



# **Rice 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.

*BMP*s are used by agricultural producers to control the generation or delivery of pollutants from agricultural activities to water resources of the state, thereby preventing degradation of surface and groundwater.



# INTRODUCTION

Rice is one of the most important crops produced in Louisiana with regard to both total acreage grown and for its economic value. Production has expanded from the traditional rice-producing area of southwestern Louisiana to other areas of Louisiana, especially the northeastern portion. Rice acreage has fluctuated in Louisiana in recent years from a high of 620,000 acres in 1994 to a low of 518,000 acres in 1991. Much of this fluctuation has been caused by farm policy programs and world market economics that directly affect the price received by Louisiana producers.

The loss of soil, plant nutrients and crop protection products, such as pesticides, from cropland has been identified as a significant environmental problem. This guide describes the conservation measures or

Best Management Practices (BMPs) for rice production implemented primarily for the purpose of conserving and protecting soil and water resources by controlling the movement of potential agricultural pollutants into surface and groundwater. They may, however, in addition to protecting the environment in many cases, enhance yields, wildlife habitats, improve overall production and provide for sustainability of soil productivity and a continued supply of water of suitable quality.

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. These BMPs also are described in the Rice Production Handbook published by the LSU Agricultural Center. 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 LSU AgCenter parish offices.

The potential for degradation of surface waters is greatest following land preparation, land leveling and conventional water planting. Measures to reduce the potential adverse effects of these activities on surface waters are discussed in detail.

# SITE SELECTION

Because rice is grown under flooded conditions, it is best produced on land that is nearly level, minimizing the number of water-retaining barriers or levees required. Some slope is required to facilitate adequate drainage. Generally slopes of less than 1 percent are necessary for adequate water management. Most of Louisiana's rice-growing areas are well suited for rice production with a minimum of land forming. Recent innovations using laser systems have made precision leveled or graded fields physically and economically feasible (NRCS code 462).

Precision grading of fields to a slope of 0.2 foot or less change in elevation between levees is important in rice production for the following reasons:

1. permits uniform flood depth
2. may eliminate a large number of levees
3. facilitates rapid irrigation and drainage
4. can lead to the use of straight, parallel levees that will increase machine efficiency
5. eliminates knolls and potholes that may cause delay of flood or less than optimum weed control
6. reduces the total amount of water necessary for irrigation



Precision land leveling



Parallel levees



# SEDIMENT MANAGEMENT IN SURFACE WATER

## Field Preparation

The following are soil and water management practices to use to reduce the amount of sediment leaving the rice field in the irrigation water, thereby reducing soil loss from the fields (NRCS code 746). The methods used on your farm will depend on weather conditions, level of red rice infestation, soil type and rotational crops.

In fields that require water leveling in the spring, the irrigation water will be retained in the field to allow for the suspended sediment to settle before release. The “Suspended Sediment Test

Kit” developed by the LSU AgCenter or other approved methods of measuring suspended sediment will be used to time planting and water release to minimize soil loss. These kits are available at your parish LSU AgCenter Extension Service office.

The kits are very simple to use. A sample of the floodwater is taken 24 hours after water leveling. Take the sample from several places in the field and place in a bucket. Next, put a sample from the bucket into the test kit bottle. Add a pinch of alum (provided in the kit) to the sample in the test bottle, and shake the bottle to mix the alum with the water. Then place the bottle where it will not be disturbed for 24 hours. The suspended sediment will settle to the bottom of the bottle. After 24 hours, measure the depth of the sediment in the bottle. This is the starting measurement. Additional samples are then taken at two- or three-day intervals, using the same procedure. The goal is to reduce the amount of suspended sediment by at least 50 percent before releasing the floodwater. For most rice growers, this means holding the floodwater for about seven to 14 days. By using the kits, the rice grower can time planting and water release to minimize soil loss.

In fields that need extensive water leveling, the work should be done in the fall and the water held as described above to allow for settling. Water may be held during the winter if desired (NRCS code 644). Holding the water over the winter also will create additional wetland habitat for waterfowl, furbearers and other wildlife.

Water needed for each irrigation application shall be applied in the most efficient manner (NRCS code 449). Water will be applied at a rate and in such a manner that it will not cause excessive soil and water loss. Installation of Structures for Water Control (NRCS code 587) and Grade Stabilization Structures (NRCS code 410) will facilitate water application and release. Grade stabilization structures (such as pipe drops or other approved devices) will be installed and maintained to reduce erosion.



Using the suspended sediment test kit



Efficient application of floodwater

## Irrigation Land Leveling

### (NRCS Code 464)

The reshaping of the surface of the land that is to be irrigated to planned grades. The purpose is to allow for efficient application of irrigation water without causing erosion, loss of water quality or damage to land by waterlogging and at the same time to provide for adequate surface drainage.

## Land Smoothing

### (NRCS Code 466)

The removing of irregularities on the land surface by use of special equipment. This improves surface drainage, provides for more effective use of precipitation, obtains more uniform planting depths, provides for more uniform cultivation, improves equipment operation and efficiency, improves terrace alignment and facilitates contour cultivation.



## Precision Land Forming

### (NRCS Code 462)

Reshaping the surface of the land to planned grades. It improves surface drainage, provides for more effective use of rainfall, facilitates the installation of more workable drainage systems, reduces the incidence of mosquito infestation, controls erosion, improves water quality and prevents damage to land by waterlogging.

## Regulating Water in Drainage System

### (NRCS Code 554)

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



## 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.



The following conservation practices apply to rice production.

The practice and the NRCS production code are listed.

## Irrigation Canal or Lateral

### (NRCS Code 320)

A permanent irrigation canal or lateral constructed to convey 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 convey water efficiently.



## Irrigation Field Ditch

### (NRCS Code 388)

A permanent irrigation ditch constructed to convey water from the source to a field or fields in a farm distribution system. It is designed to prevent erosion or loss of water quality or damage to the land, to make possible proper irrigation water use and efficiently convey water.



## Controlled Drainage

### (NRCS Code 335)

The control of surface water through the use of drainage facilities and water control structures. Its purpose is to conserve water and maintain optimum soil moisture. It is designed to store and manage rainfall for more efficient crop production. It improves surface water quality by increasing infiltration, thereby reducing runoff that may carry sediment into nearby water bodies.



## Lined Waterway or Outlet

### (NRCS Code 468)

A waterway or outlet having an erosion-resistant lining of concrete, stone or other permanent material. The lined section extends up the side slopes of the outlet. It provides for efficient flow of runoff without damage from erosion.



## 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.



## Filter Strips

### (NRCS Code 393)

These are strips or areas of vegetation for removing sediment and other pollutants from runoff. The area is on the lower edge of fields or above conservation practices such as terraces or diversions, or on fields adjacent to streams, ponds and lakes.



## Tailwater Recovery

### (NRCS Code 447)

This is a facility to collect, store and transport irrigation tailwater to reuse in a farm irrigation distribution system. It is designed to conserve irrigation water supplies and improve water quality by collecting discharge water for reuse.



## Field Borders

### (NRCS Code 386)

These are strips of perennial vegetation established at the edge of a field. A field border controls erosion and protects edges of fields that are used as “turnrows” or travel lanes for farm machinery.



## Grassed Waterways

### (NRCS Code 412)

These are natural or constructed channels that are shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff. They are designed to convey runoff without causing erosion or flooding and to improve water quality.



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

# Planting Methods

Water seeding is the predominant method of rice seeding used in Louisiana. It is widely used in southwestern Louisiana and, to a lesser extent, in the northern portion of the state.

Using a water-seeding system is an excellent cultural control method of red rice and also is the primary reason for the popularity of this system in South Louisiana. Water seeding is sometimes an alternative planting operation when excessive rainfall prevents dry planting methods.

Alternative planting methods will be used to reduce sediment loading and reduce soil loss. Methods used will depend on weather



conditions, level of red rice infestation, soil type and rotational crops. The planting method(s) used will be chosen from these options.

## Water Planting

**Sowing of dry or soaked seed into a flooded field.**

**Usually implemented for any or all of the following reasons: red rice control, wet planting season, planting efficiency and earlier crop maturity.**

**DRY SEEDBED** seedbed prepared dry before flood establishment (clear water planting).

Prepare a dry seedbed in the spring, close levees immediately and apply floodwater.

Plant rice and release clear water.



### ADVANTAGES

- Less wear and tear on equipment
- Possibility of less labor
- Possibility of reduced water mold
- Decreases the amount of suspended sediment in the floodwater

### DISADVANTAGES

- Possibility of reduced weed control, especially with red rice and aquatics
- Increases possibility of seed drift
- Difficult to prepare seedbed in wet spring

To reduce the possibility of seed drift, a grooving implement can be used. The result is a seedbed with grooves 1 to 2 inches deep on 7- to 10-inch centers. In some cases, a field cultivator can do an acceptable job. The shallow grooves provide a depression for the seed to fall into and give some protection from wave action.

## FLOODED SEEDBED

(with water retention) -  
seedbed prepared following flood  
establishment (mudding in).

Close levees and flood the field; water level the field; the floodwater must be held in the field after all water leveling or other mechanical soil-disturbing activities have been conducted to allow for settling of suspended materials, plant rice and release floodwater.

Because red rice and commercial rice are so closely related genetically, herbicides that control red rice will generally kill commercial rice. Water management alone can often effectively suppress red rice and reduce competition. Presence of red rice mandates that rice be produced in a water-seeded system. Uniform, level seedbeds are critical for success. In this system, a flood is established with the rice seed being seeded directly into the floodwater. Before flying on the rice seed, till the field to muddy the water and kill germinated red rice that would otherwise emerge through the clear water. The floodwater is then released and rice seedlings are allowed to peg into the soil. If this planting method is used, however, the procedures described in the “Field Preparation” section on page 5 must be followed to reduce the amount of sediment leaving the field in the floodwater.



### ADVANTAGES

- Helps to control red rice
- Should provide a more level seedbed
- Should reduce amount of existing vegetation
- Reduces seed drift

### DISADVANTAGES

- Increases equipment and labor cost
- Difficult to maintain levees during the time needed for sediment to settle
- Unless the floodwater is held in the field to allow for settling, increased soil loss from the field will occur



## SPRING STALE SEEDBED

seedbed prepared dry followed by  
establishment of native vegetation,  
usually three to six weeks preplant.  
May require application of preplant  
burndown herbicides before flooding.

### ADVANTAGES

- Uses less water
- Reduces use and wear on equipment
- Reduces labor
- Lower input cost possible
- Decreases the amount of suspended sediment in the floodwater

### DISADVANTAGES

- Possibility of reduced weed control
- Increases chance of poor stand establishment
- May increase use of herbicides

## FALL STALE SEEDBED

seedbed prepared dry followed by establishment of native vegetation, usually four to five months preplant. May require application of preplant burndown herbicides before flooding.



### ADVANTAGES

- Uses less water
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- Decreases the amount of suspended sediment in the floodwater

### DISADVANTAGES

- Possibility of reduced weed control
- Increases chance of poor stand establishment
- May increase use of herbicides

## NO-TILL

planting into either previous crop residue, native vegetation or existing crawfish ponds without any soil disturbance. Usually requires application of preplant burndown herbicide before planting.

Maintain previous crop residue on the soil surface, apply a recommended herbicide before planting to kill volunteer vegetation, close levees and apply floodwater, hold water until rice is planted. No disking of residue, water leveling or any other mechanical soil-disturbing activity is allowed.



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# Dry Planting

sowing seed into a dry seedbed (drilling or broadcasting).



## CONVENTIONAL SEEDBED

mechanical seedbed preparation immediately before planting.

### ADVANTAGES

- Less wear on equipment
- Lower seed requirements
- Less intensively managed (water management)
- Timely planting
- More flexibility of planting

### DISADVANTAGES

- Weather dependent
- Planting requires more time

## FALL STALE SEEDBED

seedbed prepared dry followed by establishment of native vegetation, usually four to five months preplant. May require application of preplant burndown herbicides before flooding.



### ADVANTAGES

- Uses less water
- Reduces use and wear on equipment
- Reduces labor
- Lower input cost possible
- Decreases the amount of suspended sediment in the floodwater

### DISADVANTAGES

- Possibility of reduced weed control
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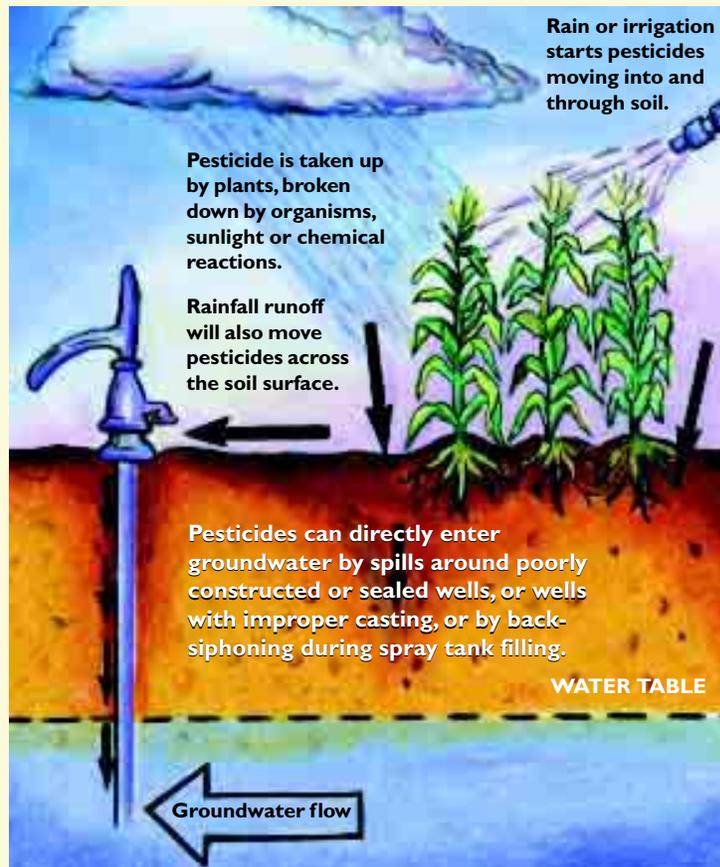
Research is being conducted on the development of herbicide-resistant rice varieties. The potential environmental benefits from using these varieties will be substantial. If these varieties are approved for use, they will alter the methods of planting rice that we use today. They will give rice growers a better method of controlling red rice, and the cultural practices used today for controlling red rice will not be needed as extensively.



# 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 prevented. Some sources of contamination are easily recognizable from a single, specific location. Other sources are more difficult to pinpoint. This is called nonpoint source pollution. 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, you will follow environmentally sound guidelines for pesticide usage.



## Pest Management Procedures

Pesticides will be applied only when they are necessary for the protection of 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 of the 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 closely followed.
- 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.

Using chemicals at rates above those specified by the label is **ILLEGAL** and an environmental hazard because more pesticide is exposed to erosion, runoff or leaching. In pesticide application, “the label is the law.” Poor timing of a pesticide application also 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 around these areas buffer zones 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 with care and carefully maintain application equipment.

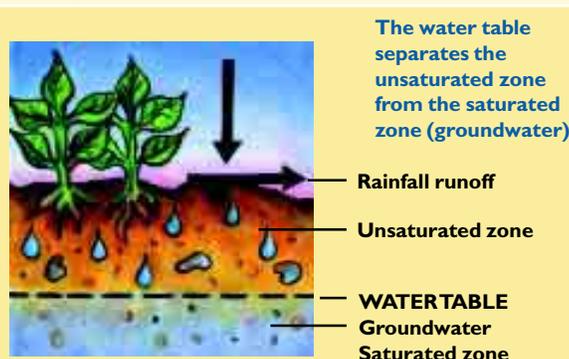
- Carefully calibrate the application equipment at the beginning of the spray season and periodically thereafter. Spray according to recommendations.

- 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 records of all pesticide applications, not just a record of Restricted Use Pesticides.



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## Pesticide Selection

When selecting pesticides, a farmer should 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 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 that are bound to soil particles and organic matter are subject to the forces of leaching, erosion or runoff over 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 brief instructions about 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, which may be disposed of during municipal waste collection if wrapped according to recommendations.

Storage sites should be carefully chosen to minimize the chance of escape 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 should be 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 that 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.



## Emergency Planning and Community Right-to-Know

Farms that use pesticides may be “facilities” subject to the notification requirements of the law. Notification also is required for emergency releases of hazardous chemicals. Proper application of pesticides is not covered under this law. The community right-to-know provisions of the act require that material safety data sheets required under OSHA, as well as documents showing the location and amount of chemicals present at the facility (if the quantity exceeds the “reportable quantity”), be provided to the state and local emergency planning bodies and to the local fire department.

## Agricultural Chemicals and Worker Safety

The EPA has general authority to regulate pesticide use in order to minimize risks to human health and 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 also read the Worker Protection Standard regulations governing the use of and exposure to pesticides. The rule sets forth minimum standards for the protection of farm workers and pesticide handlers that must be followed. 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 affect interstate commerce in some respect, regardless of where goods are produced, sold or consumed, 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

**A.** All label directions will be read, understood and followed.

**B.** The Louisiana Department of Agriculture and Forestry (LDAF) is responsible for the certification of pesticide applicators. All pesticide applicators in Louisiana 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 trainings.

**C.** 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.*

**D.** 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.

**E.** 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 DEQ, Coast Guard, USEPA.

**F.** 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.)

**G.** 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.

**H.** 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.

**I.** 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.

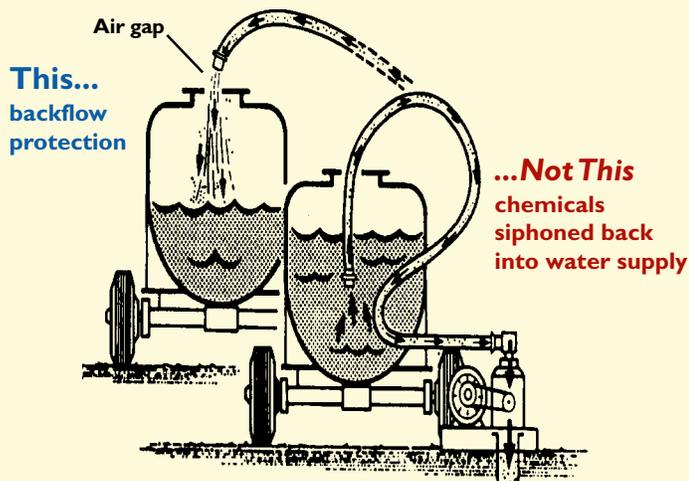


Wash pad with collection pond

The pads will be constructed of an impervious material, and there will be a system for collecting and/or storing the runoff.

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

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





# 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. 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 in N. Properly fertilized crops use both N and water more efficiently, thus improving environmental quality and profitability.

Supplemental N will be necessary on almost all non-legume crops in Louisiana for maximum profits. Rely on 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 ( $\text{NH}_4^+$ ) and nitrate ( $\text{NO}_3^-$ ). 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 some 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) are low in solubility. The amount of these elements (calcium, iron and aluminum)

present in reactive forms varies with different soils and soil conditions. They determine the amount of phosphorus that can be fixed in the soil.

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

Phosphate is not readily 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, however. 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



Algae bloom

groundwater (NRCS Production Code 590). A nutrient management plan should be developed for the proposed crop by using soil analyses from approved laboratories.

## 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, certified agricultural consultants and/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 on soil that estimates whether levels of essential plant nutrients are sufficient to produce a desired crop and yield. 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 predict which nutrient(s) and how much of that nutrient(s) should be added 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 problems
- optimize farm income by avoiding excessive fertilization and reducing nutrient losses by leaching and runoff
- 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

# Nutrient Management Plans (NMPs)



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 issues related to agriculture.

The implementation of Nutrient Management Plans (NMPs) by all agricultural producers will ensure that fertilizers are managed in an environmentally friendly fashion.

## Developing a Nutrient Management Plan

A nutrient management plan (NMP) 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 NMP. The best NMP is one that is matched to the farming operation and the needs of the person implementing the plan.

## The Parts of an NMP

An NMP looks at 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 leave the farm in harvested crops and animal products. These are nutrient removals. Ideally, 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 greater. When you check nutrient inputs against nutrient removals, you are creating a mass balance. This nutrient mass balance is an important part of an NMP and

important to understand for your farming operation.

Another important part of a successful NMP are BMPs. BMPs, such as soil testing, 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.

Filter strip



## The Basic Steps

NMPs consist of four major parts: evaluation of nutrient needs, inventory of nutrient supply, determination of nutrient balance and preventive maintenance and inspection.

### 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.

#### Soil Testing

Complete and accurate soil tests are important for a successful nutrient management plan. You will need soil tests every three years to determine how much nutrient addition is needed. The needed nutrients can be supplied from commercial fertilizer and/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. 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.

## 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 NMPs is balancing the two. This can be done in several ways. Most NMPs are developed based on nitrogen, but other factors such as phosphorus or metals could control how much you can put out under certain conditions. A phosphorus index is being developed to help producers determine when nutrient management based on phosphorus would be advisable.

## 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. You should keep all results from soil and plant and examine how they change with time with your management practices. Records should be kept on crop yields, nutrient application rates, timing and application methods. Keep detailed sched-

ules and records on calibration of spraying and spreading equipment. When you have a major change in production, update your plan to reflect these changes.

### Where Can You Obtain Information Needed for Your NMP?

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 comprehensive nutrient management plan.

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





# 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 flooding rice fields. 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 (1320 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 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 and ground-water.

- 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.”

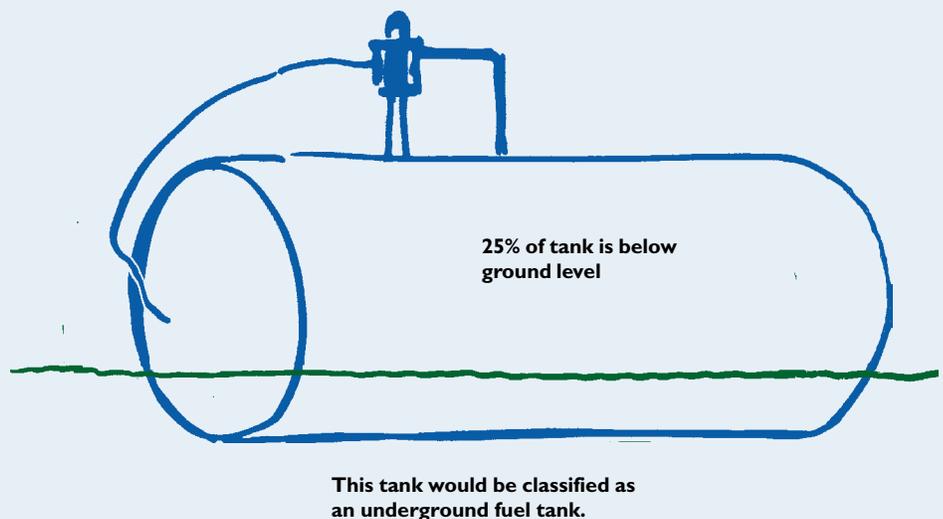
- The bottom of the tank should be supported by concrete blocks approximately 6 inches above the ground surface to protect the bottom of the tank from corrosion.

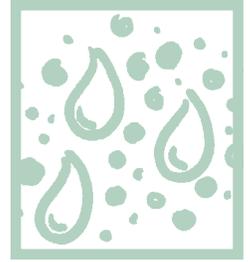
- If a pumping device is used, it should be tightly and permanently attached and meet NFPA approval. Gravity discharge tanks are acceptable, but they must be equipped with a valve that will automatically close in the event of a fire.

- 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.

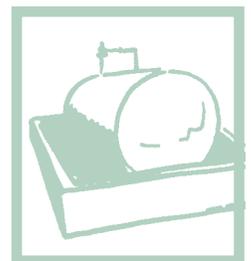




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**T**he complex nature of nonpoint pollution means programs designed to reduce its impact on the environment will not be easy to establish or maintain. Controlling these contaminants will require solutions as diverse as the pollutants themselves. Through 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](http://www.lsuagcenter.com)

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