

**GEORGIA FARM\*A\*SYST**



**FARM  
ASSESSMENT  
SYSTEM**

## **FERTILIZER STORAGE & HANDLING**

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### **PRE-ASSESSMENT:**

#### **Why Should I Be Concerned?**

Fertilizers play a vital role in agriculture. Over the years, they have increased farm production dramatically. Commercial fertilizer is, however, a major source of nitrate, which can affect ground water quality by seeping through the ground after a leak or spill.

Nitrate levels in drinking water above federal and state drinking water standards of 10 mg/l nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ) can pose a risk to some infants. Children under 6 months of age are particularly susceptible to health problems from high  $\text{NO}_3\text{-N}$  levels, including the condition known as methemoglobinemia (blue baby syndrome). Nitrates can also affect adults, but the evidence is much less certain. Young livestock are also susceptible to health problems from high  $\text{NO}_3\text{-N}$  levels. While livestock may be able to tolerate several times the 10 mg/l  $\text{NO}_3\text{-N}$  level, levels of 20-40 mg/l may prove harmful, especially in combination with high levels (1,000 ppm) of  $\text{NO}_3\text{-N}$  from feed sources.

#### **How Does This Assessment Help Protect Drinking Water and the Environment?**

- This assessment allows you to evaluate the environmental soundness of your farm and operational practices relating to your fertilizer storage and handling practices.
- This assessment asks a series of questions about your fertilizer storage and handling practices.
- You are encouraged to work through the entire document and use all areas when completing the assessment.
- The assessment evaluation uses your answers (rankings) to identify practices or structures at risk that should be modified to prevent pollution.
- The Fertilizer Facts provide an overview of sound environmental practices that can be used to prevent pollution caused directly by your storage and handling practices.
- You are encouraged to develop an action plan based on your needs as identified by the assessment. The Fertilizer Storage and Handling Facts, Reference and Publication listing can provide alternatives to current practices.
- Farm\*A\*Syst is a voluntary program.
- You should conduct the assessment for your use. If needed, a professional from UGA Cooperative Extension or one of the other partnership organizations can provide assistance in completing the assessment or action plan.
- No information from this assessment needs to leave your farm.

## ASSESSMENT:

### Assessing Your Fertilizer Storage and Handling Practices

For each category listed on the left, read across to the right and circle the statement that best describes conditions on your home and/or farm. If a category does not apply – for example, it asks about dry fertilizers and you only use liquid – then simply skip the question. Once you have decided on the most appropriate answer, look above the description to find your rank number (4, 3, 2 or 1) and enter that number in the “RANK” column. The entire assessment should take less than 30 minutes. A glossary is on page 10 to clarify words found in italics throughout this assessment.

<b>FERTILIZER STORAGE AND HANDLING</b>					
	<b>LOW RISK (rank 4)</b>	<b>LOW-MOD RISK (rank 3)</b>	<b>MOD-HIGH RISK (rank 2)</b>	<b>HIGH RISK (rank 1)</b>	<b>RANK</b>
<b>FERTILIZER STORAGE</b>					
<b>Amount of fertilizer stored</b>	None stored at any time.	Less than 1 ton of dry fertilizer or less than 55 gallons of liquid.	Between 1 and 20 tons of dry fertilizer or between 55 and 1,500 gallons of a liquid.	More than 20 tons of dry fertilizer or more than 1,500 gallons of a liquid.	
<b>Type of storage for dry solid fertilizers</b>	Covered on impermeable surfaces (such as concrete or asphalt). Spills are collected and used or returned to storage.	Covered on clay soil. Spills are collected and used or returned to storage.	Partially or incompletely covered. Spills not collected regularly.	Not covered, on sandy soils. Spills not collected.	
<b>Type of storage for liquid fertilizers</b>	Concrete or other impermeable secondary containment doesn't allow spill to enter soil. Tank in covered area.	Clay-lined secondary containment. Most of the spill can be recovered.	Somewhat permeable soils (loams). No secondary containment. Most of a spill can't be recovered.	Permeable soil (sand). No secondary containment. Spills enter soil.	
<b>Security</b>	Fenced or locked area separate from all other activities.	Fenced area separate from most other activity.	Open to activities that could damage containers or spill fertilizer.	Children have open access. Also open to theft and vandalism.	
<b>Containers</b>	Original containers clearly labeled. No holes, tears or weak seams.	Original containers old. Labels partially missing or hard to read.	Containers are old, deteriorating or patched. Metal containers showing signs of rust.	Containers have holes or tears that allow fertilizer to leak. No labels.	
<b>DRY OR LIQUID MIXING AND LOADING PRACTICES</b>					
<b>Location of well in relation to mixing/loading area without containment pad. <i>If you have a containment pad, skip to next section.</i></b>	101 or more feet downslope from well or greater than 1,000 feet upslope of a well.	51 to 100 feet downslope from well or greater than 500 feet upslope of a well.	26 to 50 feet downslope, or 101 to 500 feet upslope of a well.	Within 25 feet downslope or 100 feet upslope of a well.	

**FERTILIZER STORAGE AND HANDLING**

	<b>LOW RISK (rank 4)</b>	<b>LOW-MOD RISK (rank 3)</b>	<b>MOD-HIGH RISK (rank 2)</b>	<b>HIGH RISK (rank 1)</b>	<b>RANK</b>
<b>LIQUID MIXING AND LOADING PRACTICES</b>					
<b>Mixing and loading pad spill containment</b>	Concrete pad with curb keeps all spills contained and drains to sump, or mixing done at various locations in the field that are rotated regularly and use a nurse tank.	Concrete pad with curb keeps all spills contained with no sump, or mixing is done in the field using a nurse tank.	Concrete pad with some cracks keeps most spills contained. No curb or sump.	Concrete pad severely cracked. Spills soak into the ground OR mixing and loading on the ground (no pad).	
<b>Water source</b>	Separate water tank.	Hydrant away from well.	Hydrant near well.	Water taken directly from well or surface water source.	
<b>Backflow prevention on water supply</b>	Anti-siphon device installed or hose kept above tank opening to maintain air gap between hose and tank.	Anti-siphon device installed. Hose in tank above water line.	No anti-siphon device. Hose in tank above water line.	No anti-siphon device. Hose in tank below water line.	
<b>Supervising of tank filling</b>	Remain at site until filling is completed.	Remain near site checking on filling frequently.	Leave site for short times and check on filling every few minutes.	Start and leave site and check only when filling period is nearly complete.	
<b>Handling system</b>	Closed system for all liquid product transfers.	Closed system for most liquids. Some liquids hand poured. Application tank fill port easy to reach.	All liquids hand poured. Application tank fill port easy to reach.	All liquids hand poured. Application tank fill port hard to reach.	
<b>CLEANUP AND DISPOSAL PRACTICES</b>					
<b>Applicator cleaning and rinsate (rinse water) disposal</b>	Applicator washed out in field. Rinsate used in next load and applied to crop.	Applicator washed out on pad at farm. Rinsate used in next load and applied to crop.	Applicator washed out at farm. Rinsate sprayed less than 100 feet from well.	Applicator washed out at farm. Rinsate dumped at farm or in field.	

## FERTILIZER STORAGE AND HANDLING

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<b>FERTILIZER APPLICATION</b>					
<b>Application rates</b>	Fertilizer applied to fields at rates that are just high enough to meet crop nutrient requirements based on a nutrient management plan.	Fertilizer applied to cropped fields at rates that do not exceed crop nutrient requirements. Soils in application areas are tested yearly for phosphorus and potassium.	Fertilizer applied to cropped fields at rates that do not exceed crop nutrient requirement. Soils in application areas are not tested.	Fertilizer applied to cropped lands at rates that exceed crop nutrient requirement. Soils in application areas are not tested.	
<b>Application timing</b>	According to accurate nutrient accounting or nutrient management plan. Never apply on saturated soil.	Based on when crop is at growth stage that it usually needs fertilizing. Try to avoid applying in wet conditions.	Based on when time permits. Sometimes apply when soil is wet.	Not based on plant demand for nutrient.	
<b>Application areas</b>	All areas are more than 25 feet from rock outcrops, 100 feet from surface water sources, wells, dwellings or sinkholes, and have slopes of 15% or less. Or all areas are approved by a nutrient management plan.	Most areas are more than 25 feet from rock outcrops and 100 feet from surface water sources, wells, dwellings or sinkholes, or have slopes less than 15%. Or most areas are approved by a nutrient management plan.	Several areas are less than 25 feet from rock outcrops, or less than 100 feet from surface water sources, wells, dwellings or sinkholes, or have slopes greater than 15%.	Fertilizer nearly always applied to areas that are less than 25 feet from rock outcrops, or less than 100 feet from surface water sources, wells, dwellings, or sinkholes, or that have slopes greater than 15%.	
<b>Record keeping</b>	Good records kept on fertilizer applications, rates, timing and areas.	Fair records kept on fertilizer applications, rates, timing and areas.	Poor records kept on fertilizer applications, rates, timing and areas.	No records kept.	
<b>Calibration</b>	Fertilizer application equipment is calibrated to proper application rate before each application and checked at least once during the application period. Applications are made uniformly over the area.	Fertilizer application equipment is calibrated before each application but not rechecked during the application period. No effort made to assure applying fertilizer uniformly over the area.	Use custom applicator and assume person calibrates equipment, or calibrate your application equipment once a year.	Never calibrate fertilizer application equipment or ask custom applicator about calibration procedures.	

**Number of Areas Ranked \_\_\_\_\_**

(Number of questions answered, if all answered, should total 17.)

**Ranking Total \_\_\_\_\_**

(Sum of all numbers in the "RANK" Column)

## **ASSESSMENT EVALUATION:**

### **What Do I Do with These Rankings?**

#### **STEP 1: Identify Areas Determined to be at Risk**

Low-risk practices (4s) are ideal and should be your goal. Low- to moderate-risk practices (3s) provide reasonable protection. Moderate- to high-risk practices (2s) provide inadequate protection in many circumstances. High-risk practices (1s) are inadequate and pose a high risk for causing environmental, health, economic or regulatory problems.

**High-risk practices (rankings of “1”) require immediate attention.** Some practices may require little effort to correct, while others could be major or costly and may require planning or prioritizing before you take action. All activities identified as “high-risk” or “1s” should now be listed in the action plan. Rankings of “2s” should be examined in greater detail to determine the exact level of risk and attention should be given accordingly.

#### **STEP 2: Determine Your Fertilizer Risk Ranking**

The Risk Ranking provides a general idea of how your fertilizer storage and handling practices might be affecting your ground and surface water, contaminating your soil and affecting your air quality.

Use the rankings total and the total number of areas ranked to determine the Fertilizer Risk Ranking.

<b>RANKING TOTAL</b>	<b>÷</b>	<b>TOTAL NUMBER OF AREAS RANKED</b>	<b>=</b>	<b>FERTILIZER RISK RANKING</b>
_____	÷	_____	=	_____

<b>FERTILIZER RISK RANKING.....</b>	<b>LEVEL OF RISK</b>
3.6 to 4 .....	Low Risk
2.6 to 3.5 .....	Low to Moderate Risk
1.6 to 2.5 .....	Moderate Risk
1.0 to 1.5 .....	High Risk

This ranking gives you an idea of how your fertilizer storage and handling practices might be affecting your ground and surface water. This ranking should serve only as a general guide, and not as a precise diagnosis since it represents the average of many individual rankings.

#### **STEP 3: Read the Section on Improving Your Fertilizer Storage and Handling Practices**

While reading, think about how you could modify your practices to address some of your moderate and high-risk areas. If you have any questions that are not addressed in the “fertilizer facts” portion of this assessment, consult the references or contact your county Extension agent for more information.

#### **STEP 4: Transfer Information to the Total Farm Assessment**

If you are completing this assessment as part of a “Total Farm Assessment,” transfer your fertilizer risk ranking and your identified high-risk practices to the overall farm assessment.

## **FERTILIZER FACTS:**

### **Improving Fertilizer Storage and Handling**

We will look at five different areas of fertilizer management on your farm:

- Fertilizer Storage Practices
- Liquid Fertilizer Mixing and Loading Pad
- Spill Cleanup
- Container Disposal Practices
- Other Management Factors

### **FERTILIZER STORAGE**

If stored safely in a secure location, fertilizers pose little danger to ground water. Common sense suggests keeping fertilizer dry and away from activities that might rip open a bag or allow rain to enter a bulk container.

In the event of such an accident, an impermeable (waterproof) floor, such as properly treated concrete, helps prevent fertilizer from seeping into the ground and leaching to ground water. A curb built around liquid-fertilizer storage areas prevents contaminants from spreading elsewhere.

Secondary containment provides an impermeable floor and wall around the storage area, which will minimize the amount of fertilizer seeping into the ground if a bulk liquid fertilizer storage tank should leak.

A mixing/handling pad provides secondary containment during the transfer of liquid fertilizer to application equipment or nurse tanks. Store piles of dry bulk fertilizer on an impermeable surface under cover in a building. Treat dry fertilizer impregnated with a pesticide as a pesticide. Store under cover protected from rain.

### **Building a Storage Facility**

Building a facility for fertilizer storage may be expensive, but this may be safer than trying to modify areas meant for other purposes. When building a fertilizer-storage facility, keep the following principles in mind:

- Locate the dry-storage building or liquid secondary containment down slope and at least 100 feet away from the well. The distance from the well should be greater if the site has sandy soil or limestone bedrock.
- In the event of a fire, contaminated water should drain to a confined area.
- The mixing and loading area should be close to your storage facility to minimize the distance that fertilizers are carried.
- The building foundation and secondary containment flow should be well drained and above the water table. The finished grade should be 3 inches below the storage-area flow and sloped away from the building to provide surface drainage. The subsoil should have a low permeability.
- Provide pallets to keep bags off the floor. Store dry products separately from liquids to prevent wetting from spills.
- If you plan to store large bulk tanks, provide an area to confine 110% of the contents of the largest bulk container, plus the displaced volume of any other storage tanks.

- A locked storage cabinet or building provides security. Preventing unauthorized use of fertilizer reduces the chance of accidental spills or theft. Provide signs or labels indicating that the cabinet or building is a fertilizer storage area. Labels on the outside of the building give firefighters important information about fertilizers during an emergency response to a fire or spill.
- Provide adequate road access for deliveries and emergency equipment.

## Modifying an Existing Storage Facility

You may find the above principles to be expensive and difficult to apply to your current storage, but compared to the cost of a major accident or even a lawsuit, storage improvements are a bargain.

The cheapest alternative you may have is to cut back on the amounts stored. If that option is not practical, consider how you can protect the fertilizers you keep on hand.

Sound containers are your first defense against a spill or leak. Should a bag be accidentally ripped, fertilizers should be confined to the immediate area and promptly recovered.

Confinement means having a solid floor and, for liquid fertilizers, a curb. The secondary containment space should have enough volume to hold 110% of the contents of the largest container, plus the displaced volume of any other storage tanks in the area.

Ideally, your fertilizer storage area should be separate from other activities. If the building must also serve as a machine shed or as housing for livestock, you may find it difficult to meet all the requirements for safe storage.

Stored fertilizers can pose a danger to firefighters and the environment. Reducing the fire risk in the storage area may be the first step, but other things can be done.

You can reduce potential damage by anticipating such emergencies. If a fire should occur, consider where the water will go and where it might collect. Make the storage area secure and accessible, allowing you to get fertilizers out in a hurry. Label windows and doors to alert firefighters to the presence of fertilizer stored in the structure.

If fertilizer containers are damaged, the stored nutrients may be carried away by water and spread over a large area. A curb around the floor can help confine contaminated water.

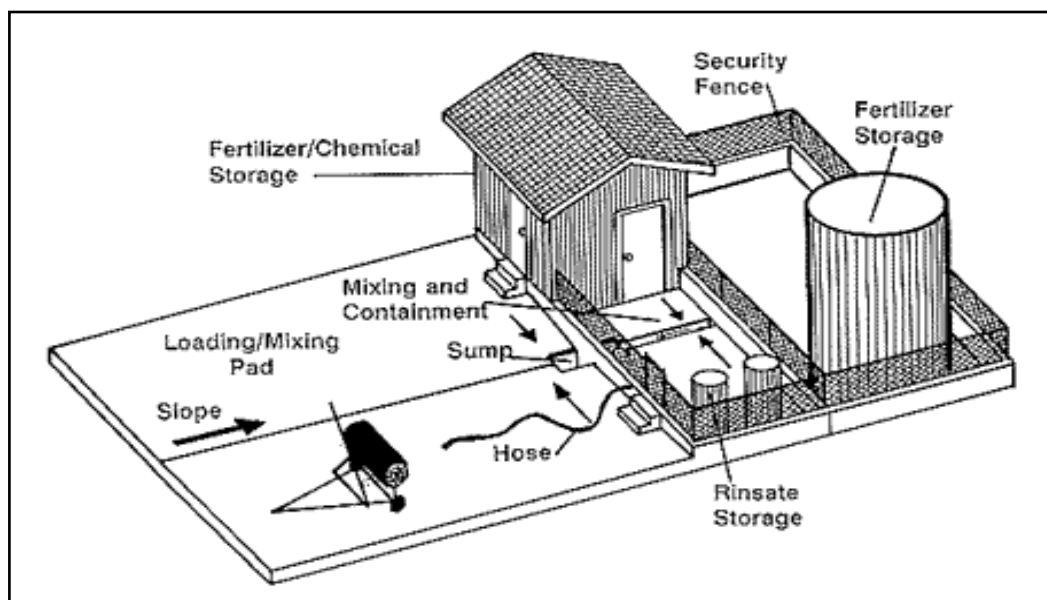


Figure 1. Farm-sized fertilizer facility. *Source: Modular Concrete Wash/Containment Pad for Agricultural Chemicals, by R.T. Noyes and D.W. Dammel.*

## **MIXING AND LOADING PRACTICES: *DRY OR LIQUID***

Ground water contamination can result from small quantities spilled regularly in the same place. To avoid this, it is best to do all of your mixing and loading on a concrete pad or in various locations throughout the field using nurse tanks if liquid formulations are used. Dry fertilizer spills should be promptly and completely cleaned up and placed immediately into the application equipment. Cleaning up liquid fertilizer spills can be much more difficult.

### **Liquid Fertilizer Mixing and Loading Pad**

Containing liquid fertilizer spills and leaks requires an impermeable surface (such as concrete) for mixing and loading. A concrete pad should be large enough to accommodate your equipment and contain leaks from bulk tanks, wash water and spills from transferring fertilizers to the sprayer. Locate the pad adjacent to the storage area. There should be no runoff from the pad.

Pad size depends on your equipment. The pad should provide space around the parked equipment for washing and rinsing. The fertilizers and rinse water should have a confined area, such as a sump for settling, before transfer to rinsate storage tanks. Having several separate rinsate storage tanks allows you to keep rinse water from different fertilizer chemical mixes separate. That way, rinsate can be used for mixing water on subsequent loads.

### **Better Management of Your Existing Mixing and Loading Site**

Liquid fertilizer spills and leaks are bound to occur from time to time. Even if you don't have an impermeable mixing and loading pad, you can minimize contamination by following some basic guidelines.

- Avoid mixing and loading fertilizers near your well. One way to do this is to transport water in a nursetank to the mixing and loading site. Ideally, the mixing and loading site should be moved from year to year within the field of application.
- Avoid mixing and loading on gravel driveways or other surfaces that allow spills to sink quickly through the soil. A clay surface is better than sand because the former slows the movement considerably compared to gravel or sand.
- Install an anti-siphon device on the well or hydrants to prevent backflow of a mixture of water and chemicals into the water supply. Never put the hose in the sprayer tank. Provide an air gap by keeping the hose above the tank opening.
- Always supervise sprayer filling.
- Consider using a closed handling system, in which the fertilizer is directly transferred from the storage container to the applicator equipment, such as by a hose. Humans and the environment are never inadvertently exposed to the chemical when using this method.
- Use rinsate for mixing subsequent loads, and spray the last rinsate load on the targeted crop.

## **CLEANUP AND DISPOSAL PRACTICES**

### **Spill Cleanup**

Promptly sweep up dry spills and reuse the fertilizer as intended. Dry spills are usually very easy to clean up. Dry, impregnated fertilizer is considered a pesticide and, if spilled, should be recovered and applied to the target crop as intended.

For liquid spills, recover as much of the spill as possible and reuse as intended. Some contaminated soils may require removal and field application if possible.

Report spills of more than 25 gallons on the soil or a mixing/loading pad within one working day to the Georgia Department of Agriculture. Smaller quantities of liquid or dry products should be reported if they could cause damage because of the nature of the specific compound or spill location. Remove the spilled material and contaminated soil no matter what the quantity and dispose of it properly.

### **Container Disposal Practices**

Bulk deliveries of anhydrous ammonia, liquid fertilizers and dry bulk fertilizers have reduced the need to dispose of containers. Many farms do, however, use bagged fertilizers and burn the bags in the field. This practice is not recommended. Whenever possible, bundle bags and dispose of them in an approved landfill.

### **Other Management Factors**

Reducing fertilizer waste makes financial as well as environmental sense, but it means more than just reducing spills. It also means buying no more than you need to apply and keeping records of what you do have on hand. Buying only what you need makes long-term storage unnecessary.

Keeping records may seem like a task unrelated to ground water contamination but knowing what you've used in the past and what you have on hand allows you to make better purchasing decisions. Keep records of past field application rates and their effectiveness.

### ***NOTES:***

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## **GLOSSARY:**

### **Fertilizer Storage and Handling**

**Air Gap:** An air space (open space) between the hose or faucet and water level, representing one way to prevent backflow of liquids into a well or water supply.

**Anti-siphon device:** A safety device used to prevent backflow of a mixture of water and chemicals into the water supply.

**Backflow:** The unwanted reverse flow of liquids in a piping system.

**Closed handling system:** A system for transferring pesticides or fertilizer directly from storage container to applicator equipment (through a hose, for example), so that humans and the environment are never inadvertently exposed to the chemicals.

**Milligrams per liter (mg/l):** The weight of a substance measured in milligrams contained in one liter. It is equivalent to 1 part per million in water measure.

**Parts per million (ppm):** A measurement of concentration of one unit of material dispersed in one million units of another.

**Secondary containment:** Impermeable floor and walls around a fertilizer or chemical storage area that minimize the amount of fertilizer or chemical seeping into the ground from a spill or leak.

## **ACTION PLAN:**

An action plan is a tool that allows you to take the needed steps to modify the areas of concern as identified by your assessment. The outline provided below is a basic guide for developing an action plan. Expand your plan if you feel the need to include detail or additional areas. Consult the list of references on the next page if additional assistance is needed to develop a detailed action plan.

Area of Concern	Risk Ranking	Planned Action to Address Concern	Time Frame	Estimated Cost

## **REFERENCES:**

<b>CONTACTS AND REFERENCES</b>			
<b>Organization</b>	<b>Responsibilities</b>	<b>Address</b>	<b>Phone Number</b>
Georgia Environmental Protection Division	Questions concerning disposal of fertilizer.	Hazardous Waste Branch Floyd Tower East 205 Butler Street, SE Atlanta, GA 30334	404-656-3851
Biological & Agricultural Engineering Dept., University of Georgia	Design of fertilizer storage, mixing and loading facilities; sprayer calibration.	Extension Unit Rural Development Center P.O. Box 1209 Tifton, GA 31793	229-386-3442
County Extension-UGA	Information about storage and hazardous waste management.	Local County Extension Office	1-800-ASK-UGA1.

## **PUBLICATIONS:**

**State Soil and Water Conservation Commission**  
**P.O. Box 8024**  
**Athens, GA 30603**

- Best Management Practices for Georgia Agriculture

**University of Georgia Cooperative Extension**  
**Athens, GA 30602**

- Pesticide Storage and Mixing Facilities, Bulletin 1095
- Pesticide Usage in the United States: History, Benefits, Risks and Trends, Bulletin 1121
- Fertilizer Injectors: Selection, Maintenance and Calibration, Bulletin 1237
- Soil and Fertilizer Management Considerations for Forage Systems in Georgia, Bulletin 1346
- Pesticide Storage and Handling, Bulletin 1152-06

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THE UNIVERSITY OF GEORGIA  
**COOPERATIVE EXTENSION**  
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