads, or other conduits to surface waters.

- Vegetated buffer compliance alternative. As a compliance alternative, the CAFO may substitute the 100-foot setback with a 35-foot wide vegetated buffer where applications of manure, litter, or process wastewater are prohibited.

- Alternative practices compliance alternative. As a compliance alternative, the CAFO may demonstrate that a setback or buffer is not necessary because implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions that would be achieved by the 100-foot setback.

Conservation Practices that Reduce Nutrient Losses

A list of NRCS approved conservation practices can be found in Table 9-4. When recommending practices, the NRCS standard should be followed closely. If it is unclear as to what practice would be the most effective for a specific location and a given set of conditions, then contact the local USDA Service Center for assistance.

Not all practices fit a particular situation. It is up to the planner to ensure that a BMP standard is followed closely so that the selected practice is addressing the concern. For detailed standards and practice descriptions please refer to the NRCS electronic field office technical guide (eFOTG) for the county in which the plan is being written. The eFOTG for each county can be found online at *http://www.ar.nrcs.usda.gov/technical/*.

The following is a brief description of selected NRCS conservation practices that have application to livestock operations.

Table 9-2. Setback distances for dry manure applications (i.e., poultry litter) where filter strips are not installed as required by Arkansas Nutrient Management Title 22, which is based on NRCS Waste Management Standard 633

Slope %	Setback Distance
0-2	20 ft
>2-3	30 ft
>3-8	50 ft
>8	100 ft

Table 9-3. Setback distances for dry manure applications (i.e., poultry litter) for the purposes of establishing filter strips which is based on NRCS Filter Strip Standard 393. Critical landscapes features are such as springs, seeps, sinkholes, wells, rock outcrops, and loosing streams.

Slope %	Length of Flow
0-2	20 ft
3-8	50 ft
>8	100 ft
Critical Landscape Feature 100 ft	

Table 9-4. NRCS approved conservation practices

NRCS Practice #	Name	Mode	Expected Water Quality Outcome
313	Manure storage	Storage/Handling	Reduces nutrient loss
317	Compost	Alters source	Stabilizes nutrients in source
386	Field border	Reduces transport	Reduce nutrients/sediments from moving from field
391	Riparian buffer	Reduces transport	Reduce nutrients/sediments from moving from field
393	Filter strip	Reduces transport	Reduce nutrients/sediments from moving from field
528	Prescribed grazing	Improve soil and pasture conditions	Reduce nutrients/sediments from moving from field
561	Heavy use area	Improve soil and pasture conditions	Reduce nutrients/sediments from moving from field
786	Alum	Litter treatment	Reduces soluble P in litter

Field Borders (NRCS Code 386) and Filter Strips (NRCS Code 393)

These are strips of grasses or other close-growing vegetation planted around fields and along drainage ways, streams and other bodies of water. They are designed to reduce sediment, organic material, nutrients and chemicals carried in runoff. In a properly designed filter strip, water flows evenly through the strip, slowing the runoff velocity and allowing contaminants to settle from the water. In addition, where filter strips are seeded, fertilizers and herbicides no longer need to be applied right next to susceptible water sources. Filter strips also increase wildlife habitat. Soil particles (sediment) settle from runoff water when flow is slowed by passing through a filter strip. The largest particles (sand and silt) settle within the shortest distance. Finer particles (clay) are carried the farthest before settling from runoff water, and they may remain suspended when runoff velocity is high. Farming practices upslope from filter strips affect the ability of strips to filter sediment. Fields with steep slopes or little crop residue will deliver more sediment to filter strips than more gently sloping fields and those with good residue cover. Large amounts of sediment entering the filter strip may overload the filtering capacity of the vegetation, and some may pass on through.

Filter strip effectiveness depends on five factors:

1. The amount of sediment reaching the filter strip. This is influenced by:

   - Type and frequency of tillage in cropland above the filter strip. The more aggressive and frequent tillage is above filter strips the more likely soil is to erode.
   - Time between tillage and a rain. The sooner it rains after a tillage operation, the more likely soil is to erode.
   - Rain intensity and duration. The longer it rains, and thus the more sediment deposited, the less effective filter strips become as they fill with soil.
   - Steepness and the length above the filter strip. Water flows faster down steeper slopes. Filter strips below steep slopes need to be wider in relation to the cropland drained above to slow water and sediment movement adequately.

In general, a wider, uniformly shaped strip is more effective at stopping or slowing pollutants than a narrow strip. As a field's slope or watershed size increases, wider strips are required for effective

filtering. The table gives the suggested filter strip width based on slope. For a more accurate determination of the size of filter strip you will need for your individual field's, consult your local NRCS or Soil and Water Conservation District office.

Suggested Vegetated Filter Strip Widths on Percent Slope

Land Slope, %	Strip Width, Feet
0-5	20
5-6	30
6-9	40
9-13	50
13-18	60

Widths are for grass and legume species only and are not intended for shrub and tree species. Adapted from the NRCS Field Office Technical Guide, 1990.

2. The amount of time that water is retained in the filter strip. This is influenced by:

   - Width of the filter area. Filter strips will vary in width, depending on the percent slope, length of slope and total drainage area above the strip.
   - Type of vegetation and quality of stand. Tall, erect grass can trap more sediment than can short flexible grass. The best species for filter strips are tall perennial grasses. Filter strips may include more than one type of plant and may include parallel strips of trees and shrubs, as well as perennial grasses. In addition to potential for improving water quality, these strips increase diversity of wildlife habitat.

3. Infiltration rate of the soil.

   - Soils with higher infiltration rates will absorb water and the accompanying dissolved nutrients and pesticides faster than soils with low infiltration rates. County soil survey reports include a table listing the infiltration rate group for the soils identified in each county.

4. Uniformity of water flow through the filter strip.

   - Shallow depressions or rills need to be graded to allow uniform flow of water into the filter strip along its length. Water concentrated in low points or rills will flow at high volume, so little filtering will take place.

5. Maintenance of the filter strip.

   - When heavy sediment loads are deposited, soil tends to build up across the strip, forming a miniature terrace. If this becomes large enough to impound water, water will eventually break over the top and flow will become concentrated in that area. Strips should be inspected regularly for damage. Maintenance may include minor grading or re-seeding to keep filter strips effective.

In Summary

Vegetative filter strips can reduce sediment effectively if water flow is even and shallow. Filter strips must be properly designed and constructed to be effective. Filter strips become less effective as sediment accumulates. With slow accumulation, grass re-growth between rains often restores the filtering capacity.

Filter strips remove larger sediment particles of sand and silt first. Smaller clay-sized particles settle most slowly and may be only partially removed, depending on the strip width and water flow rate. Because soil-bound nutrients and pesticides are largely bound to clay particles, filter strips may be only partially effective in removing them. Fewer dissolved nutrients and pesticides will be removed than those bound to soil particles.

Filter strips are a complementary conservation practice that should be used with in-field conservation practices such as conservation tillage, contour buffer strips, strip cropping and waterways.

Grassed Waterways (NRCS Code 412)

These are natural or constructed channels that are shaped or graded to required dimensions and planted in suitable vegetation to carry water runoff. They are designed to carry this runoff without causing erosion or flooding and to improve water quality by filtering out some of the suspended sediment.

Fence (NRCS Code 382)

This practice may be applied as part of a conservation management system to treat the soil, water, air, plant, animal and human resources concern. This practice may be applied on any area where livestock or wildlife control is needed or where human access is to be regulated. It is used with BMPs such as Livestock Exclusion. Plans for fencing along waterways to exclude livestock need to include crossings over the waterways and provisions for drinking water sources.

Heavy Use Area Protection (NRCS Code 561)

This practice addresses the need to stabilize areas frequently and intensely used by animals or vehicles. Suggested practices include establishing vegetative cover, installing suitable surface materials and constructing needed structures.

Prescribed Grazing (NRCS Code 528A)

Prescribed grazing is the controlled harvest of vegetation with grazing or browsing animals. The Prescribed Grazing Practice helps ensure that forage use does not exceed the production limitations of the forage being grazed to the extent that forage health, soil erosion condition, water quality and animal health are affected negatively. Grazing systems are used to accomplish this goal and may be used to control the forage, the animals, or both. Successful implementation of a grazing system requires periodic monitoring and adjustments of forage or livestock to ensure that goal is met. Grazing systems range from continuous grazing to rotational grazing, with several intermediate levels of intensity. All grazing systems have advantages and disadvantages. The requirements of a grazing system and the goals of the manager can be matched to provide environmentally and economically sound options for specific situations.

Continuous Grazing

Unrestricted grazing of one pasture by livestock throughout a certain season or during the entire year.

Advantages:

- Requires the least time and labor.
- Initial capital expenditures are relatively low.
- Animals are allowed to graze selectively and when stocking rates are appropriate. This method can result in high levels of individual animal performance.

Disadvantages:

- Limits options for managing through inclement environmental conditions.
- Reduces potential for effectively utilizing species with different growing seasons (warm season vs. cool-season).
- Reduces the potential to harvest excess forage production as hay.
- Selective grazing allows for uneven pasture use; both over grazing and under grazing can occur in the same pasture. In mixed species stands, the most palatable species can be overgrazed and replaced by less palatable species.

Rotational Grazing

Grazing more than one paddock in sequence followed by a rest period for recovery and re-growth of the grazed forage. Rotational grazing can be used whenever two or more pastures are available. The intensity of a rotational grazing system generally increases as more pastures are created.

Advantages:

- Flexibility or management control increases as the pastures increase in number. Excess forage

production can be harvested or more easily stockpiled (sometimes called dormant season grazing) for later use. Increased potential for using species with different growing seasons.
- Forage harvest efficiency increases as intensity increases. This may allow for higher livestock carrying capacity under some conditions.
- Allows the forage species to rest and re-grow.
- Gives concentration areas a chance to heal between uses, and results in more even manure distribution across the pasture.
- Has the potential to increase pounds of meat produced per acre.

Disadvantages:

- As grazing intensity increases, the initial capital and labor expenditures increase.
- Increased investment risk.
- Increased management input as intensity increases.
- If pastures are not grazed or harvested within a certain time, the quality of available forage may drop during an extended rest period, which could affect animal performance adversely. Individual animal performance is lower than that of continuous grazing.

It should be specifically noted that there is no inherently superior grazing system among the approaches available. Requirements of the various grazing approaches and goals of the manager can be matched to provide environmentally and economically sound options for specific grazing situations that may include any of these grazing approaches or stocking methods.

Trough or Tank (NRCS Code 614)

A trough or tank is installed to provide drinking water for livestock. This practice provides water for livestock at selected locations that will protect vegetative cover. It also reduces or eliminates the need for livestock to be in streams. This practice applies where there is a need for new or improved watering places that permit the desired level of grassland management. It also reduces health hazards for livestock and reduces livestock waste in streams.

Critical Area Planting (NRCS Code 342)

This involves the planting of vegetation, such as trees, shrubs, vines, grasses or legumes, on highly erodible or critically eroding areas. This practice does not include planting trees for wood products. The primary purposes are to stabilize the soil, reduce damage from sediment and runoff to downstream areas, and improve wildlife habitat and aesthetics. Examples of applicable areas are dams, dikes, levees, cuts, fills and denuded or gullied areas where vegetation is difficult to establish by usual planting methods.

Regulating Water in Drainage System (NRCS Code 554)

Controlling the removal of surface runoff, primarily through the operation of water control structures. It is designed to conserve surface water by controlling the outflow from drainage systems.

Riparian Forest Buffer (NRCS Code 391)

This is an area of trees, shrubs and other vegetation located adjacent to and uphill from water bodies. This practice may be applied in a conservation management system to supplement one or more of the following:

- To create shade to lower water temperature, this would improve habitat for aquatic organisms.
- To remove, reduce or buffer the effects of nutrients, sediment, organic material and other pollutants before entry into surface water and groundwater recharges systems.
- This practice applies on cropland, hayland, rangeland, forestland and pastureland areas adjacent to permanent or intermittent streams, lakes, rivers, ponds, wetlands and areas with groundwater recharge where water quality is impaired or where there is a high potential of water quality impairment.

Stream Bank and Shoreline Protection (NRCS Code 580)

This practice involves using vegetation or structures to stabilize and protect banks of streams, lakes, estuaries or excavated channels against erosion. Its purpose is to stabilize or protect banks of streams, lakes, estuaries or excavated channels for one or more of the following purposes:

- To prevent the loss of land or damage to utilities, roads, buildings or other facilities adjacent to the banks.
- To maintain the capacity of the channel.
- To control channel meander that would affect downstream facilities negatively.
- To reduce sediment loads causing downstream damages and pollution.
- To improve the stream for recreation or as a habitat for fish and wildlife.

This practice applies to natural or excavated channels where the stream banks are likely to be eroded from the action of water, debris or damage from livestock or vehicular traffic. It also applies to controlling erosion on shorelines where the problem can be solved with relatively simple structural measures, vegetation or upland erosion practices and where failure of structural measures will not create a hazard to life or result in serious damage to property.

Livestock Exclusion (NRCS Code 472)

The purpose of Use Exclusion is to protect, maintain or improve the quantity and quality of the natural resources in an area by excluding animals, people or vehicles from an area. The purpose includes aesthetic resources as well as human health and safety. The practice is used in a conservation plan in areas where vegetation establishment or maintenance is a concern. Protecting the vegetation is often essential to conserving the other natural resources. The barriers constructed must be adequate to prevent, restrict or control use by target animals, vehicles or people. The barriers are usually fences, but they may be natural and artificial structures such as logs, boulders, earth fill, gates, signs, etc.