LSU AgCenter
Research & Extension

Sugarcane Environmental
BEST MANAGEMENT PRACTICES
BMPs

Endorsed by

Louisiana Department of Agriculture and Forestry

NRCS

Farm Bureau Louisiana

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Why BMPs Are Important to Louisiana

In 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. Many sugarcane activities also can contribute to the amount of these materials entering streams, lakes, estuaries and groundwater. In addition to ensuring an abundant, affordable food supply, Louisiana aquaculture producers must strive to protect the environment.

Research 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 agricultural commodity groups, the Natural Resources Conservation Service, the Louisiana Department of Environmental Quality, the Louisiana Farm Bureau Federation and the Louisiana Department of Agriculture and Forestry, the LSU AgCenter has taken the lead in assembling a group of best management practices, also known as BMPs, for each agricultural commodity in Louisiana.

BMPs are practices used by producers to control the generation of pollutants from agricultural activities and to thereby reduce the amount of agricultural pollutants entering surface water and groundwater. Each BMP is the result of years of research and demonstrations conducted by agricultural research scientists and soil engineers. A list of BMPs and accompanying standards and specifications are published by the Natural Resources Conservation Service in its Field Office Technical Guide.

Sugarcane BMPs

Of the domestic sugar industries, Louisiana has the oldest and most historic. It has been a vital part of the Louisiana agricultural economy for more than 200 years. Production has expanded from the traditional sugar-producing areas of southeastern and central Louisiana along the Mississippi River, Bayou Lafourche and Red River and southwestern Louisiana along Bayou Teche to other areas of Louisiana, especially other central and western portions of the state.

More than 400,000 acres of sugarcane are produced each in 23 of Louisiana's 64 parishes. The value of the sugar to farmers, factories and landlords exceeds $850 million, and the direct effects of the economic value generated from the crop exceed $2 billion each year.

Sugarcane's economic value ranks it first among Louisiana's plant commodities, which include rice, soybeans, cotton, wheat, corn and feed grains. Louisiana produces about 16 percent of the total sugar grown in the United States (including sugar from both sugar beets and sugarcane). It is grown on 495 farms and processed in 11 factories in the state. The importance of sugarcane to the economy of the state cannot be overemphasized.

For sugarcane production to continue to thrive in Louisiana, responsible management of soil and water resources should be a priority. These BMPs for Louisiana sugarcane production are offered primarily for the purpose of conserving and protecting soil and water resources. If properly implemented – with appropriate incentives, where needed – the practices described in this publication will help improve water quality without placing unreasonable burdens on the sugarcane industry in Louisiana.

The implementation of these BMPs should be made on a voluntary basis by each producer. This guide provides only a brief description of the BMPs recommended for use in sugarcane production. A comprehensive description of BMPs is available in the Field Office Technical Guide located in all Soil and Water Conservation District offices and all USDA Natural Resources Conservation Service field offices. Technical assistance to develop and implement a site-specific plan is available through the Conservation Districts, NRCS field offices and LSU AgCenter parish offices.

Importance of BMPs to Reduce Losses of Soil and Nutrients

By implementing and using best management practices, Louisiana sugarcane producers are minimizing pollution of water resources of the state as well as saving money in many cases. Sediment runoff reduction is one of the most important practices a producer can adopt – from an economic and environmental perspective. Based on volume, sediment is the largest pollutant of surface water in the nation. Sediment pollution comes from several sources, including all agricultural operations that leave bare soil exposed to rainfall.

From an economic perspective, allowing nutrient-laden soil to run off the sugarcane farm and into rivers and streams is a financial loss to any operation. Soil lost in this manner can never be used again. Retaining as much soil as possible can increase the amount of topsoil available to any sugarcane farming operation.

One negative environmental effect that is increasingly noticed and can cause much concern to the public and environmental regulatory agencies involves increases in the turbidity of water, thereby reducing light penetration. This, in turn, results in impairment of photosynthesis, and the altering of oxygen relationships that can reduce the available food supply for certain aquatic organisms. Excessive runoff can adversely affect fish populations in areas where sediment deposits cover spawning beds and, in some situations, given a long enough period of time, partially fill in ponds, lakes and 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 potentially harmful effects may include rapid algae growth, oxygen depletion as organic matter and algae decompose, fish kills from oxygen depletion, toxic effects of pesticides on aquatic life and unsafe drinking water caused by high nitrate or pesticide content.

Nutrient management is another profoundly important aspect of an aquaculture operation. Excessive nutrient runoff can cost the farm significant amounts of money. Often, without a sound comprehensive nutrient management plan, producers may apply too much of these essential elements. When this occurs, it's just money down the river. Excessive nutrients cost the operation money and ultimately run off the farm and pose environmental problems in nearby surface waters. .

Nutrients such as nitrogen and phosphorus can become pollutants. Both are essential for all plant growth and therefore essential for the proper function of ecosystems. Excessive nitrogen and phosphorus concentrations in water, however, can accelerate algae and plant growth in surface waters, resulting in oxygen depletion or critically low dissolved oxygen levels. Often referred to as nutrient overenrichment, or hypoxia, this has become a major concern in many water bodies of Louisiana and in the Gulf of Mexico.

Nutrient Management

Nutrient levels should optimize crop yields while minimizing movement of nutrients into surface water and groundwater (NRCS Practice Code 590 – Nutrient Management). A sound soil fertility program is the foundation upon which a profitable farming business must be built. Agricultural fertilizers are necessary for producing abundant, high-quality food, feed and fiber crops.

The goal of nutrient management is to apply nutrients in the correct amounts and forms at the correct times to produce optimum sugarcane yields while minimizing the movement of nutrients into surface and groundwater. Research-based recommendations are available through the LSU AgCenter's Extension Service.

Nitrogen

Nitrogen is a part of all plant and animal proteins. Therefore, human survival depends on an abundant supply of nitrogen in nature. Approximately 80 percent of the atmosphere is nitrogen gas, but most plants cannot use this form of nitrogen.

Fertilizer nitrogen must be supplied to the soil to make profitable sugarcane yields. Rely on nitrogen recommendations based on Louisiana research. Nitrogen fertilizer rates for sugarcane vary depending on the age of the crop and soil texture, so fertilizer should be applied using the appropriate criteria to prevent excess runoff and leaching. Applying nitrogen at the right time will maximize plant uptake and minimize off-site losses. Research suggests the optimum time to apply nitrogen fertilizer is April. An exception is the occasional use of a starter fertilizer at planting consisting of 15-45-45 (N-P_2O_5-K_2O) pounds per acre.

The source of nitrogen is not important if applied based on good agronomic principles. If organic materials are used as nitrogen sources, they should be tested for nitrogen content, the amount of soluble nitrogen and the amount of nitrogen expected to be mineralized from the organic fraction during the growing season. This amount should not exceed the chemical fertilizer nitrogen recommendation for the crop.

High soil organic matter levels also contribute to plant nitrogen. Decomposition of organic matter results in inorganic nitrogen forms such as ammonium (NH_4^+) and nitrate (NO_3^-). Ammonium also can be converted into nitrate by a process known as nitrification. Both ammonium and nitrate forms are soluble and readily available for plant uptake. The ammonium form is attracted to soil particles, however, so it does not readily leach through the soil with rainfall or irrigation water. Nitrate, on the other hand, is repelled by soil particles and can leach into groundwater. Both can be lost via surface runoff. Excessive nitrate concentrations in surface water can accelerate aquatic plant growth, which can be detrimental to water quality.

Phosphorus

Naturally occurring phosphorous exists in a phosphate form as soluble inorganic phosphate, soluble phosphate, particulate phosphate or mineral phosphate. The mineral forms of phosphorus (calcium, iron and aluminum phosphate) are low in solubility. Uptake of applied phosphorous fertilizer by the plant will be closely related to soil pH. Soils with low pH will form insoluble iron and aluminum phosphate, and soils with high pH will form insoluble calcium phosphate. Correcting soil pH is an important first step in the management of phosphorous where an optimum range is 5.5-7.0. The amount of these elements (calcium, iron and aluminum) present in reactive forms varies with different soils and soil conditions and will determine the amount of phosphorus that can be fixed in the soil.

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

Phosphorous fertilizer may be applied in April to coincide with nitrogen application, but it also may occur in late winter or early spring. Reducing erosion also will reduce phosphorus movement since phosphorus binds with the soil particles. If organic materials, such as filter press mud, are used as a phosphorus source, they should be tested for phosphorus content. The organic material should be applied to provide the amount of phosphorus necessary for the crop based on phosphorus levels indicated by a soil test.

Potassium

Potassium is needed to produce adequate sugarcane yields in Louisiana. Proper soil testing to determine soil potassium levels is important for determining proper application rates. Research-based recommended potash rates are available through the LSU AgCenter's Extension Service.

Soil Testing

Soil testing is the foundation of a sound nutrient management program. Testing soil involves a series of

chemical analyses that estimate whether levels of essential plant nutrients are sufficient to produce a desired crop yield.

When not taken up by a crop, some excess nutrients, such as nitrogen, potentially can be lost off-site through runoff, leaching or volatilization. Others, like phosphorus, react with soil minerals over time to form compounds that are slowly available for uptake by plants.

Take soil tests during the fallow period between sugarcane crop cycles. Soil testing is particularly important if the field in question has undergone precision leveling.

Generally, a soil test can be taken successfully by keeping the following in mind:

–Soils that differ in appearance, crop growth or past treatment should be sampled separately, provided the area is of such size and nature that it can be fertilized separately. For each sample, collect subsamples of soil from 10 or more places in each sampling area in a zigzag fashion so as to make a representative sample.

–Mix all random subsamples from one sampling area thoroughly before filling a sampling carton or container to be mailed to the Lab. For each sampling area, the laboratory will need 1 pint of the mixture of all subsamples.

–One soil sample should represent 10 acres or less. Avoid sampling directly in the fertilized band.

–Proper sampling depth depends on the kind of crop you plan to grow. For pastures, and minimum tillage, take the top 2-3 inches of soil. For cultivated crops, collect the upper 5-6 inches of soil.

–If possible. collect and submit samples three to five months before your projected planting date to ensure you have plenty time to plan your liming and fertilization program for the upcoming season.

–Always collect soil samples at the same time of year to reduce climate-induced variability in the results.

Grid Sampling and Variable Rate Applications

Variable rate applications of nutrients and lime to adjust soil pH are feasible if fields are properly grid sampled. Applying nutrients and lime on parts of the field only where needed will improve crop yield, reduce costs to the grower and lower runoff from excess applications.

Another application of variable rate technology is soil electrical conductivity. Sensors have been developed to determine electrical conductivity that can be used to map nutrient and crop management zones that rely on the properties of soils. Crops can then be managed according to soil texture.

Cover Crops

Cover crops can provide positive benefits to sugarcane growers. A winter cover crop, such as wheat, may take up excess nitrogen and phosphorous and thus reduce potential for leaching or runoff. Legume cover crops, such as soybeans, can add nitrogen to the soil during the fallow year, but limited research has not been able to determine the amount of nitrogen to be credited for legume cover crops because of the long period between the fallow period and the grand growth stage. Legume cover crops planted during the winters while sugarcane is in the ground can contribute more than 100 pounds of nitrogen per acre if terminated the year after it is planted.

Cover crops also provide soil erosion control, which limits runoff-associated losses of nitrogen and phosphorous. Cover crops can improve soil health by increasing organic matter inputs and by increasing biological diversity, and some cover crops can provide an economic incentive if commodity prices remain stable, especially with soybeans.

Fertilizer Application Equipment

Injecting fertilizers below the soil surface and/or incorporating with tillage will reduce runoff losses. Fertilizer application equipment should be calibrated at least annually to ensure uniformity and accuracy of fertilizer application. Fertilizer equipment or storage vessels should not be cleaned out near bodies of surface water. Fertilizer should not be stored in areas where the possibility of contaminating groundwater or surface water could occur.

Nutrient Management Plans

Both the U.S. Environmental Protection Agency and the U.S. Department of Agriculture are encouraging a voluntary approach to managing nonpoint-source issues related to agriculture. The implementation of nutrient management plans of all agricultural producers will ensure that fertilizers are managed responsibly.

Developing a Nutrient Management Plan

A nutrient management plan is a strategy for making wise use of plant nutrients to enhance farm profits while protecting water resources. It is a plan that examines your entire farming operation by making the best use of fertilizers and other nutrient sources. Successful nutrient management requires thorough planning and recognizes that every farm is different. The type of farming and the specifics of your operation will affect your nutrient management plan. The best plan is one that is matched to the farming operation and the needs of the person implementing the plan.

The Parts of a Nutrient Management Plan

Nutrients are brought to the farm through fertilizers and other off-farm soil amendments, such as filter press mud. These inputs are used, and some are recycled, by the sugarcane plant. Nutrients leave the farm in the harvested sugarcane crop, runoff water and eroded soil. These are nutrient removals. Ideally, nutrient inputs and removals should be approximately the same.

When nutrient inputs to the farm greatly exceed nutrient removals from the farm, the risks of nutrient losses to groundwater and surface water are greater. When you check nutrient inputs against nutrient removals, you are creating a mass balance. This nutrient mass balance is an important part of a nutrient management plan and is important to understand for your farming operation.

Another important part of a successful nutrient management plan is soil testing, which helps you select the proper nutrient rate so crops can use nutrients efficiently. This not only reduces nutrient losses and protects the environment but can also increase farm profitability. Other best management practices may include managing the farm to reduce soil erosion, improving soil tilth through conservation tillage (reduced tillage and residue management), planting cover crops, or using filter strips and buffers to protect water quality.

The Basic Steps

Nutrient management plans (NRCS Code 590) consist of four major parts:

1. **Evaluation of Nutrient Needs**

   a. **Maps and Field Information**

   You will need a detailed map of your farm. The map should include farm property lines; field identification; locations of all surface waters such as ditches, canals, bayous, rivers, ponds or lakes and direction of surface flows with arrows indicating the direction of flow from the farm; and a soils map. This map will serve as the basis for the nutrient management 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 Agency office.

   b. **Locate Critical Areas**

   Certain areas on your farm such as canals, bayous, rivers, lakes or ponds are sensitive to nutrient overload. You should create buffer zones around these areas where nutrient use will be reduced or eliminated and indicate those on your map. Slowing water flow from ditches allows sediment to settle before being emptied into larger bodies of water. This can be achieved by shallower ditches and smaller diameter culverts. By buffering these water areas, water quality problems can be decreased.

   c. **Soil Testing** (See previous section for details.)

   d. **Determine Nutrients Needed for Each Field**

   Based on soil test results, you can determine the nutrient needs of the crop. At a minimum, the amounts of lime, nitrogen, phosphorus and potassium should be listed in the plan for each field. Soil testing laboratories will provide recommended application rates based on soil test results. Your LSU AgCenter county agent can help you with this.

Basic Steps *continue on page 8*

Basic Steps *continued from page 7*

2. **Inventory of Nutrient Supply**

Many of the nutrients needed to grow your crops are already present on your farm in the soil or in crop residues. Knowing the amounts of nutrients already present in these sources is important so that you do not apply more nutrients than needed. A soil test is necessary to obtain a nutrient inventory.

3. **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 a nutrient management plan is balancing the two. This can be done in several ways. Most nutrient management plans are developed based on nitrogen, but other factors such as phosphorus and potassium could control how much you can use under certain conditions.

4. Preventive Maintenance and Inspections

Keeping good, detailed records that help you monitor your progress is essential to know if your NMP is to accomplish your goals. Examine how nutrients change over based on your management practices. Records should be kept on crop yields and nutrient application rates, timing and methods. Keep detailed schedules and records on calibration of spraying and spreading equipment. When you have a major change in production, update your plan to reflect these changes.

Record Keeping

Keeping good, detailed records that help you monitor your progress are important to determine if your goals have been accomplished. Always keep records of:

- Nutrient management plan documents.
- Soil and plant tissue tests. Observe the response to management practices over time.
- Purchased fertilizers.
- Crop yields. Update your management plan as production changes.
- Nutrient application rates, timing and application methods.
- Detailed schedules and records on calibration of application equipment.
- Emergency action plan documents.

Where Can You Obtain Information Needed for Your Nutrient Management Plan?

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

Primary Conservation Practices

Reduced/Minimum Tillage (NRCS Code 329)

Conservation practices that include reduced or minimum tillage, crops and crop residues can have a positive effect on improving or maintaining water quality in addition to reducing soil erosion. Sediment and chemicals (pesticides and plant nutrients) are the two main types of contaminants in surface runoff.

Reduced soil erosion is observed where the number of tillage trips is reduced compared with conventional tillage systems, thus reducing loss in runoff. The amount of reduction is variable and depends on the amount of crop residue on the soil (soil exposure) and the timing and duration of rainfall.

As with nitrogen and phosphorus, some herbicides attach to soil particles or dissolve in surface runoff. Practices that increase water infiltration and reduce surface runoff, such as minimum or reduced tillage and the use of alternate crops and crop residues, effectively reduce herbicide runoff. In some cases, herbicide runoff increased in no-till systems. If a large rainstorm occurs soon after herbicide application, the herbicide washes off the soil surface and crop residues before it can infiltrate the soil or contact the target plants.

Minimum or reduced-tillage practices sometimes have been falsely criticized for increasing chemical contamination of groundwater for two main reasons: increased herbicide use and increased leaching. Additional herbicide is often required for weed control in conservation tillage compared with conventional tillage systems. Further, more pre-emergence herbicide is needed because the chemical binds to the litter or residue. Post-emergence herbicides frequently are relied upon in no-till systems to control vegetation instead of mechanical tillage. These herbicides usually are strongly adsorbed by the soil and resist leaching. In some instances, soil-applied pre-emergence herbicides are used and, in some cases, both the post-emergence and pre-emergence herbicides would be broadcast instead of banded, which translates into more herbicide use. Selection will be based on recommendations by qualified consultants and crop advisers and on the published recommendations of the LSU AgCenter.

Disadvantages of a conservation approach to the culture of the crop include soil compaction, poor drainage, delays in working ground due to moisture and carryover of diseases or pests in crop residue.

Minimum/reduced tillage may be practiced as part of a conservation management system to supplement one or more of the following:

- Reduce sheet and rill erosion.
- Maintain or improve soil organic matter content and tilth.
- Conserve soil moisture.
- Provide food and cover for wildlife.
- Improve overall soil health.

Conservation management practices such as no-till or reduced/minimum tillage are most practical in fallow fields, newly planted fields and the final ratoon crop where rutting did not occur during the harvest of the previous year's crop.

Fallow and Seedbed Management (Stubble destruction through seedbed preparation)

The conventional approach to managing the fallow period in Louisiana sugarcane production normally begins in the fall or winter with the destruction of the final stubble crop in a production cycle by disking. Field activities continue during late winter or early spring with land smoothing (NRCS Code 466 – Land Smoothing) or precision land grading (NRCS Code 462 – Precision Land Forming) followed by row arrangement (NRCS Code 557 – Row Arrangement), bedding (NRCS Code 310 – Bedding) and subsoiling (NRCS Code 324 – Deep Tillage). Beds are kept weed-free by the timely opening and closing of beds during cultivation until planting is done in late summer or early fall.

A chemical fallow program is similar to conventional fallow management, with the notable exception of the substitution of herbicides for tillage to destroy emerged sugarcane in the early spring and for maintaining a weed-free seedbed. Residue (trash blanket) resulting from combine harvesting of green cane may be maintained on the soil surface until stubble destruction in the spring after harvesting of the final stubble crop in a production cycle (NRCS Code 344 – Residue Management, Seasonal). This practice has not been comprehensively evaluated for its effect on diseases and insect pest management, but it has shown benefits for sugarcane weed control where Bermuda grass and rhizome Johnson grass are not present.

Louisiana sugarcane producers could follow these suggested practices to reduce soil loss during these field operations. Long-term ramifications of chemical fallow programs in Louisiana have provided some shift in pre-

dominant weeds. Chemical fallow and a program consisting of a combination of early tillage followed by the use of herbicides have been successfully used by Louisiana sugarcane growers in addition to conventional fallow tillage.

Delaying destruction of the last stubble crop in the cycle until after April 1 can reduce erosion rates and satisfy the 30 percent coverage of the soil surface to meet the requirements essential for achieving adequate soil erosion control. But the best timing of older stubble destruction has not been completely evaluated for its effect on production, sediment loss, pest management and weed control. This practice is more feasible in fields with limited weed infestations that have not been rutted by harvest equipment. This practice may be made more feasible when used in conjunction with a burndown herbicide program.

Cover and green manure crops can be grown during the fallow period to provide seasonal soil loss protection, to improve soil organic matter and fertility (NRCS Code 340 – Cover Crop) and, when harvested, to provide an economic return. In Louisiana, wheat and soybeans are grown on limited fallow acreage both as a summer cover crop and a cash crop. Soybeans potentially can increase nematode problems, which must be factored in when deciding on planting within the sugarcane rotation. Further, allelopathy is evident with hasty cane planting after soybean harvest. Documented losses have occurred from stalk rot, wireworm infestations and persistent weed problems. Other crops, such as corn, sweet sorghum, wheat and winter legume cover crops, have been tried on a limited basis. Cropping systems for the traditional fallow period have not been fully evaluated for their consequences and benefits but can interfere with proper seedbed preparation and may ultimately reduce crop yields.

Although not a common practice in Louisiana, elimination of a fallow period, which controls weeds, can be accomplished by succession planting of sugarcane immediately after harvest. The suggested sequence is to burn the trash blanket (crop residue), disk the row tops, roto-till, re-form the beds and open for planting (NRCS Codes 310 – Bedding). Succession planting is best suited for early harvested fields on lighter-textured soils and should be practiced on fields without heavy infestations of weeds. Limited acreage is succession planted in Louisiana each year. Sugarcane yields from succession planting are often reduced even where starter fertilizer is used because of the late planting date and increased weed pressure. Any increase in succession planting will require additional economic incentive.

Additional sugarcane crops from a single planting also reduce the amount of fallow land and increase the amount of land with vegetative cover. This is feasible with improved stubbling sugarcane varieties where Louisiana growers have a greater opportunity of achieving an additional stubble crop in the production cycle. This would decrease the amount of fallow land exposed to soil erosion.

Sugarcane Planting (Late summer to early fall)

The standard planting method consists of placing sugarcane stalks in planting furrows in weed-free beds (NRCS Codes 310 – Bedding) subsequent to a fallow period.

Sugarcane Crop Cycle (Planting to stubble destruction)

Reducing cultivation operations during the growing season to off-barring, fertilization and layby enhances the protection of the soil. Growers can reduce the number of cultivations from as many as five or six to as few as two to three. This is most feasible when fields have not been rutted during the harvest of the previous year and layby occurs early.

Increasing the off-barring width by using wide (28- to 32-inch) planting furrows to accommodate high-population varieties provides soil protection. Wider planting decreases soil exposure to erosion by increasing the percentage of vegetative cover in a field.

When additional stubble crops are expected from a combine-harvested field, the residue from the row top can be repositioned from the row top to the wheel furrow immediately after harvest, where feasible (NRCS Code 344 – Residue Management, Seasonal). Research has shown that sugarcane crop losses for the succeeding crop can be as high as 25 percent when the residue is allowed to remain on the row top until spring. Retaining the residue presents an added problem in the spring by holding moisture, thus preventing timely cultivation. Research continues to assess how this residue could be used to reduce weed pressure and reduce soil erosion without negatively affecting the succeeding sugarcane crop.

Additional conservation practices relevant to sugarcane production include:

- Banding herbicides to maintain weed-free row tops minimizes erosion of soil from row shoulders and row middles.
- Maintaining vegetative cover on headlands and primary field roads minimizes soil erosion (NRCS Code 560 – Access Road).

Using vegetative cover on headlands can effectively control erosion, especially in areas near drainage ditches and canals (NRCS Code 386 – Field Border). The use of shallow V-ditches, mowing the ditch banks and smaller culverts to slow the flow of water would allow sediment to settle before entering bayous, rivers and lakes.

Post-Harvest Residue Management (NRCS Code 344)

In Louisiana, approximately 85 percent of the sugarcane crop is harvested by combine. When the weather permits, some of the sugarcane is burned before harvest to improve both harvesting and milling efficiency by reducing the amount of leafy trash. Where sugarcane fields are harvested green, the blanket of plant residue deposited on the soil surface after harvest currently is burned.

A voluntary Certified Prescribed Burn Manager program is administrated by the Louisiana Department of Agriculture and Forestry. The Department of Agriculture and Forestry, the American Sugar Cane League and the LSU AgCenter have developed the Louisiana Smoke Management Guidelines for Sugarcane Harvesting and provide certification for growers who conduct controlled agricultural burns. Understanding the recommendations will help employees understand the importance of smoke and ash management. Most important, prescribed burns should not go unattended. Proper equipment, such as a water tank, should be available at all controlled agricultural burns.

When a controlled agricultural burn is done, sugarcane growers should follow these voluntary guidelines:

- Identify smoke sensitive areas.
- Obtain a fire weather forecast.
- Develop farm prescribed burn plan.
- Determine the smoke category day.
- Determine smoke and ash screening distance.
- Determine the direction of the smoke and ash plume.
- Evaluate the prescribed burn results.
- Keep good harvest records.

Based on the research conducted so far, removing the residue as quickly as possible before spring green-up is the recommended practice. Burning typically is done immediately after harvest, weather permitting. This is necessary because research has shown this residue has the potential to reduce sugar yields in the subsequent stubble crop by as much as 25 percent.

One explanation for that decrease is that the residue acts as an insulating blanket, effectively slowing the warming and drying of the soil during the spring and thereby delaying the emergence of the crop. A second reason is that during the decay process allelochemicals are released that can inhibit the germination or emergence of sugarcane root and shoot buds. In addition, naturally occurring soil microorganisms are responsible for the decomposition of plant residues, degrading pesticides and improving soil structure and nutrient availability. Soil microorganism's influence on the degradation of sugarcane residues is not known.

An effective residue management program that manages the residue over the winter and spring to reduce runoff while minimizing the effect of the residue on the yield of the subsequent year's crop would eliminate the need to burn the crop residue. Demonstrating the potential benefits of effectively managing the residue on the crop and the environment also may result in a higher percentage of the sugarcane being harvested green, even under weather conditions that favor burning.

Several investigations of the influence of post-harvest sugarcane residue management on soil runoff and water quality showed no meaningful differences in nutrient or soil removal and water quality parameters between burning or retaining the post-harvest residue. Until alternative practices are found or a clear economic benefit to leaving the residue in the field is found, it is imperative that Louisiana sugarcane producers continue to burn this residue to remain competitive.

The greatest effect of conservation practices (conservation tillage, cover crops and post-harvest residue management) is on surface water quality by reducing runoff. Soil cover affords protection of the soil surface from the impact of raindrops and slow water movement. Rainfall stays in the field, allowing the soil to absorb it. The decomposition of these residues also increases the soil organic matter. Soils with high organic matter content are less likely to erode than soils with low organic matter content, and they are more apt to absorb pesticides and nutrients. Likewise, reducing the number of tillage/cultivation trips over the field reduces the amount of soil and water leaving a field, as well as the fuel consumed on the farm.

Field Borders and Filter Strips

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

Field borders and filter strips are strips of grass 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, as well as provide habitat.

In a properly designed filter strip, water flows evenly through the strip, slowing runoff velocity and allowing contaminants to settle from the water. In addition, where filter strips are seeded, fertilizers and herbicides should not be used near susceptible water sources. Filter strips also increase wildlife habitat. In a sugarcane field, a filter strip could be a headland or the banks of a shallow lateral V-ditch.

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 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 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 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 that is being drained 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. Table 7 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 Natural Resources Conservation Service or Soil and Water Conservation District office.

Table 7. Suggested Vegetated Filter Strip Widths based on Land Slope Percentage.

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.

Where the majority of sediment and sediment-associated pollutants, such as phosphorus and pesticides, are controlled by no-till cultivation and the buffer is in an upland position or the stream next to the buffer is incised (B), a 50-foot buffer is needed – either 50 feet of tree buffer or 25 feet of trees next to the stream plus 25 feet of grass buffer. If the stream or ditch is in a lower position in a landscape with hydric soils (very wet soils), a 25-foot vegetated (trees, grass or shrubs) buffer is considered sufficient to reduce nitrogen, assuming that erosion is minimal either because conservation tillage is used or the topography is very flat (C).

For well-maintained pastures, where the pollutant of concern is nitrogen, a fenced, 25-foot buffer is considered sufficient (D). Grass buffers can be used if the stream bank is stable; otherwise, a tree buffer should be used. It is necessary to fence cattle out of streams to reduce stream-bank degradation and nutrient deposition. A buffer of 25 feet is considered sufficient to reduce the low levels of nitrate moving into the stream.

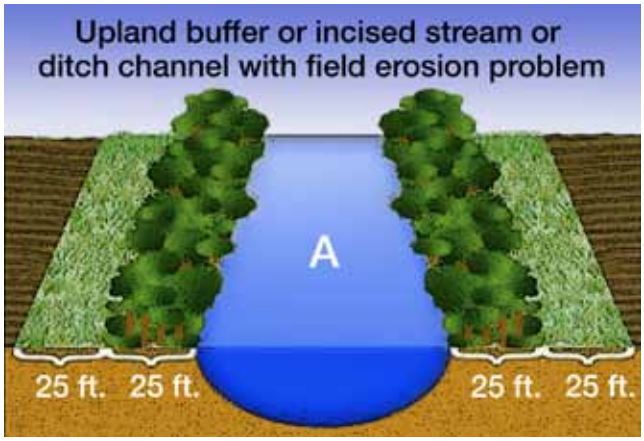


Figure 1. Ideal buffer: 25 ft. forested on side of channel and 25 ft. grassed bottom next to field.

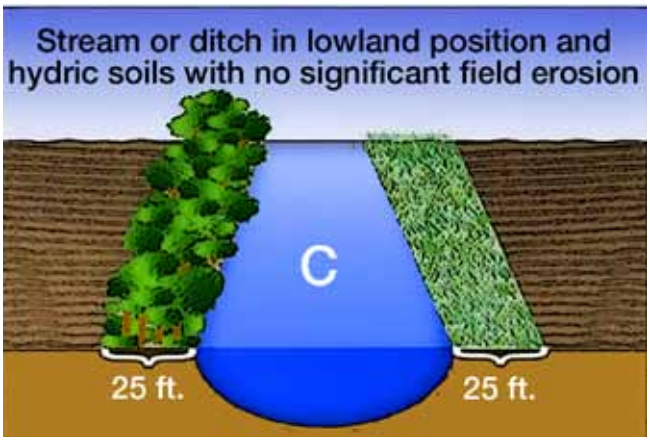


Figure 3. Stream or ditch in lowland position and hydric soils with no significant field erosion.

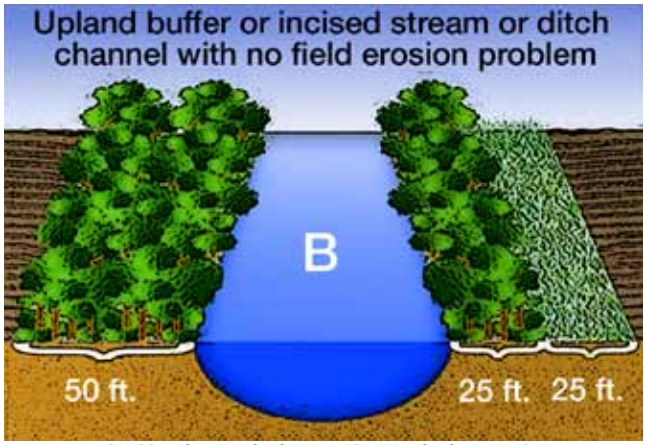


Figure 2. Ideal buffer: 50 ft. forested or 25 ft. forested next to stream with no field erosion problem.

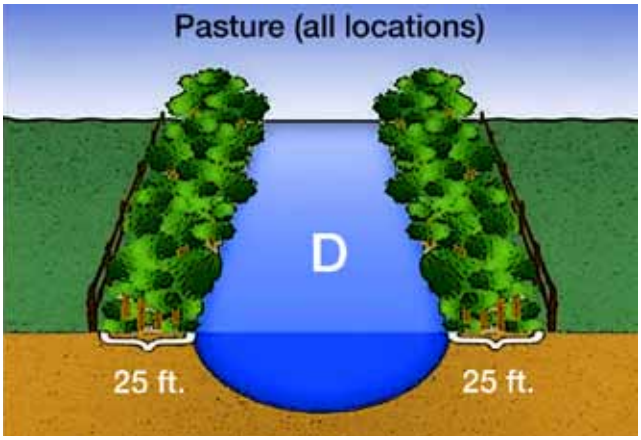


Figure 4. Adequate buffer: 25 ft. forested each side of stream.

2. The amount of time 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 percentage of 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 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. Soil survey reports for Louisiana parishes 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 and 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 eventually will break over the top and the 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.

Related Conservation Practices

Precision Land Forming (NRCS Code 462)

With precision grading, slope of the land can be reduced, rows can be lengthened in some cases and ditches can be eliminated, which reduces runoff and affords an opportunity to use the headland as a filter strip. Precision grading improves surface drainage, provides for more effective use of precipitation, obtains more uniform planting depths, provides for more uniform cultivation and improves equipment operation.

Surface Drainage – Field Ditch (NRCS Code 607)

A graded ditch for collecting excess water in a field or for irrigation water drainage. This practice intercepts or collects surface water and carries it to an outlet.

Irrigation Canal or Lateral (NRCS Code 320)

A permanent irrigation canal or lateral constructed to move water from the source of supply to one or more farms. The conservation objectives are to prevent erosion or degradation of water quality or damage to land, to make possible proper water use and to move water efficiently.

Open Channel (NRCS Code 582)

The constructing or improving of a channel, either natural or artificial, in which water flows with a free surface. It provides discharge capacity required for flood prevention, drainage or a combination of these purposes.

Grassed Waterways (NRCS Code 412)

Grassed Waterways 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.

Corridors (NRCS Code 645, Upland Wildlife Habitat Management)

A corridor is any combination of grasses, legumes, shrubs and trees used to link separate wildlife habitats and provide cover for wildlife to travel between habitats. Corridors, like vegetated filter strips, may provide some filtering of pollutants from nearby croplands, but they primarily provide benefits for wildlife and divert wildlife from adjacent fields.

Riparian Zones (Forested Buffers NRCS Code 391 and Herbaceous Buffers, NRCS Code 390)

A riparian zone consists of the land adjacent to and including a stream, river or other area that is at least periodically influenced by flooding in a natural state. Similar to vegetated filter strips, plants in riparian areas effectively prevent sediment, chemicals and organic matter from entering bodies of water. Unlike filter strips, riparian zones use plants that are of a higher order, such as trees or shrubs, as well as grasses or legumes. Vegetated filter strips often are used in riparian areas as initial filtering components next to crop field borders.

For more information on these practices and how to implement them, contact your local NRCS or Soil and Water Conservation District Office or call your LSU AgCenter county agent.

General Farmstead Management

Heavy-Use Protection (NRCS Code 561)

Open, unpaved, bare areas, such farm roads, are common on Louisiana farms. Unpaved areas may be overlaid with suitable surface materials, such as limestone, to reduce muddy conditions. This is particularly helpful where equipment enters roadways to reduce mud on the highways.

Other areas such as pathways to equipment sheds and transitions from pavement to dirt also can cause sediment issues. These areas may be considered to need runoff controls in some cases, if it's feasible, and improvements to these areas will minimize the effects of runoff into streams.

Some unpaved areas or bare dirt spots that receive moderate weight traffic that is not too heavy can be underlain with suitable surface materials to reduce muddy conditions. One option might be geotextile fabric or filter cloth. If used, the surface on which the nonwoven geotextile is placed should be graded smooth and free of loose rocks, depressions, projections and standing or flowing water. The geotextile is unrolled and placed loosely on the graded soil surface, overlapping at the seams by 18 inches. Approximately 6 to 8 inches of crusher-run gravel or other aggregate is placed on top of the geotextile. This installation allows surface liquids to drain through and reduces muddy conditions.

When possible, bare ground areas should be located at least 100 feet away from perennial streams and 25 feet away from intermittent streams and drainage ways and should have a permanently vegetated buffer between them and the drainage area. Sloping areas should have cross terraces to reduce erosion and collect eroded sediment and solids. At the lowest point of the bare area edge, earthen or concrete settling basins can help trap solids that may otherwise leave in rainfall runoff. Areas with very light traffic sometimes can be re-seeded with grass, thus eliminating the need for geotextile fabric and gravel or rock. Check with your local LSU AgCenter Extension agent or NRCS office if you have concerns or want to see if a practical solution is available.

Critical Area Planting (NRCS Code 342):

Examples of applicable areas are levees, cuts, fills and denuded or gullied areas where vegetation is difficult to establish by usual planting methods. The easiest and most effective way to protect these areas is to maintain perennial plants in these locations. These plants provide soil stabilization and control erosion, provide water quality protection and wildlife habitat.

The roots of native grasses, low shrubs and aquatic plants bind to the soil and provide the necessary benefits. Proper treatment of a critical area 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.

Although any rooted plants growing in these areas are helpful, some plants give better protection than others. Low grasses and shrubs that provide deep, strong, fibrous root systems are the best and grow faster than trees. Some native trees that grow relatively fast and provide the neces-

sary root system, however, are the willows (Salix). Unlike other trees, willows actually are woody shrubs that love water and develop deep, strong root systems in wet soil.

Plants that are suitable for planting in these areas can be found in most nurseries or can be transplanted from existing stands. For advice on the proper plants for your situation and area, contact the local NRCS office or LSU AgCenter Extension agent.

Fuel storage tanks

Aboveground fuel storage tanks in Louisiana are regulated by the State Fire Marshal's Office and by the U.S. Environmental Protection Agency if surface water is at risk. Aboveground tanks containing 660 gallons or more require secondary containment, but 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 must be followed:

- Any existing above-ground fuel storage tank of 660 gallons or more (or 1,320 gallons total, if you have more than one tank) must have a containment wall surrounding the tank that is capable of holding 100 percent of the tank's capacity (or the largest tank's capacity, if more than one) in case of spillage. Additional secondary containment measures are required for operations that store more than 1,320 gallons of fuel. NRCS Code 710 is designed to prevent accidental discharge of petroleum products into the environment. Additional information can be obtained from your local NRCS office in consultation with the local LSU AgCenter agent.
- The tank and storage area should be located at least 40 feet from any building. Fuel storage tanks should be placed at least 150 feet away and downslope 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 water and/or 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's Office for approval.
- All tanks that catch on fire must be reported to the State Fire Marshal's Office 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 aboveground tanks, because leaks often can 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.

Roof Runoff Management (NRCS Code 558)

Roof runoff management is a practice that can be used if rainfall runoff from barns or other structures is flowing across animal waste areas or bare ground areas where significant erosion is occurring. Management of this runoff ensures manure waste and sediment are not transported into drainage branches or small creeks that ultimately can carry pollutants into surface water off the farm. The practice also can sometimes have the added benefit of protecting the foundation of the building from water inundation and weakening. In some cases, if desired, roof runoff can be collected, stored and used for other purposes such as lot wash water.

Gutters and down spouts commonly are used with care taken to ensure that water from downspouts is directed away from the building foundation and areas of concern. Water velocity from downspouts is emptied onto the ground surface with velocity dissipation systems such as rock pads, rock filled trenches or concrete to prevent erosion and to ensure ground infiltration.

Irrigation Water Quality

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

Responding to Complaints

More and more families are moving into rural areas of Louisiana. These families typically come from nonfarm backgrounds and do not understand contemporary agricultural practices. Balancing the expectations of rural landowners and the needs of sugarcane producers to provide a safe and economical supply of sugar will become more challenging in the future.

There are some things that can be done, however, to be a good steward of the land and a good neighbor. Being friendly and courteous to people who neighbor your farm can go a long way to help foster good working relationships. The appearance of the farming operation also helps. The way a producer handles complaints and concerns also is a vital part in keeping good relations with neighbors.

Be considerate of neighbors. Give advance notice when you are planning to burn or planning to conduct any other farming practice that might affect areas outside of your operation. Let your neighbors know you are willing to talk about the issue and that you care.

A system of communication also may need to be set up. This will help solve problems before they get out of hand. Some people feel more comfortable talking to someone other than the person with the problem. Give concerned members of the community a person to contact. This third-party can be separated from the issue, be less emotionally involved and can likely identify simple and mutual solutions.

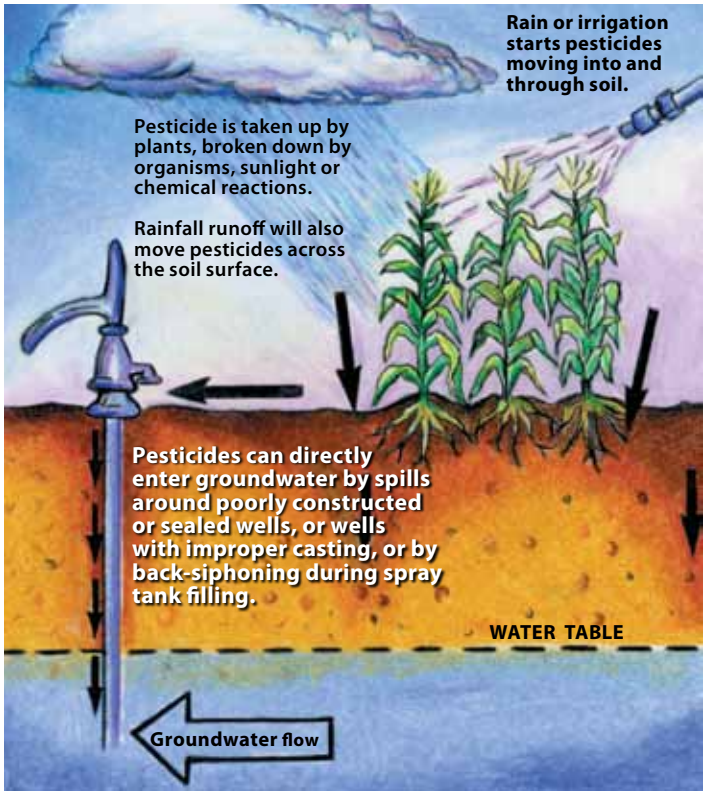
Finally, producers need to work with community leaders and regulatory agencies when a complaint arises. A sugarcane farmer working with community leaders may reduce the demands for unnecessary regulation.

Pesticide Management and Pesticides

Introduction

To preserve the availability of clean and environmentally safe water in Louisiana, contamination of surface water 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.

These pest management practices are based on current research and extension recommendations. By using these recommendations, pesticide use 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 byproducts 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 should be applied only when they are necessary to protect the crop or to control vermin or parasites. The pesticide should be chosen carefully to ensure that the one you pick will give the most effective pest control with the least potential adverse effects on the environment.

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

- All label statements and use directions designed specifically to protect groundwater must be followed closely.
- Specific best management practices designed to protect surface water should be followed closely.
- Erosion control practices (such as pipe drops, etc.) should 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 can potentially run off or leach. 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 land, 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 should be followed:

- Select the pesticide to give the best results with the least potential environmental effect 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 areas surrounding the application site.
- Carefully maintain all applications of pesticides, 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 should be followed:

- Pesticide selection should be based on recommendations by qualified consultants and crop advisers and the published recommendations of the LSU AgCenter.
- The selection of the pesticide to be used must be based on its registered uses and its ability to give the quality of pest control required.
- The selection also must be based on a pesticide's effects on beneficial insects, other nontarget organisms and the general environment.

The water table separates the unsaturated zone from the saturated zone (groundwater)

Pesticide Storage and Safety

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. Louisiana's pesticide laws address 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 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 to avoid contamination of the clothing. Decontamination equipment should be present where highly toxic pesticides are stored.

Exceptions for Farmers

Farmers disposing of used pesticide containers from 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 water or groundwater may be considered a source of pollution under the Clean Water Act or the Safe Drinking Water Act and therefore is 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 in 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 people, as well as 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 the employers may 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 Standard 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 product on a farm, forest, nursery or greenhouse ultimately responsible for compliance with the worker safety standards. This means the landowner or farmer 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.

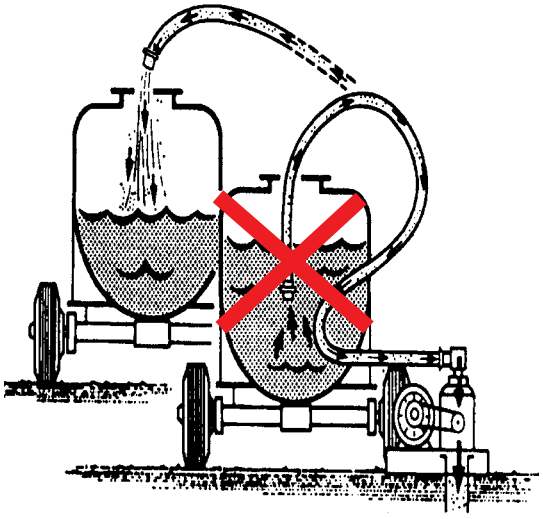
The Occupational Safety and Health Act (OSHA)

The federal government also regulates farm employee safety under the Occupational Safety and Health Act (OSHA). OSHA applies to all people (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.

Pesticide summary:

- All label directions must be read, understood and followed.
- The Louisiana Department of Agriculture and Forestry is responsible for the certification of pesticide applicators in the state. All commercial and private pesticide applicators who apply restricted-use pesticides must successfully complete a certification test administered by the state Department of Agriculture and Forestry. The LSU AgCenter conducts training sessions and publishes study guides in various categories covered by the test. Contact your LSU AgCenter county agent for dates and times of these sessions.
- All requirements of the Worker Protection Standard must be followed, including, but not limited, to:
- Notifying workers of a pesticide application (either oral or posting of the field) and abiding by the restricted entry interval.
- 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 past 30 days that have a restricted entry interval.
- Maintaining a decontamination site for workers and handlers.
- Furnishing the appropriate personal protective equipment to all handlers and early entry workers and ensuring that they understand how and why they should use it.
- Ensuring that all employees required to be trained under the Worker Protection Standard have undergone the required training.
- Pesticides should 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 should be at least 150 feet away and downslope from any water wells.
- All uncontained pesticide spills of more than 1 gallon liquid or 4 pounds dry weight must be reported to the director of Pesticide and Environmental Programs with the 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 must be reported to the Louisiana Department of Transportation and Development. Spills into navigable waters must be reported to the Louisiana Department of Environmental Quality, U.S. Coast Guard and U.S. Environmental Protection Agency.
- Empty metal, glass or plastic pesticide containers must be either triple rinsed or pressure washed, and the rinse water should be added to the spray solution to dilute the solution at that time or stored according to Louisiana Department of Agriculture and Forestry rules to be used later. Rinsed pesticide containers must 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 LSU AgCenter county agent for dates and locations in your area.)

- All pesticides must be removed from paper and plastic bags to the fullest extent possible. The sides of the container should be cut and opened fully, without folds or crevices, on a flat surface. Any pesticides remaining in the opened container should be transferred into the spray mix. After this procedure, the containers can be disposed of in a sanitary landfill.
- Application equipment should be triple rinsed and the rinse water applied to the original application site or stored for later use to dilute a spray solution.
- Mix/load or wash pads (NRCS production code Interim) should be located at least 150 feet away and downslope from any water wells and away from surface water sources such as ponds, streams, etc. The pads should be constructed of an impervious material, and there should be a system for collecting and storing the runoff.
- Empty containers should not be kept for more than 90 days after the end of the spray season.
- Air gaps should be maintained while filling the spray tank to prevent back-siphoning.



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.

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Authors

Kenneth Gravois, PhD.
Sugarcane Specialist, LSU AgCenter, Sugar Research Station

Brian D. LeBlanc, Ph.D.
Associate Professor, W.A. Callegari Environmental Center, LSU AgCenter
Louisiana Sea Grant College Program

Ronald Sheffield, Ph.D.
Associate Professor, Department of Biological and Agricultural Engineering, LSU AgCenter

Karen E. Nix, M.S.
Pesticide Safety Education Coordinator, W.A. Callegari Environmental Center, LSU AgCenter,

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Louisiana State University Agricultural Center, William B. Richardson, Chancellor
Louisiana Agricultural Experiment Station, John S. Russin, Vice Chancellor and Director
Louisiana Cooperative Extension Service, Paul D. Coreil, Vice Chancellor and Director

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