Worksheet #3

Assessing the Risk of Groundwater Contamination from

Fertilizer Storage and Handling

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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 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 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.

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.

	RANK 4	RANK 3	RANK 2	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.	____

	RANK 4	RANK 3	RANK 2	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 from well.****	***10 to 50 feet from well.****	***Within 10 feet of well.****	____
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 below water line.	____
Filling supervision	Constant	_____	Frequent	Seldom or never	____

Boldface type: Besides representing a higher-risk choice, this practice also violates New Mexico law.

*Illegal for new well installation. Existing wells must meet separation requirements in effect at time of construction.

	RANK 4	RANK 3	RANK 2	RANK 1	YOUR RANK
	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.	____
	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.***	____

Boldface type: Besides representing a higher-risk choice, this practice also violates New Mexico law.

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 W12.1. 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 characteristics), 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 W12.6-W12.7 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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