

SWINE



Swine Production Best Management Practices (BMPs)

endorsed by



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WHY BMPs ARE IMPORTANT TO LOUISIANA

*I*n Louisiana we are blessed with beautiful and abundant waters to enjoy fishing, hunting, boating or just relaxing on the shore of a lake, river or bayou. Most of the water in Louisiana's rivers and lakes comes from rainfall runoff. As this runoff travels across the soil surface, it carries with it soil particles, organic matter and nutrients, such as nitrogen and phosphorus. Agricultural activities contribute to the amount of these materials entering streams, lakes, estuaries and groundwater. In addition to assuring an abundant, affordable food supply, Louisiana farmers must strive to protect the environment.

*R*esearch and educational programs on environmental issues related to the use and management of natural resources have always been an important part of the LSU AgCenter's mission. Working with representatives from the agricultural commodity groups, the Natural Resources Conservation Service (NRCS), the Louisiana Department of Environmental Quality (LDEQ), the Louisiana Farm Bureau Federation (LFBF) and the Louisiana Department of Agriculture and Forestry (LDAF), the LSU AgCenter has taken the lead in assembling a group of Best Management Practices (BMPs) for each agricultural commodity in Louisiana.

BMPs are practices used by agricultural producers to control the generation and delivery of pollutants from agricultural activities to water resources of the state, thereby reducing the amount of agricultural pollutants entering surface and ground waters. Each BMP is a culmination of years of research and demonstrations conducted by agricultural research scientists and soil engineers. BMPs and accompanying standards and specifications are published by the NRCS in its Field Office Technical Guide.



INTRODUCTION

The pork industry in Louisiana is not as large as the poultry or beef cattle industries, but it does have an impact on the Louisiana agriculture community and the Louisiana economy. As late as 1949, more than 1.5 million market hogs were produced annually in Louisiana. The number of market hogs and feeder pigs produced in Louisiana decreased annually until production stabilized about 1985. From 1994 to 1997, approximately 800 Louisiana pork producers annually produced 75,000 market hogs and 25,000 feeder pigs.

Louisiana had 634 pork producers in 1999 compared to 542 in 1998. The increase in total numbers of pork producers is caused primarily by an increase in the number of show pig producers. Fifty-three parishes reported production of pigs in 1999, with a total breeding herd of 5,303 head. The total value of hogs produced and processed in

Louisiana in 1999 exceeded \$7 million.

Best Management Practices (BMPs) have been determined to be an effective and practical means of reducing point and nonpoint-source water pollutants at levels compatible with environmental quality goals. The primary purpose for implementation of BMPs is to conserve and protect soil, water and air resources. BMPs for swine farms are a specific set of practices used by farmers to reduce the amount of soil, nutrients, pesticides and microbial contaminants entering surface and groundwater while maintaining or improving the productivity of agricultural land. This list of BMPs is a guide for the selection and implementation of those practices that will help swine farmers to conserve soil and protect water and air resources by reducing pollutants from reaching both surface and groundwater.

The BMPs that apply most directly to the swine industry are included in this publication. A brief description, purpose and conditions to which the practice applies are given for each of the swine BMPs listed.

References are made to specific Natural Resources Conservation Service (NRCS) production codes, which are explained in the text of this document. More detailed information about these practices can be found in the NRCS Field Office Technical Guide (FOTG). The FOTG can be found in all Soil and Water Conservation district offices and all NRCS field offices or on the NRCS web page. Additionally, under voluntary participation by the producer, technical assistance to develop and implement a farm-specific conservation plan is available through the Conservation Districts, NRCS field offices and the LSU AgCenter parish offices.



SOIL AND WATER MANAGEMENT

Sediment is the largest pollutant by volume of surface water in the Nation. Sediment comes from agricultural sources, construction sites and other soil-disturbing activities in urban settings that leave the soil exposed to rainfall. Sediment increases the turbidity of water, thereby reducing light penetration, impairing photosynthesis, altering oxygen relationships and may reduce the available food supply for certain aquatic organisms. It can affect fish populations adversely in areas where sediment deposits cover spawning beds. Increased sediment also fills lakes and reservoirs.

Sediment directly damages water quality and reduces the usefulness of streams and lakes in many ways. These include:

- Damaged fish spawning areas
- Reduced light penetration for aquatic life
- Increased water purification costs
- Lower recreational value
- Clogged channels and increased flooding
- Increased dredging to maintain shipping channels
- Reduced storage capacity for reservoirs

In addition, sediment is often rich in organic matter. Nutrients such as nitrogen and phosphorus and certain pesticides may enter streams with sediment. The detrimental effects of these substances accompanying the sediment may include:

- Rapid algae growth
- Oxygen depletion as organic matter and algae decomposition
- Fish kills from oxygen depletion
- Toxic effects of pesticides on aquatic life
- Unsafe drinking water caused by nitrate or pesticide content

The following are production practices and the NRCS production code associated with each practice that applies to swine production.

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 drainageways, 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 fields, 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. Parish soil survey reports include a table listing the infiltration rate group for the soils identified in each parish.

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 regrowth 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.



Roof Runoff Management (NRCS Code 558):

The practice addresses the collection, control and disposal of runoff water from roofs. It is used to prevent the runoff water from roofs from flowing across animal waste areas and to reduce pollution and erosion, improve water quality, improve drainage and protect the environment. This practice applies where: (1) roof runoff is included in an overall plan for a waste management system and (2) roof runoff water may come in contact with wastes or cause soil erosion.



Sediment Basin (NRCS Code 350):

This is a basin constructed to collect and store manure and sediment. Its purpose is to maintain the capacity of lagoons, to prevent deposition on bottom lands and to trap sediment, agricultural wastes and other debris. This practice helps prevent bedding materials, such as sand, hay or straw, from entering waste disposal systems, and traps manure for hauling to fields.



Drain line from sediment basin

Waste Management System (NRCS Code 312):

This is a planned system in which all the necessary components are present for managing liquid and solid waste, including runoff from concentrated waste areas. This is done in a manner that does not degrade air, soil or water resources. The purpose is to manage waste in a manner that prevents or minimizes pollution of air, soil and water resources and protects public health and safety. Such systems are planned to reduce discharge of pollutants to surface or groundwater and to recycle waste through soil and plants.



Pit recharge systems are used to improve air quality by reducing gaseous odors.



Flush systems are used extensively throughout the pork industry to handle waste.

Waste Storage Facility (NRCS Code 313):

This system is comprised of a waste impoundment made by constructing an embankment, excavating a pit or by fabricating a structure. This practice is designed to temporarily store waste such as manure, wastewater and contaminated runoff. This standard establishes the minimum acceptable requirements for planning, designing, constructing, operating and maintaining waste storage facilities, including waste storage tanks, waste stacking facilities and settling basins. It does not apply to waste treatment lagoons (NRC Code 359). Storage tanks are used for liquid and slurry wastes and may be: (1) open or covered, (2) within or outside an enclosed housing or (3) beneath slotted floors. Stacking facilities are used for solid wastes and may be open or roofed. Settling basins are used to separate solids from polluted runoff, wastewater or wash water.



Waste Treatment Lagoon (NRCS Code 359):

This is an impoundment made by excavation or earthfill for the temporary storage and biological treatment of animal or other agricultural waste. The impoundment stores organic waste, reduces pollution and protects the environment. This standard establishes the minimum acceptable requirements for design, construction and operation of waste treatment lagoons. Embankments are limited to an effective height of 35 feet or less. This practice applies where: (1) an overall waste management system has been planned, (2) waste generated by agricultural production needs treatment, (3) a lagoon can be located near the source of the waste, (4) soils are suitable for retaining the waste or can be sealed and (5) a water supply is adequate to fill the lagoon to about 3 feet before operation and to maintain the design depth when the lagoon becomes fully operational.



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.



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, which 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 recharge 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.



Waste Utilization (NRCS Code 633):

This involves using agricultural waste on land in an environmentally acceptable manner while maintaining or improving soil and plant resources. It is designed to use waste safely to provide fertility for crop forage or fiber production and to improve or maintain soil structure. It also helps to prevent erosion and to safeguard water resources. It is applicable on soils and vegetation suitable for the use of waste as a fertilizer. This includes waste from farm feedlot and swine operations, municipal treatment plants and agricultural processing plants.

For more information on these practices and how to implement them, contact your local NRCS or Conservation District office.





NUTRIENT MANAGEMENT



Introduction

A sound soil fertility program is the foundation upon which a profitable farming business must be built. Agricultural fertilizers are a necessity for producing abundant, high quality food, feed and fiber crops. Using fertilizer nutrients in the proper amounts and applying them correctly are both economically and environmentally important to the long-term profitability and sustainability of crop production. The fertilizer nutrients that have potential to become groundwater or surface water pollutants are nitrogen and phosphorus. In general, other commonly used fertilizer nutrients do not cause concern as pollutants.

Because erosion and runoff are the two major ways nonpoint-source pollutants move into surface water resources, practices that reduce erosion or runoff are considered Best Management Practices (BMPs). Similarly, practices that limit the buildup of nutrients in the soil, which can

leach to groundwater or be picked up in runoff, and practices that ensure the safe use of agricultural chemicals also are considered BMPs. In general, soil conservation and water quality protection are mutually beneficial; therefore the BMPs described here are the best means of reducing agricultural nonpoint-source pollution resulting from fertilizer nutrients.

Nitrogen

Nitrogen (N) is a part of all plant and animal proteins. Therefore, human survival depends on an abundant supply of N in nature. Approximately 80 percent of the atmosphere is nitrogen gas, but most plants cannot use this form of nitrogen, and supplemental nitrogen must be supplied through the soil. A crop well supplied with N can produce substantially higher yields, on the same amount of water, than one deficient for N. Furthermore, properly fertilized crops use both N and water more efficiently, thus improving environmental quality and profitability.

Supplemental N is necessary on almost all non-legume crops in Louisiana for maximum profits. Producers should follow N recommendations based on Louisiana research. These recommendations take into account maximum economic yield potentials, crop variety, soil texture and area of the state. Nitrogen recommendations from the LSU

AgCenter are usually ample to provide optimum economic yields.

Decomposition of organic matter results in simpler inorganic N forms such as ammonium (NH_4^+) and nitrate (NO_3^-). These are soluble in soil water and readily available for plant uptake. The ammonium form is attracted to and held by soil particles, so it does not readily leach through the soil with rainfall or irrigation water. Nitrates, on the other hand, are not attached to soil particles and do move downward with soil water and can be leached into groundwater or run off into surface waters.

Excessive nitrate concentrations in water can accelerate algae and plant growth in streams and lakes, resulting in oxygen depletion. Nitrate concentrations above a certain level in drinking water may injure young animals or human infants.

Phosphorus

Phosphorus (P), like nitrogen, is essential for plant growth. Naturally occurring P exists in a phosphate form either as soluble inorganic phosphate, soluble phosphate, particulate phosphate or mineral phosphate. The mineral forms of phosphorus (calcium, iron and aluminum phosphates) do not dissolve in water very easily. The amount of these elements (calcium, iron and aluminum) present in reactive

forms varies with different soils and soil conditions.

The immediate source of phosphorus for plants is that which is dissolved in the soil solution. Phosphate is absorbed from the soil solution and used by plants. A soil solution containing only a few parts per million of phosphate is usually considered adequate for plant growth. Phosphate used by plants is replaced in the soil solution by soil minerals, soil organic matter decomposition or applied fertilizers or animal waste.

Most phosphate is not readily water soluble. Most of the ions are either used by living plants or adsorbed to sediment, so the potential of their leaching to groundwater is low. That

portion of phosphate bound to sediment particles is virtually unavailable to living organisms, but becomes available as it detaches from sediment. Only a small part of the phosphate moved with sediment into surface water is immediately available to aquatic organisms. Additional phosphate can slowly become available through biochemical reactions. The slow release of large amounts of phosphate from sediment layers in lakes and streams could cause excessive algae blooms and excessive growth of plants, thereby affecting water quality.

Nutrients will be used to obtain optimum crop yields while minimizing the movement of nutrients to surface and groundwater (NRCS Production Code 590). A nutrient management plan should be developed for the proposed crop by using soil analyses from approved laboratories.



algae bloom

Nutrient Application Rates

Nutrient application rates will be based on the results of a soil analysis. Select only those materials recommended for use by qualified individuals from the Louisiana Cooperative Extension Service, Louisiana Agricultural Experiment Station, certified crop advisors and certified agricultural consultants or published LSU AgCenter data.



Soil testing is the foundation of a sound nutrient management program.

A soil test is a series of chemical analyses that determine the levels of essential plant nutrients in the soil. When not taken up by a crop, some nutrients, particularly nitrogen, can be lost from the soil by leaching, runoff or mineralization. Others, like phosphorus, react with soil minerals over time to form compounds that are not available for uptake by plants. Soil testing can be used to estimate how much loss has occurred and to predict which nutrient(s) and how much of that nutrient(s) should



be added to the soil to produce a particular crop and yield. Take soil tests at least every three years or at the beginning of a different cropping rotation.

Recommended Practices

1. Soil test for nutrient status and pH to:

- determine the amounts of additional nutrients needed to reach designated yield goals, and the amount of lime needed to correct soil acidity (pH) problems
- optimize farm income by avoiding excessive fertilization and reducing nutrient losses by leaching and runoff; and identify other yield-limiting factors such as high levels of salts or sodium that may affect soil structure, infiltration rates, surface runoff and, ultimately, groundwater quality.

2. Base fertilizer applications on:

- soil test results
- realistic yield goals and moisture prospects
- crop nutrient requirements
- past fertilization practices
- previous cropping history

3. Manage low soil pH by liming according to the soil test to:

- reduce soil acidity
- improve fertilizer use efficiency
- improve decomposition of crop residues
- enhance the effectiveness of certain soil applied herbicides

4. Time nitrogen applications to:

- correspond closely with crop uptake patterns
- increase nutrient use efficiency
- minimize leaching and runoff losses

5. Inject fertilizers or incorporate surface applications when possible to:

- increase accessibility of fertilizer nutrients to plant roots
- reduce volatilization losses of ammonia N sources
- reduce nutrient losses from erosion and runoff

6. Use animal manures and organic materials:

- when available and economically feasible
- to improve soil tilth, water-holding capacity and soil structures
- to recycle nutrients and reduce the need for commercial inorganic fertilizers

7. Rotate crops when feasible to:

- improve total nutrient recovery with different crop rooting patterns
- reduce erosion and runoff
- reduce diseases, insects and weeds

8. Use legumes where adapted to:

- replace part or all of crop needs for commercial N fertilizer
- reduce erosion and nutrient losses
- maintain residue cover on the soil surface

9. Control nutrient losses in erosion and runoff by:

- using appropriate structural controls
- adopting conservation tillage practices where appropriate
- properly managing crop residues
- land leveling
- implementing other soil and water conservation practices where possible
- using filter strips

10. Skillfully handle and apply fertilizer by:

- properly calibrating and maintaining application equipment
- properly cleaning equipment and disposing of excess fertilizers, containers and wash water
- storing fertilizers in a safe place

Comprehensive Nutrient Management Plans (CNMPs)

Both the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) are encouraging a voluntary approach to handling nonpoint-source pollution issues related to animal agriculture. The implementation of Comprehensive Nutrient Management Plans (CNMP) by all swine producers will ensure that the nutrient value of manure is managed in an environmentally friendly fashion by either (1) properly using manure on the land based on its nutrient value or (2) transferring the manure to an alternative use program.

Manure is an excellent source of organic nutrients that can be incorporated into most farming operations when properly managed. For swine producers, the proper management of manure is a major consideration in daily operations. Whether the material is used as a nutrient source on land controlled by the producer, provided as a nutrient source on other lands or is offered as a material in an alternative use process, the proper management of the manure is essential. Storage, transportation, application, disease prevention and proper documentation are just a few of the items that need to be included in the manure management plan.

Developing a Comprehensive Nutrient Management Plan

A Comprehensive Nutrient Management Plan (CNMP) is a strategy for making wise use of plant nutrients to enhance farm profits while protecting water resources. It is a plan that looks at every part of your farming operation and helps you make the best use of manures, fertilizers and other nutrient sources. Successful nutrient management requires thorough planning and recognizes that every farm is different. The type of farming you do and the specifics of your operation will affect your CNMP. The best CNMP is one that is matched to the farming operation and the needs of the person implementing the plan.

The Parts of a CNMP

A CNMP takes into account how nutrients are used and managed throughout the farm. It is more than a nutrient management plan that looks only at nutrient supply and needs for a particular field. Nutrients are brought to the farm through feeds, fertilizers, animal manures and other off-farm inputs. These inputs are used, and some are recycled by plants and animals on the farm. Nutrients then leave the farm in harvested crops and animal products. These are nutrient



removals. Ideally, the amount of nutrient inputs and removals should be roughly the same. When nutrient inputs to the farm greatly exceed nutrient removals from the farm, the risk of nutrient losses to groundwater and surface water is increased. When you compare nutrient inputs and nutrient removals, you are creating a mass balance. **This nutrient mass balance is an important part of a CNMP and important to understand for your individual farming operation.**

BMPs also are important to a successful CNMP. BMPs, such as soil testing and manure analysis, help you select the right nutrient rate and application strategy so that crops use nutrients efficiently. This not only reduces nutrient losses and protects the environment but also increases farm profitability. BMPs may include managing the farm to reduce soil erosion and improve soil tilth through conservation tillage, planting cover crops to use excess nutrients or using filter strips and buffers to protect water quality. Preventive maintenance, record keeping and emergency response plans must be included in a CNMP for swine operations, too.



Filter strip

The Basic Steps

CNMPs consist of five major parts: evaluation of nutrient needs, inventory of nutrient supply, determination of nutrient balance, preventive maintenance and inspection, and an emergency response plan.

Evaluation of Nutrient Needs

Maps and Field Information

You will need a detailed map of your farm. The map should include:

- farm property lines
- your fields with the field identification
- the location of all surface waters such as streams, rivers, ponds or lakes
- direction of surface flows
- arrows showing the direction that streams or rivers flow
- a soils map, if available

This map will serve as the basis for the entire plan, so each field should have a unique identification. In addition to the map, prepare a list of the crops to be grown in each field with a realistic yield goal for each crop. Most of this information is available at your local USDA Farm Service Center.

Locate Critical Areas

Certain areas on your farm such as streams and rivers, wellheads and lakes or ponds are sensitive to nutrient overload. You should create buffer zones around these areas on your map where nutrient use will be reduced or eliminated. By buffering these areas, water quality problems may be decreased. Areas such as roads, off-site dwellings

and areas of public gatherings should be noted on your map. To reduce complaints about odors, you may want to limit the use of manures near these types of areas.



Soil Testing

Complete and accurate soil tests are important for a successful nutrient management plan. You will need soil tests at least every three years to determine how much nutrient addition is needed. The needed nutrients can be supplied from commercial fertilizer or organic sources. Be sure to take representative soil samples and have them tested by a reputable laboratory familiar with Louisiana soils and crop production. Your county agent can help you submit samples to the LSU Soil Testing Laboratory.

Determine Nutrients Needed for Each Field

Once you have set realistic yield goals and you have your soil test results, you can determine the nutrients your crops will need. The amount of nutrients needed should be based on your local growing conditions. At a minimum, the amounts of lime, nitrogen, phosphorus and potassium should be listed in the plan for each field. Most soil and plant analysis labs will give you recommended application rates based on the soil test results. Your county agent can help you with this.





Inventory of Nutrient Supply

Many of the nutrients needed to grow your crops are already present on your farm in the soil, in animal manures or in crop residues. Knowing the amounts of nutrients already present in these sources is important so that you do not buy or apply more nutrients than needed.

Determine the Quantity of Nutrients Available on Your Farm

Supply planning starts with an inventory of the nutrients produced on the farm. Animal manure is an important source of nutrients. The quantity of manure collected and stored, either dry or liquid, should be determined. An inventory should be performed of any other by-products available, such as lagoon sludge (if lagoon cleaning is planned), crop residue nutrients or nitrogen from legumes. This information will allow you to balance your nutrient purchases with what is available on your farm for the realistic production potential of the crops grown.

Nutrient Analysis

Animal manure and other organic products are not all the same as far as nutrient content is concerned. A nutrient analysis of these products tells you their nutrient content so you can match this with soil test recommendations and determine application rates. The lab results will help you determine how much of the nutrients in the manure will be available to your crops. The amount credited to the nutrient budget should be based on plant available nutrient levels, which may be substantially different from the total nutrient content. Your parish LSU AgCenter Extension office can help you arrange for nutrient analysis.

Determining Nutrient Balance

Balance Between Supply and Need

Once you have determined both the supply and need of nutrients for each of your fields, a critical aspect of CNMPs is balancing the two. This can be done in several ways. Most CNMPs are developed based on nitrogen, but other factors such as phosphorus or metals could control how much poultry litter or manure you can put out under certain conditions. A phosphorus index has been developed to help producers determine when nutrient management based on phosphorus would be advisable. If your crop acreage is small relative to the number of animals produced, the nutrient balance will allow you to evaluate how much manure you may need to move off your farm to avoid overapplication of nutrients.

Manure Storage

Manure storage is critical because it affects both the quantity and quality of nutrients that will need to be land applied or exported from the farm. The storage structures and design capacities need to be identified as part of a CNMP. These structures also need to be managed to prevent nutrient losses and to protect water quality.

Manure Application to Fields

Land application is the most common, and usually the most desirable, method of using manure because of the value of the nutrients and organic matter. Basic requirements of the manure management plan to ensure that material applied on the land does not cause pollution include (1) calculations to determine the proper amount of manure to be applied to meet, but not exceed, crop nutrient needs and (2) land management practices to prevent runoff and erosion of material applied to crop or pasture lands.

Timing of animal waste application must be considered to reduce potential water pollution and to increase plant nutrient uptake. Timing of application should be just before or during periods of maximum crop nutrient uptake such as either spring or summer when crops can use most of the nutrients.

Spring application can be made on almost any crop. Bermuda grass hayfields are ideal for spring applications of lagoon waste because they can use the water and large amounts of nitrogen. Make sure that the excess forage produced is harvested or heavily grazed. Fall application can lead to losses of up to 50 percent of the total nitrogen through decomposition and leaching.

Winter applications have shown large nutrient losses, too. Up to 86 percent of the nitrogen and 94 percent of the phosphorus applied during the winter season can be lost in a single rainfall or runoff in colder climates. If fall

and winter applications cannot be avoided, manure rates should be applied to a vegetative cover crop, thus reducing runoff losses.

Climate

Local weather conditions should be checked before land application. It is best to spread manures in the morning when the air is warming and rising, when the humidity is low and when the wind is blowing away from residential areas. Although rain removes odors from the air, waste should not be spread within 24 hours of predicted rain unless it can be incorporated into the soil at the time of application. Checking these and other weather conditions will help to dissipate the odors quickly.

Crop Type

The crop's sensitivity to ammonia should be taken into account when determining application time. Animal wastes with high ammonia concentrations have been shown to inhibit seed germination and decrease yields when applied too close to the planting date.

Manures should be applied near the time when crops need nutrients by using calibrated spreaders or irrigation equipment. Solid or slurry manure should be incorporated into the soil when appropriate. Incorporation or mixing into the soil greatly reduces losses of nitrogen to the air and keeps more in the soil where it is needed. This also reduces potential odor emissions.

Some nutrients applied in excess of crop needs can accu-

mulate in the soil, and at certain levels may cause water pollution. High soil phosphorus levels have been linked to negative water quality impacts. On such fields, application of manure may need to be reduced or stopped to remove excess phosphorus from the soils through crop uptake.

Proper land management following manure application can reduce runoff and loss of nutrients to overland flow. Conservation practices that should be included as part of a land application plan are conservation tillage, grazing management, buffers and other practices that will prevent runoff, erosion and the washing of organic matter and nutrients from fields. Taken together with nutrient management, these practices will help to ensure that the right amount of nutrients are applied to the field, that the nutrients stay on the field and that any potential pollutants that might be washed from the field are captured before they reach a stream or lake.

Methods of applying animal wastes are broadcasting, broadcasting followed by incorporation, knifing or injection, and irrigation.



Application Methods

The application method depends on the manure moisture content. Most animal manures are in a solid, liquid or slurry form. Solid manure will have a solids content of about 15 percent to 25 percent; liquid manure will have 0 percent to 4 percent solids; slurry manure will have a solids content in between.

Slurry manure can be spray irrigated but is often broadcast or soil injected by a liquid manure spreader. Waste slurries should be applied to the soil surface so plants and soil bacteria can use and break down the nutrients with a minimum of soil and water pollution.

Solid manure can be handled either by drying or by adding bedding (straw, wood chips). Bedding, in addition to its adsorption properties, helps reduce volatilization losses of nitrogen.

Broadcasting without immediate injection can lead to losses by ammonia volatilization and by surface runoff. Limiting winter manure spreading to land with less than 6 percent slopes or on land treated to meet allowable soil loss limits can reduce surface runoff. The spreading of animal manure within 200 feet of a stream, pond or water well should be avoided to reduce potential transport of nutrients to surface water and groundwater. Planting a grassed buffer strip between the land and any creek, waterway and surface impoundment can protect the water from excess surface runoff and erosion.

Incorporation of manure into the soil before it dries produces the best crop yields and lowest nutrient losses. Immediate incorporation of solid manure minimizes losses to the air and allows soil microorganisms to decompose the waste sooner, thus allowing nutrients to become available sooner. When manure slurry is incorporated, losses to air and runoff, as well as odors, are minimized. All forms of animal waste should be incorporated when applied to land with slopes of more than 10 percent or on land subject to flooding.

Recommended Practices

- Land to receive solid manures or wastewater irrigation should have a slope less than 6 percent. Waste and wastewater may be applied to steeper slopes if it is incorporated immediately or if vegetation and other practices to reduce erosion and surface runoff are adequate.
- Waste should not be spread when the ground is frozen or saturated or during rainfall.
- Waste should be incorporated into the soil within 48 hours of application. If the waste is not to be incorporated, a 200-foot buffer zone of grass or other thick vegetation should be maintained between the disposal areas and the downhill property line or water courses.
- Representative soil samples should be taken at least annually from the water and/or wastewater application site.
- When wastewater is applied through irrigation, a 100-foot or more buffer zone should be left downwind to prevent spray from leaving the property.
- The cover crop should be harvested at least once a year.

Swine producers should keep records of the amount of manure applied to each field, its nutrient content and the date of application. The amount of manure transported to others should be recorded, along with the date, amount and person receiving the manure.

Identify Alternative Uses for Excess Manures

If your manure production exceeds nutrient needs on-farm, you should identify alternatives to land application of your manure. Potential options include selling manures to other farmers, composting manures for use by homeowners or possibly selling it to other off-farm users.



When transporting manure to an alternative use location, to a land application site or to any other location using public roads, trucks or other vehicles should be covered and/or be contained well enough to prevent loss of material.



Preventive Maintenance and Inspections

Keeping good, detailed records that help you monitor your progress are essential to determine if your CNMP is accomplishing the goals you have set. You should keep all results from soil, plant and manure tests and examine how they change with time with your management practices. Keep records on crop yields, manure production, manure exports, nutrient application rates, timing and application methods. Keep detailed schedules and records on calibration of spraying and spreading equipment, maintenance of pumps and other machinery, and inspections and current capacities on manure storage facilities. When you have a major change in production, update your plan to reflect these changes.



Emergency Response Plans

The final aspect of your plan should include the procedures to follow in an emergency. This should include actions taken to contain or manage any discharge of manure or wastewater, a list of the proper authorities to notify when certain events occur and any authorizations necessary to obtain essential equipment or access to neighboring properties during these events. It should outline a plan for training new employees in these procedures.

Where Can You Obtain Information Needed for Your CNMP?

The LSU AgCenter, the USDA Natural Resources Conservation Service, the Louisiana Department of Agriculture and Forestry, Certified Crop Advisors or other private consultants will be able to assist you in developing parts of a nutrient management plan.

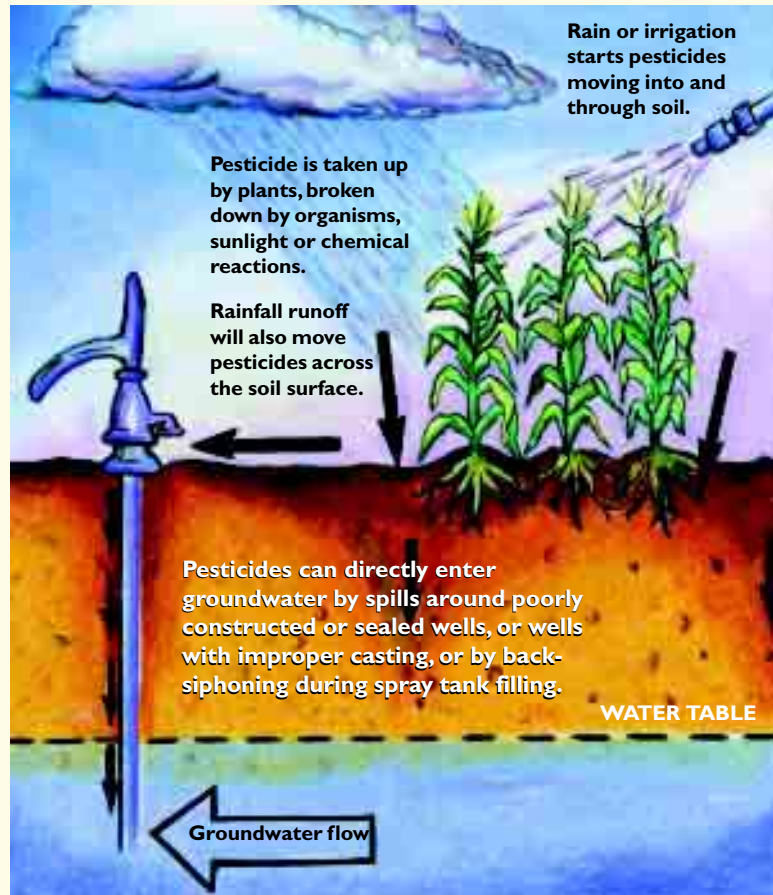
A CNMP is a good tool to help you use your on- and off-farm resources more efficiently and to prevent future problems. A successful CNMP will help you obtain the maximum profit while protecting the environment.



PESTICIDE MANAGEMENT AND PESTICIDES

Introduction

To preserve the availability of clean and environmentally safe water in Louisiana, contamination of surface and groundwater by all agricultural and industrial chemicals must be reduced. Some sources of contamination are easily recognizable from a single, specific location. Other sources are more difficult to pinpoint. Nonpoint-source pollution of water with pesticides is caused by rainfall runoff, particle drift or percolation of water through the soil. Pest management practices will be based on current research and extension recommendations. By using these recommendations, pesticide usage will follow environmentally sound guidelines.



Soil-incorporated systemic pesticide

Pesticide is carried into and through soil. Movement through soil is affected by soil and pesticide properties and amount and timing of water. Pesticide residue and by-products not absorbed are broken down into the groundwater.

Movement with groundwater – additional breakdown generally slowed, but depends on chemical nature and groundwater.

Pest Management Procedures

Pesticides will be applied only when they are necessary to protect the crop. The pesticide will be chosen following guidelines to assure that the one chosen will give the most effective pest control with the least potential adverse effects on the environment.

Water quality, both surface and ground, will be protected by following all label recommendations and guidelines dealing with water quality.

- All label statements and use directions designed specifically to protect groundwater will be followed closely.

- Specific Best Management Practices designed to protect surface water will be followed closely.

- Erosion control practices (such as pipe drops, etc.) will be used to minimize runoff that could carry soil particles with adsorbed pesticides and/or dissolved pesticides into surface waters.



Pesticide Application

Management practices such as the pesticide selected, the application method, the pesticide rate used and the application timing influence pesticide movement. Pesticides should be applied only when needed to prevent economic loss of a crop.

In pesticide application, “the label is the law.” Using chemicals at rates higher than specified by the label is ILLEGAL as well as an environmental hazard because more pesticide is exposed to erosion, runoff or leaching. Poor timing of a pesticide application (application just before rain falls) can result in pesticide movement into water sources, as well as give little control of the targeted pest.

Certain areas on your farm such as streams and rivers, wellheads and lakes or ponds are sensitive to pesticides. You should create buffer zones around these areas where pesticide use will be reduced or eliminated. By buffering these areas, you may reduce water quality problems. Areas such as roads, off-site dwellings and areas of public gatherings should be identified. You may want to limit the use of pesticides near these types of areas, too.

These practices will be followed:

- Select the pesticide to give the best results with the least potential environmental impact outside the spray area.



- Select application equipment with care and maintain it carefully.

- Carefully calibrate application equipment at the beginning of the spray season and periodically thereafter. Spray according to recommendations.



- Minimize spray drift by following the label instructions and all rules and regulations developed to minimize spray drift (the physical movement of spray particles at the time of or shortly after application).

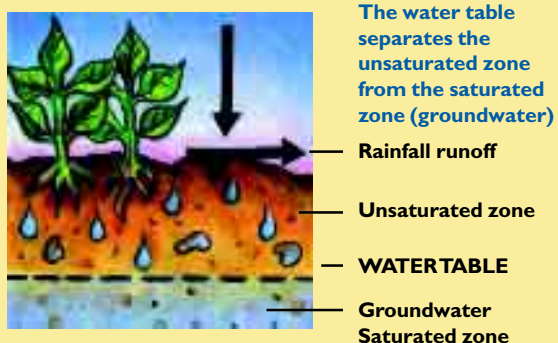
- Before applying a pesticide, make an assessment of all of the environmental factors involved in all of the area surrounding the application site.



- Carefully maintain all pesticide applications, not just Restricted Use Pesticides.

Pesticide Selection

When selecting pesticides, consider chemical solubility, adsorption, volatility and degradation characteristics. Chemicals that dissolve in water readily can leach through soil to groundwater or be carried to surface waters in rainfall or irrigation runoff. Some chemicals hold tightly to, or are adsorbed on, soil particles, and these chemicals do not leach as much. But even these chemicals can move with sediment when soil erodes during heavy rainfall. Runoff entering surface waters may ultimately recharge groundwater reserves. Chemicals bound to soil particles and organic matter are subject to the forces of leaching, erosion or runoff for a longer period, thus increasing the potential for water pollution.



These practices will be followed:

- Selection will be based upon recommendations by qualified consultants, crop advisors and upon the published recommendations of the LSU AgCenter, Cooperative Extension Service.
- The selection of the pesticide to be used will be based upon its registered uses and its ability to give the quality of pest control required.
- The selection also will be based upon its impact on beneficials, other non-target organisms and on the general environment.

Pesticide Storage and Safety

Pesticide storage shed



Farmers and commercial pesticide applicators are subject to penalties if they fail to store or dispose of pesticides and pesticide containers properly. Each registered pesticide product, whether general or restricted use, contains instructions for storage and disposal in its labeling. The Louisiana Pesticide Law addresses specific requirements for storage and disposal. The applicator must follow these requirements carefully and ensure that employees follow them as well.

The recommended procedures do not apply to the disposal of single containers of pesticides registered for use in the home and garden. These containers may be disposed of during municipal waste collection if wrapped according to recommendations.

Storage sites should be chosen to minimize the chance of pesticides escaping into the

environment. Pesticides should not be stored in an area susceptible to flooding or where the characteristics of the soil at the site would allow escaped chemicals to percolate into groundwater. Storage facilities should be dry, well ventilated and provided with fire protection equipment. All stored pesticides should be carefully labeled and segregated and stored off of the ground. Do not store pesticides in the same area as animal feed. The facility should be kept locked when not in use. Further precautions include appropriate warning signs and regular inspection of containers for corrosion or leakage. Protective clothing should be stored close by but not in the same room as the pesticides because they may become contaminated. Decontamination equipment should be present where highly toxic pesticides are stored.

Exceptions for Farmers

Farmers disposing of used pesticide containers for their own use are not required to comply with the requirements of the hazardous waste regulations provided they triple rinse or pressure wash each container and dispose of the residues on their own farms in a manner consistent with the disposal instructions on the pesticide label. Note that disposal of pesticide residues into water or where they are likely to reach surface or groundwater may be considered a source of pollution under the Clean Water Act or the Safe Drinking Water Act and therefore illegal.



After the triple rinse procedure, the containers are then “empty” and the farmer can discard them in a sanitary waste site without further regard to the hazardous waste regulations. The empty containers are still subject to any disposal instructions contained within the labeling of the product, however. Disposal in a manner “inconsistent with the labeling instructions” is a violation of EPA guidelines and could lead to contamination of water, soil or persons and legal liability.

Agricultural Chemicals and Worker Safety

The EPA has general authority to regulate pesticide use to minimize risks to human health and to the environment. This authority extends to the protection of farm workers exposed to pesticides. All employers must comply with ALL instructions of the Worker Protection Standard

concerning worker safety or be subject to penalties.

Labels may include, for example, instructions requiring the wearing of protective clothing, handling instructions



and instructions setting a period of time before workers are allowed to re-enter fields

after the application of pesticides (Restricted Entry Interval).

Employers should read the Worker Protection Stan-

dard regulations governing the use of and exposure to pesticides. The regulations set forth minimum standards that must be followed to protect farm workers and pesticide handlers. The regulations include standards requiring oral warnings and posting of areas where pesticides have been used, training for all handlers and early re-entry workers, personal protective equipment, emergency transportation and decontamination equipment.



The EPA regulations hold the producer of the agricultural plant on a farm, forest, nursery or greenhouse ultimately responsible for compliance with the worker safety standards. This means the landowner must ensure compliance by all employees and by all independent contractors working on the property. Contractors and employees also may be held responsible for failure to follow the regulations.

The Occupational Safety and Health Act (OSHA)

The federal government also regulates farm employee safety under the Occupational Safety and Health Act (OSHA). OSHA applies to all persons (employers) engaged in business affecting interstate commerce. The federal courts have decided that all farming and ranching operations, regardless of where goods produced are actually sold or consumed, affect interstate commerce in some respect, and thus are subject to OSHA's requirements. In general, every employer has a duty to provide employees with an environment free from hazards that are causing or are likely to cause death or serious injury.



In summary:

- All label directions will be read, understood and followed.

- The Louisiana Department of Agriculture and Forestry (LDAF) is responsible for the certification of pesticide applicators. All commercial and private pesticide applicators applying restricted use pesticides must successfully complete a certification test administered by the LDAF. The LSU AgCenter conducts training sessions and publishes study guides in various categories covered by the test. Contact your county agent for dates and times of these sessions.

- All requirements of the Worker Protection Standard (WPS) will be followed, including, but not limited, to:

- *Notifying workers of a pesticide application (either oral or posting of the field), abiding by the restricted entry interval (REI).*

- *Maintaining a central notification area containing the safety poster; the name, address and telephone number of the nearest emergency medical facility; and a list of the pesticide applications made within the last 30 days that have an REI.*

- *Maintaining a decontamination site for workers and handlers.*

- *Furnishing the appropriate personal protective equipment (PPE) to all handlers and early entry workers, and ensuring that they understand how and why they should use it.*

- *Assuring that all employees required to be trained under the Worker Protection Standard have undergone the required training.*

- Pesticides will be stored in a secure, locked enclosure and in a

container free of leaks, abiding by any specific recommendations on the label. The storage area must be maintained in good condition, without unnecessary debris. This enclosure will be at least 150 feet away and down slope from any water wells.

- All uncontained pesticide spills of more than one gallon liquid or four pounds dry weight will be reported to the director of Pesticide and Environmental Programs, Louisiana Department of Agriculture and Forestry within 24 hours by telephone (225-925-3763) and by written notice within three days. Spills on public roadways will be reported to the Louisiana Department of Transportation and Development. Spills into navigable waters will be reported to LDEQ, Coast Guard, USEPA.

- Empty metal, glass or plastic pesticide containers will be either triple rinsed or pressure washed, and the rinsate will be added to the spray solution to dilute the solution at the time or stored according to the LDAF rules to be used later. Rinsed pesticide containers will be punctured, crushed or otherwise rendered unusable and disposed of in a sanitary landfill. (Plastic containers may be taken to specific pesticide container recycling events. Contact your county agent for dates and locations in your area.)

- All pesticides will be removed from paper and plastic bags to the fullest extent possible.

The sides of the container will be cut and opened fully, without folds or crevices, on a flat surface; any pesticides remaining in the opened container will be transferred into the spray mix. After this procedure, the containers will be disposed of in a sanitary landfill.

- Application equipment will be triple rinsed and the rinsate applied to the original application site or stored for later use to dilute a spray solution.



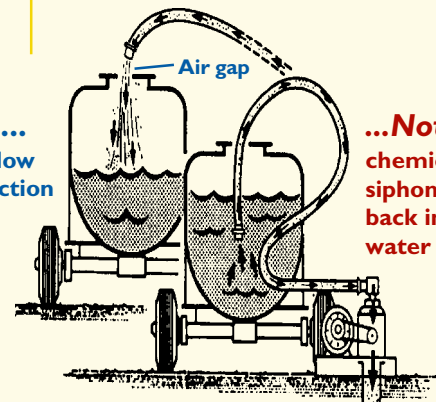
Wash pad with collection pond

- Mix/load or wash pads (NRCS production code Interim) will be located at least 150 feet away and down slope from any water wells and away from surface water sources such as ponds, streams, etc. The pads will be constructed of an impervious material, and there will be a system for collecting and storing the runoff.

- Empty containers will not be kept for more than 90 days after the end of the spray season.

- Air gaps will be maintained while filling the spray tank to prevent back-siphoning.

**This...
backflow
protection**



**...Not This
chemicals
siphoned
back into
water supply**



MORTALITY MANAGEMENT

According to R.S. 3:2131, animal carcasses will be disposed of by cremation or burial. The statute reads: “In order to prevent, control, and eradicate anthrax or charbon, glanders, blackleg, hemorrhagic septicemia, hog cholera and all other contagious or communicable diseases of mules, horses, cattle, sheep, goats, and swine throughout the state, the carcasses of all animals shall be disposed of in a sanitary manner by cremation or deep burial. Burial in this sense means that the animal carcass shall be placed in a hole or pit not less than six feet deep in the disposition of carcasses of cows, mules, and horses, and not less than four feet as applying to carcasses of sheep, goats, and swine. The owners, agents, firms, or corporations, or persons in charge of any or all live stock on ranges, pastures, or other premises shall be responsible for disposition of all carcasses in those herds over which they have jurisdiction, with reference to complying to the provisions of this Part. The provisions of this Part shall not apply to animal carcasses within the limits of a city or town which is provided with an incinerator or in which a rendering plant is operated, provided such incinerator or rendering plant is equipped with facilities to properly transport or handle carcasses in a manner to prevent dissemination of infection.”

Some parishes have their own regulations dealing with animal mortality. Contact your local parish sanitarian to find out your parish regulations.

POULTRY CARCASSES

Poultry carcasses CANNOT legally be fed to hogs or alligators in Louisiana unless they are first cooked or rendered. A complaint to the Livestock Sanitary Board, the Department of Health and Hospitals (DHH) or the Department of Environmental Quality (DEQ) concerning noncompliance with these regulations will result in an inspection by the enforcement staff and possible fines and/or penalties.



GENERAL FARM BMPs

Water well protection

Farm*A*Syst/ Home*A*Syst should be used every three years to determine potential threats to water wells. Threats identified will be ranked and measured to correct the most serious.



Used engine oil, grease, batteries, tires, etc.

- Used engine oil should be stored in a waste oil container (tank or drum) until recycled.
- Empty paint cans, anti-freeze containers, used tires, old batteries, etc., will be stored in a secure area until they can be disposed of properly.



Irrigation water quality

Irrigation water (surface and/or well) should be tested in the spring to determine the salinity (salt) level before irrigating a field or pasture. Take samples to an approved laboratory for analysis.



Fuel storage tanks

Above-ground fuel storage tanks in Louisiana are regulated by the State Fire Marshal and by the EPA if surface water is at risk. Above-ground tanks containing 660 gallons or more require secondary containment. The State Fire Marshal recommends that some sort of secondary containment be used with all fuel storage tanks. This could include the use of double-walled tanks, diking around the tank for impoundment or remote impoundment facilities.



These practices are to be followed:

- Any existing above-ground fuel storage tank of 660 gallons or more (1,320 gallons if more than one) must have a containment wall surrounding the tank capable of holding 100 percent of the tank's capacity (or the largest tank's capacity if more than one) in case of spillage.
 - The tank and storage area should be located at least 40 feet from any building. Fuel storage tanks should be placed 150 feet and down slope from surface water and water wells.
 - It is recommended that the storage tank be on a concrete slab to prevent any spillage from entering surface and groundwater.
 - The storage area should be kept free of weeds and other combustible materials.
 - The tank should be conspicuously marked with the name of the product that it contains and "FLAMMABLE-KEEP FIRE AND FLAME AWAY."

- The bottom of the tank should be supported by concrete blocks approximately 6 inches above the ground surface to protect the bottom of the tank from corrosion.

- If a pumping device is used, it should be tightly and permanently attached and meet NFPA approval. Gravity discharge tanks are acceptable, but they must be equipped with a valve that will automatically close in the event of a fire.

- Plans for the installation of all storage tanks that will contain more than 60 gallons of liquid must be submitted to the State Fire Marshal for approval.

- All tanks that catch on fire must be reported to the State Fire Marshal within 72 hours of the fire.

- Underground storage tanks are defined as containing more than 10 percent of their total volume beneath the soil surface. Underground tanks represent more of a problem than above-ground tanks, because leaks can often go for long periods without being detected. This poses a serious threat to groundwater sources in the vicinity of the tank. If you have an underground fuel storage tank, you need to contact the State Fire Marshal's Office for regulations affecting these storage tanks.

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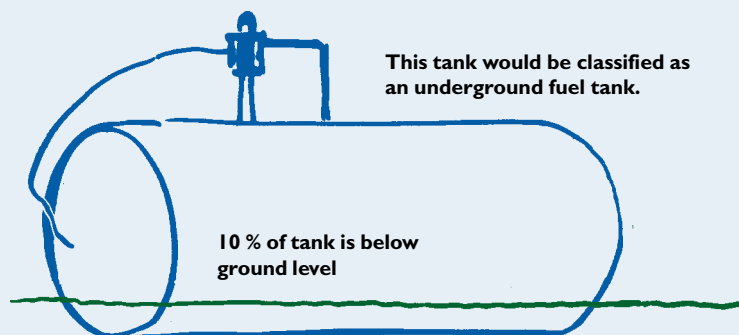
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The complex nature of nonpoint pollution means programs designed to reduce its impact on the environment will not be easy to establish or maintain. Controlling these contaminants will require solutions as diverse as the pollutants themselves. Through a multi-agency effort, led by the LSU AgCenter, these BMP manuals are targeted at reducing the impact of agricultural production on Louisiana's environment. Agricultural producers in Louisiana, through voluntary implementation of these BMPs, are taking the lead in efforts to protect the waters of Louisiana. The quality of Louisiana's environment depends on each of us.

Visit our website:
www.lsuagcenter.com

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