



Worksheet #8
Assessing the Risk of Groundwater Contamination from
Barn Yard Management

Why should I be concerned?

Livestock yards, such as barnyards, holding areas and feedlots, are areas of concentrated livestock wastes. They can be a source of nitrate and bacteria contamination of groundwater. This is especially true if there is no system to 1) divert clean water flow from the livestock yard or 2) collect polluted runoff from the yard for diversion to an area where its effect on surface water or groundwater is minimal. The potential for livestock yards to affect groundwater is greatest if the yard is located over coarse-textured permeable soils, if the water table is at or near the surface, if bedrock is within a few feet of the surface, or when polluted runoff is discharged to permeable soils and bedrock.

Nitrate levels in drinking water above federal and state drinking water standards of 10 milligrams per liter (mg/l; equivalent to parts per million for water measure) nitrate-nitrogen can pose health problems for infants under 6 months of age, 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 susceptible to health problems from high nitrate-nitrogen levels. Levels of 20-40 mg/l in the water supply may prove harmful, especially in combination with high levels (1,000 ppm) of nitrate-nitrogen from feed sources.

Fecal bacteria in livestock waste can contaminate groundwater if waste seeps into nearby wells, causing such infectious diseases as dysentery, typhoid and hepatitis. Organic materials, which may lend an undesirable taste and odor to drinking water, are not known to be dangerous to health, but their presence does suggest that other contaminants are flowing directly into groundwater.

The goal of Farm*A*Syst is to help you protect the 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 livestock yards management 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 livestock yards management practices.
- It will help you determine which of your practices are reasonably safe and effective, and which practices might require modification to better protect your drinking water.

How do I complete the worksheet?

Follow the directions 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

Barn Yard Management

These terms may help you make more accurate assessments when completing Worksheet #8. They may also help clarify some of the terms used in Fact Sheet #8.

Depth to Bedrock: The distance from the soil surface to the bedrock layer.

Filter strip: A gently sloping grass plot used to filter runoff from the livestock yard. Influent waste is distributed uniformly across the high end of the strip and allowed to flow down the slope. Nutrients and suspended material remaining in the runoff water are filtered through the grass, absorbed by the soil and ultimately taken up by the plants. Filter strips must be designed and sized to match the characteristics of the livestock yard.

Infiltration: The downward entry of water through the soil surface.

Percolation: The downward movement of water through the soil.

Runoff control system: A combination of management practices that can be used together to prevent water pollution from livestock yard runoff. Practices may include diversion of runoff from the yard, roof runoff systems, yard shaping, settling basins, and filter strips or buffer areas.

Soil drainage class: The conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soils, as opposed to human-altered drainage. Different classes are described by such terms as excessively drained, well-drained, and poorly drained.

Soil permeability: The quality that enables the soil to transmit water or air. Slowly permeable soils have fine-textured materials, like clays, that permit only slow water movement. Moderately or highly permeable soils have coarse-textured materials, like sands, that permit rapid water movement.

Soil texture: The relative proportions of the various soil separates (clay, sand, silt) in a soil. Described by such terms as sandy loam and silty clay.

Barn Yard Management

Resource Concern

Rank 4
LOW RISK

Rank 3
LOW-MOD RISK

Rank 2
MOD-HIGH RISK

Rank 1
HIGH RISK

Field Number

LOCATION					
Distance from drinking water well	More than 200 feet downslope from well	More than 300 feet upslope from well	Less than 300 feet upslope from well	Less than 100 feet from well.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
SITE CHARACTERISTICS					
Soil depth and permeability	Well-drained medium- or fine-textured soils (loam, silt loam, clay loams, clays). Depth to bedrock more than 40 inches deep with low permeability (silt and clay).	Well-drained or moderately well-drained medium- or fine-textured soils (loam, silt loam, clay loams, clays). Depth to bedrock is 30-40 inches deep with moderate permeability (loamy).	Moderately well-drained coarse-textured soils (sands, sandy loam). Depth to bedrock is 20-30 inches and/or high permeability (sandy).	Excessively well-drained coarse-textured soils (sands, sandy loam) to gravel, and/or somewhat poorly drained soil to poorly drained soils. Depth to bedrock is less than 20 inches and/or very high permeability (coarse sand).	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
DESIGN AND MANAGEMENT					
Surface water diversion	All upslope and roof water diverted.	Most upslope surface and roof water diverted.	No surface water diverted. Some roof water collected and redirected.	All water (surface and roof water) runs through the yard.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Lot runoff control system	No yard runoff (either barn or roofed area).	All runoff collected from curbed lot. Solids separated. Water directed onto filter strip.	Most of lot runoff collected. Some solids removed. No filter strip.	Lot runoff uncontrolled.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Yard cleaning and scraping practice	No yard (animals confined).	Once per week.	Once per month.	Rarely.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

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Field Number

CONCENTRATION OF ANIMALS ON YARD [square feet per animal (sf/a)]**					
Dairy cows	No yard. Confined to barn or roofed yard.	75 sf/a or more on fenced, curbed concrete pad and/or 400 sf/a on graded earthen surface. More than 1800 sf/a in exercise area.	50 sf/a or more on concrete and/or 200-300 sf/a on earthen surface. More than 1200 sf/a in exercise area.	Some concrete (less than 50 sf/a) and earth (less than 100 sf/a).	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Dairy replacements	No yard. Confined to barn or roofed yard.	More than 40 sf/a on fenced, curbed concrete pad and/or 150-200 sf/a on earthen yard.	More than 20 sf/a on concrete and/or more than 75 sf/a on earthen surface.	Less than 75 sf/a on earth.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Beef feeders	No yard. Confined to barn with slotted floor.	Barn and/or paved lot more than 50 sf/a. Earthen lot with mound more than 300 sf/a, or without mound more than 500 sf/a.	No shelter and paved lot 40-50 sf/a. Earthen with mound more than 150 sf/a or earthen without mound less than 240 sf/a.	Paved less than 30 sf/a, or earthen less than 150 sf/a.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Beef cows/heifers	Barn or roofed lot.	Barn with paved lot more than 60 sf/a. Earthen with mound more than 400 sf/a. Earthen without mound more than 600 sf/a.	Paved lot more than 30 sf/a. Earthen with mound than 200 sf/a. Earthen without mound more than 300 sf/a.	Earthen without mound less than 200 sf/a.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Sheep/ewes	No yard. Confined to barn or roofed yard.	Barn and paved lot more than 20 sf/a. Earthen more than 40 sf/a.	Barn and paved lot less than 15 sf/a. Earthen less than 25 sf/a.	Earthen less than 10 sf/a.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Feeder lambs	No yard. Confined to barn.	Barn and paved lot more than 10 sf/a. Earthen more than 25 sf/a.	Barn and paved lot more than 5 sf/a. Earthen more than 10 sf/a.	Earthen less than 10 sf/a.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Hogs/sows	No yard. Confined to barn.	Shed and paved lot more than 30 sf/a.	Shed and earthen lot less than 15 sf/a.	Shed and earthen lot less than 10 sf/a.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

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Pigs: growing/finishing	No yard. Confined to barn.	Shed and paved lot more than 30 sf/a.	Shed and earthen lot more than 15 sf/a.	Shed and earthen lot less than 10 sf/a.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Horses	No yard. Confined to barn or on pasture.	Earthen exercise lot more than 2500 sf/a. No pasture.	Earthen lot more than 1500 sf/a. No pasture.	Earthen lot less than 1000 sf/a. No pasture.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Poultry:					
Broilers	No lot. In building with watering system in good working order. Runoff protected.	No lot. In building with watering system in good working order. Inadequate runoff protection.	Earthen lot of 2 sf/a or more, on medium-textured soils (silt loam, loam). Water table deeper than 20 feet.	Earthen lot of 2 sf/a or more, on coarse-textured soils (sands, sandy loam). Water table shallower than 20 feet.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Layers	No lot. In building with watering system in good working order. Runoff protected.	No lot. In building with watering system in good working order. Inadequate runoff protection.	Earthen lot of 4 sf/a or more, on medium-textured soils (silt loam, loam). Water table deeper than 20 feet.	Earthen lot of 4 sf/a or more, on coarse-textured soils (sands, sandy loam). Water table shallower than 20 feet.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Turkeys	No lot. In building with watering system in good working order. Runoff protected.	No lot. In building with watering system in good working order. Inadequate runoff protection.	Earthen lot of 8 sf/a or more, on medium-textured soils (silt loam, loam). Water table deeper than 20 feet.	Earthen lot of 8 sf/a or more, on coarse-textured soils (sands, sandy loam). Water table shallower than 20 feet.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Ducks	No lot. In building with watering system in good working order. Runoff protected.	No lot. In building with watering system in good working order. Inadequate runoff protection.	Earthen lot of 4 sf/a or more, on medium-textured soils (silt loam, loam). Water table deeper than 20 feet.	Earthen lot of 4 sf/a or more, on coarse-textured soils (sands, sandy loam). Water table shallower than 20 feet.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

What do I do with these rankings?

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

_____ divided by _____ equals *	
Rankings total from previous page	number of risk ranking categories ranked (11 if ranked all)

*Carry your answer out to one decimal place.

Example:
 $26 \div 11 = 2.36$
Use 2.4.

Risk Ranking Description

3.6 - 4.0 = low risk 1.6 - 2.5 = moderate to high risk
2.6 - 3.5 = low to moderate risk 1.0 - 1.5 = high risk

This ranking gives you an idea of how your well condition, **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 overlook any **individual** rankings (such as 1's or 2's) that should be of concern. (Step 2 will focus on individually ranked activities of concern.)

Enter your boxed well condition ranking in the appropriate place in the table on the front of Worksheet #12. Later you will compare this risk ranking with other farmstead management rankings. Worksheet #11 will help you determine 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.

- **4's - Best:** low-risk practices
- **3's - Provide reasonable groundwater protection:** low- to moderate-risk practices
- **2's - Possibly inadequate protection:** moderate- to high-risk practices
- **1's - Inadequate protection with relatively high groundwater contamination risk:** high-risk practices

Regardless of your overall risk ranking, any individual rankings of "1" require immediate Attention. You can take care of some of the concerns right away; others could be major or costly projects, requiring planning and prioritizing before you take action.
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Find any activities that you identified as 1's and list them under "High-Risk Activities" on Worksheet #12.
Step 3: Read Fact Sheet #8, "*Improving Your Barn Yard Management*," and give some thought to how you might modify your farmstead practices to better protect your drinking water.

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