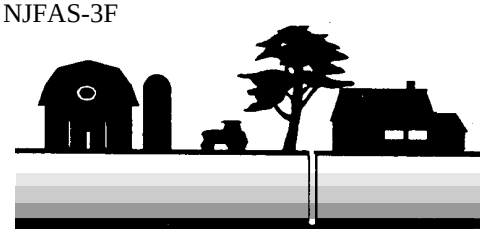

NEW JERSEY
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A FARMSTEAD WATER QUALITY ASSESSMENT SYSTEM

#3 Fact Sheet: Reducing the Risk of Groundwater Contamination by

Improving Fertilizer Storage and Handling

1. Fertilizer storage practices

If stored safely in a secure location, fertilizers pose little danger to groundwater. Common sense suggests keeping fertilizer dry and out of the way of 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 concrete, helps to prevent fertilizer seeping into the ground and leaching to groundwater. A curb built around liquid fertilizer storage areas will prevent contaminants from spreading to other areas.

Secondary containment provides an impermeable floor and walls 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/loading pad provides for 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 or in a building. Treat dry fertilizer impregnated with a pesticide as a pesticide. Store under cover or protected from rain.

Building a new storage facility

While a new facility just for fertilizer storage may be expensive, it may be safer than trying to adapt areas meant for other purposes. Keep these simple principles in mind:

1. Locate the dry storage building or liquid secondary containment downslope and at least 100 feet away from the well. Separation from the well should be greater in areas of sand or fractured bedrock. Worksheet #11, *Site Evaluation*, can assist you in ranking your farmstead soils and geologic conditions according to their ability to keep contaminants out of ground water.
2. In the event of a fire, contaminated surface water should drain to a confined area.
3. The mixing and loading area should be close to your storage facility, to minimize the distance that chemicals are carried.
4. The building foundation or secondary containment floor should be well drained and located above the water table. The finished grade should be 3 inches below the floor of the storage area and sloped away from the building to provide surface drainage. The subsoil should have a low permeability.
5. Provide pallets to keep bags off the floor. Store dry products separate from liquids to prevent wetting from spills.

For glossary, see page 2 of Worksheet #3.

6. If you plan to store large bulk tanks, provide a large-enough containment area to confine 125 percent of the contents of the largest bulk container, plus the displaced volume of any other storage tanks.
7. 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 for a fire or spill.
8. Provide adequate road access for deliveries and emergency equipment.
9. For information on factors to consider in the design of a storage facility, such as ventilation, water access, temperature control and worker safety, contact your NRCS district office.

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. Items 5–8 above are also important points to remember for existing storage.

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.

> That means having a solid floor and, for liquid fertilizers, a curb. The secondary containment space should have enough volume to hold 125 percent 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 to the environment. Reducing the fire risk in the storage area may be the first step, but other things can be done.

> You can reduce the damages by anticipating such emergencies. If a fire should occur, consider where the water will go and where it might collect. In making the storage area secure, also make it accessible, allowing you to get fertilizers out in a hurry.
>
> If fertilizer containers are damaged, the stored nutrients may be carried away by water and spread over a large area.
>
> Label windows and doors to alert firefighters to the presence of fertilizer stored in the structure.
>
> A curb around the floor can help confine contaminated water.

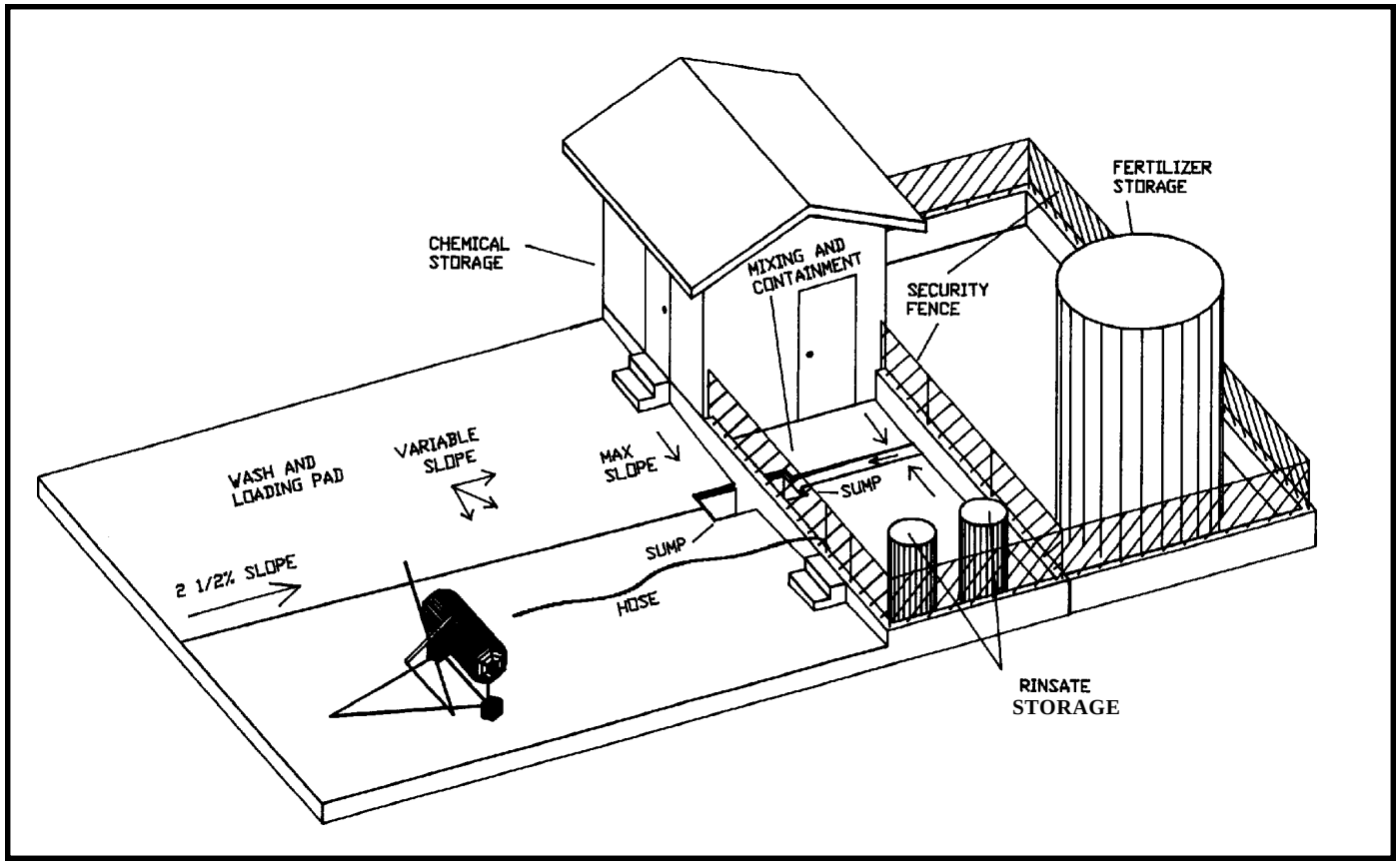

Figure 1: Farm-sized fertilizer facility. *Source: Modular Concrete Wash/Containment Pad for Agricultural Chemicals , by R.T. Noyes and D.W. Kammel. American Society of Agricultural Engineers Paper Number 891613.*

2. Mixing and loading practices

Groundwater contamination can result from small quantities spilled regularly in the same place. Spills of dry fertilizer should be promptly and completely cleaned up and placed immediately into the application equipment. Cleaning up spills of liquid fertilizers can be much more difficult.

A 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 to contain leaks from bulk tanks, wash water and spills from transferring fertilizers to the sprayer.

Locate the pad adjacent to the storage area. Make sure that water from the well moves away from the well. At sites where runoff could reach the well, construct a diversion to direct runoff to another area.

The size of the pad depends on the equipment you use. It 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, it can be used for mixing water on subsequent loads.

If you are considering constructing a mixing/loading pad, more detailed information is available your NRCS district office.

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 use a nurse tank to transport water to the mixing and loading site. Ideally, the mixing 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.
- Anti-backsiphon devices are required by New Jersey law on the well or hydrants. Never put the hose in the sprayer tank. Provide an air gap of 6 inches between the hose and the top of the sprayer tank.
- 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.
- Use rinsate for mixing subsequent loads.

Effective Spill Response: A Case Example

The Wisconsin Department of Natural Resources (DNR) recently responded to a spill of liquid fertilizer on a farm. The 4500-gallon spill occurred from a tank that had been filled a few days earlier. The bottom of the storage container was observed to be leaking and the remaining 28-0-0 was quickly transferred to a different tank. The liquid that leaked from the tank drained into the farmer's paved cattle yard. The farmer, through his fertilizer dealer, contacted DNR and obtained advice on containment methods. Dried manure already formed a berm along the lower edge of the paved lot, and straw and sawdust were used to absorb the liquid. The material was then landspread at normal application rates for the fertilizer.

Prompt discovery, location of the tank such that it drained to a paved and contained area, and immediate reporting and recovery of the spill allowed the farmer to protect his water supply and reuse the spilled fertilizer.

In other cases, extremely high nitrates have been detected in private wells near sites where small amounts of liquid or solid fertilizers have repeatedly been spilled and not cleaned up.

3. Spill cleanup

For dry spills, promptly sweep up and reuse the fertilizer as it was 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 it was intended.

For liquid spills, recover as much of the spill as possible and reuse as it was intended. Some contaminated soil may be required to be removed and field applied if possible.

Report spills of any amount to streams or lakes. Report spills of more than 50 gallons on the soil or a mixing/loading pad. 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.

To report, call the 24-hour Emergency Hotline of New Jersey Department of Environmental Protection at (609) 292-7172.

Remove the spilled material and contaminated soil no matter what the quantity, and dispose according to NJDEP recommendations.

Have an emergency response plan for the site. Know where the runoff water will go, how to handle your particular fertilizers, and whom to call for help.

4. Container disposal practices

Bulk deliveries of anhydrous ammonia, liquid fertilizers and dry bulk fertilizers have reduced the need to dispose of containers. Many farmers do, however, use bagged fertilizers and burn the bags in the field. **Burning bags is illegal**. Bundle bags and dispose of them in an approved landfill.

Your drinking water is least likely to be contaminated by your disposal practices if you follow appropriate management procedures or dispose of wastes in any location that is off the farm site. However, proper offsite disposal practices are essential to avoid risking contamination that could affect the water supplies and health of others.

5. Other management factors

Reducing fertilizer waste makes financial as well as environmental sense, but it means more than just reducing spills. It also means not buying 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 groundwater 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.

CONTACTS AND REFERENCES

Who to call about...

General Contacts

See Introductory Sheet

Plans and recommendations for fertilizer mixing and loading pads

Your local NRCS district office (see Introductory Sheet).

Fertilizer spills

The 24-hour Emergency Hotline of New Jersey Department of Environmental Protection at (609) 292-7172.

Proper disposal of soil contaminated by a fertilizer spill

The NJ Department of Environmental Protection's Division of Solid Waste and Hazardous Waste, Advisement and Waste Classification Unit at (609) 292-8341.

What to read about...

Publications are available from sources listed at the end of the reference section. (Refer to number in parentheses after each publication.)

Health effects

The product label. Read your product labels carefully for specific information on fertilizer health effects.

Nitrate: its effect on families and livestock, Special Circular 308. The Pennsylvania State University. (1)

Nitrates and Groundwater. Freshwater Foundation. (2)

Fertilizer handling and management

Managing Agricultural Fertilizers. NJ Clean Water Information Series (3)

Chemicals in Your Community: A Guide to the Emergency Planning and Right To Know Act. 1988. U.S. Environmental Protection Agency.
Pages 26-27 contain information on implications of this law for farmers. (4)

Fertilizer storage

Fertilizer and Pesticide Containment Facilities Handbook. Midwest Plan Service, Ames, Iowa. MWPS-37. (5)

Publications available from...

1. Rutgers Cooperative Extension, 80 Nichol Ave.,Cook College, New Brunswick, NJ 08903, (732) 932-9634.

2. Freshwater Foundation at Spring Hill Center, 725 County Road 6, Wayzata, Minnesota, (612) 449-0092.

3. Your county offices of Rutgers Cooperative Extension (found in the blue pages of your phone book) or the Publications Distribution Center, Cook College-Rutgers University, New Brunswick, NJ 08903, (732) 932-9762.

4. U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs (TS-766C), 401 M Street S.W., Washington, D.C. 20460.

5. The Midwest Plan Service Secretary, Agricultural Engineering Department, 460 Henry Mall, University of Wisconsin, Madison, Wisconsin 53706, (608) 262-3310.

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The New Jersey Farmstead Assessment System is a cooperative project of the USDA Natural Resources Conservation Service, Rutgers Cooperative Extension, and New Jersey Department of Environmental Protection.

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#3 Worksheet: Assessing the Risk of Groundwater Contamination from Fertilizer Storage and Handling

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. Nitrate-nitrogen levels exceeding the public health standard of 10 milligrams per liter (mg/l; equivalent to parts per million for water measure) nitrate-nitrogen (as N) have been found in many drinking water wells. The other major components of commercial fertilizer, phosphorus and potassium, are not generally a groundwater contamination concern.

Nitrate levels in drinking water above federal and state drinking water standards of 10 mg/l nitrate-nitrogen (as N) can pose a risk to some infants. Infants under 6 months of age are particularly susceptible to health problems from high nitrate-nitrogen levels, including the condition known as methemoglobinemia (blue baby syndrome). Nitrate can also affect adults, but the evidence is much less certain.

Young livestock are also particularly susceptible to health problems from high nitrate-nitrogen levels. While livestock may be able to tolerate several times the 10 mg/l nitrate-nitrogen level, levels of 20-40 mg/l may prove harmful, especially in combination with high levels (1,000 ppm) of nitrate-nitrogen from feed sources.

Farmstead handling of fertilizers can affect groundwater by allowing materials containing nitrogen to seep through the ground after a leak or spill. Other potential farmstead sources of nitrate are septic systems, livestock yards, livestock waste storage facilities and silage storage.

Your drinking water is least likely to be contaminated if you follow appropriate management procedures or dispose of wastes **off the farm site.** However, proper offsite disposal practices are essential to avoid risking contamination that could affect the water supplies and health of others.

The goal of Farm•A•Syst is to help you protect your groundwater that supplies your drinking water.

How will this worksheet help me protect my drinking water?

- It will take you step by step through your fertilizer handling, storage and disposal practices.
- It will rank your activities according to how they might affect the groundwater that provides your drinking water supplies.
- It will provide you with easy-to-understand rankings that will help you analyze the "risk level" of your fertilizer handling, storage and disposal practices.
- It will help you determine which of your practices are reasonably safe and effective, and which practices might require some modification to better protect your drinking water.

How do I complete the worksheet?

Follow the direction at the top of the chart on the next page. It should take you about 15-30 minutes to complete this worksheet and figure out your ranking.

Information derived from Farm•A•Syst worksheets is intended only to provide general information and recommendations to farmers regarding their own farmstead practices. It is not the intent of this educational program to keep records of individual results.

Glossary

Fertilizer Storage and Handling

These terms may help you make more accurate assessments when completing Worksheet #3. They may also help clarify some of the terms used in Fact Sheet #3.

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-backflow (anti-backsiphoning) device: A check valve or other mechanical device to prevent the unwanted reverse flow of liquids back down a water supply pipe into a well.

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

Backflow prevention device: (See **anti-backflow device**.)

Backsiphonage: Backflow caused by formation of a vacuum in a water supply pipe.

Closed handling system: A system for transferring pesticides or fertilizers 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.

Cross-connection: A link or channel between pipes, wells, fixtures or tanks carrying contaminated water and those carrying potable (safe for drinking) water. Contaminated water, if at higher pressure, enters the potable water system.

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.

Rinsate: Rinse water from pesticide or fertilizer tank cleaning.

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

Worksheet #3

Fertilizer Storage and Handling: Assessing Drinking Water Contamination Risk

1. Use a pencil. You may want to make changes.
2. For each category listed on the left that is appropriate to your farmstead, read across to the right and circle the statement that **best** describes conditions on your farmstead. (Skip and leave blank any categories that don't apply to your farmstead.)
3. Then look above the description you circled to find your "rank number" (4, 3, 2 or 1) and enter that number in the blank under "your rank."
4. Directions on overall scoring appear at the end of the worksheet.
5. Allow about 15-30 minutes to complete the worksheet and figure out your risk ranking for fertilizer storage and handling practices.

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
FERTILIZER STORAGE					
Dry formulation					
Amount stored	None stored at any time.	Less than 1 ton.	Between 1 and 20 tons.	More than 20 tons.	____
Type of storage	Covered on impermeable surface (such as concrete or asphalt). Spills are collected.	Covered on clay soil. Spills are collected.	Partial cover on loamy soils. Spills not collected.	No cover on sandy soils. Spills not collected.	____
Liquid formulation					
Amount stored	None stored at any time.	Less than 55 gallons.	Between 55 and 1500 gallons.	More than 1500 gallons.	____
Type of storage	Concrete or other impermeable secondary containment does not allow spill to contaminate soil.	Clay-lined secondary containment. Most of spill can be recovered.	Somewhat permeable soils (loam). No secondary containment. Most of spill cannot be recovered.	Permeable soil (sand). No secondary containment. Spills contaminate soil.	____
Containers	Original containers clearly labeled. No holes, tears or weak seams. Lids tight.	Original containers old. Labels partially missing or hard to read.	Containers old but patched. Metal containers showing signs of rusting.	Containers have holes or tears that allow fertilizers to leak. No labels.	____

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
FERTILIZER STORAGE (continued)					
Security	Fenced or locked area separate from all other activities, or locks on valves.	Fenced area separate from most other activities.	Open to activities that could damage containers or spill fertilizer.	Open access to theft, vandalism and children.	____
MIXING AND LOADING PRACTICES					
Location of well in relation to mixing/ loading area with no curbed and impermeable containment area	100 or more feet downslope from well.	50 to 100 feet downslope.	10 to 50 feet downslope or 100 to 500 feet upslope.	Within 10 feet downslope or 100 feet upslope.	____
ADDITIONAL MIXING AND LOADING PRACTICES FOR LIQUID FERTILIZER					
Mixing and loading pad (spill containment)	Concrete mixing/loading pad with curb keeps spills contained. Sump allows collection and transfer to storage.	Concrete pad with curb keeps spills contained. No sump.	Concrete pad with some cracks keeps some spills contained. No curb or sump.	No mixing/loading pad. Permeable soil (sand). Spills soak into ground.	____
Water source	Separate water tank.	Hydrant away from well.	Hydrant near well.	Directly obtained from well.	____
Backflow prevention on water supply	Anti-backflow device installed or 6-inch air gap maintained above sprayer tank.	Anti-backflow device installed. Hose in tank above waterline.	***No anti-backflow device.*** Hose in tank above waterline.	***No anti-backflow device.*** Hose in tank above waterline.	____
Filling supervision	Constant	_____	Frequent	Seldom or never	____

Boldface type: Although these practices are legal for fertilizers in New Jersey, they are illegal for pesticides. Therefore, if the same area is used for both pesticide and fertilizer handling, these conditions are illegal.

	LOW RISK (rank 4)	LOW-MOD RISK (rank 3)	MOD-HIGH RISK (rank 2)	HIGH RISK (rank 1)	YOUR RANK
ADDITIONAL MIXING AND LOADING PRACTICES FOR LIQUID FERTILIZER (continued)					
Handling system	Closed system for all liquid product transfers.	Closed system for most liquids. Some liquids hand poured. Sprayer fill port easy to reach.	All liquids hand poured. Sprayer fill port easy to reach.	All liquids hand poured. Sprayer fill port hard to reach.	____
CLEANUP AND DISPOSAL PRACTICES					
Sprayer cleaning and rinsate (rinse water) disposal	Sprayer washed out in field. Rinsate used in next load and applied to labeled crop.	Sprayer washed out on pad at farmstead. Rinsate used in next load and applied to labeled crop.	Sprayer washed out at farmstead. Rinsate sprayed less than 100 feet from well.	Sprayer washed out at farmstead. Rinsate dumped at farmstead or in nearby field.	____

TOTAL ☐

Use this total to calculate risk ranking on back page of worksheet.

What do I do with these rankings?

Step 1: Begin by determining your overall fertilizer management risk ranking. Total the rankings for the categories you completed and divide by the number of categories you ranked:

_____ divided by _____ equals [ ]*
total of rankings; # of categories ranked; risk ranking

*Carry your answer out to one decimal place.

3.6–4=low risk, 2.6–3.5=low to moderate risk, 1.6–2.5=moderate to high risk, 1–1.5=high risk

This ranking gives you an idea of how your fertilizer management practices **as a whole** might be affecting your drinking water. This ranking should serve only as a **very general guide, not a precise diagnosis.** Because it represents an **averaging** of many individual rankings, it can mask any **individual** rankings (such as 1's or 2's) that should be of concern. (See Step 2.)

Enter your boxed fertilizer management risk ranking on page 1 of Worksheet #12. Later you will compare this risk ranking with other farmstead management rankings. Worksheet #11 will help you identify your farmstead's site conditions (soil type, soil depth and bedrock charac teristics), and Worksheet #12 will show you how these site conditions affect your risk rankings.

Step 2: Look over your rankings for individual activities:
- **Low-risk** practices (4's): ideal; should be your goal despite cost and effort
- **Low-to-moderate-risk** practices (3's): provide reasonable groundwater protection
- **Moderate-to-high-risk** practices (2's): inadequate protection in many circumstances
- **High-risk** practices (1's): inadequate; pose a high risk of polluting groundwater

Regardless of your overall risk ranking, any individual rankings of "1" require immediate attention. Some concerns you can take care of right away; others could be major—or costly—projects, requiring planning and prioritizing before you take action.

Find any activities that you identified as 1's and list them under "High-Risk Activities" on pages 6-7 of Worksheet #12.

Step 3: Read Fact Sheet #3, *Improving Fertilizer Storage and Handling*, and consider how you might modify your farmstead practices to better protect your drinking water.

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