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TENNESSEE
FARM•A•SYST

Assessing Your Livestock Yard Management

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The goal of this *Farm•A•Syst* factsheet is to help you protect and improve the groundwater that supplies your drinking water as well as the ponds, lakes, rivers, and streams that make Tennessee beautiful.

The following questions are designed to help you pinpoint potential problem areas on your farmstead. These problem areas may contribute to the contamination of your drinking water if they are not managed properly.

If your answer to any of these questions is *YES*, or if you don't know the answer, you may have a high-risk situation in your home or on your farmstead. Refer to the fact section with the same number as that question (under the heading, "What you should know about . . .") for more information.

Don't be alarmed if you answered *YES* to many or even all of these questions. That does not automatically mean you have a water-quality problem. It may, however, tell you that change is needed to avoid potential problems. In the same way, answering *NO* to every question does not mean you are *not* at risk.

Why should you care?

Groundwater is the underground water that supplies wells and springs and recharges surface water

YES	NO	
❑	❑	1. Do you have a livestock yard located less than 100 feet from your drinking-water well?
❑	❑	2. Is your livestock yard located on soil that is 1) excessively well drained, 2) coarse-textured (sands, sandy loam), 3) poorly drained, *or* 4) very shallow (less than 20 inches to bedrock)?
❑	❑	3. Do you have a livestock yard where all surface and roof water runs through the yard?
❑	❑	4. Is the runoff from your livestock yards uncontrolled?
❑	❑	5. Is your livestock yard cleaned and scraped less than once a week?

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YES	NO	
		6. Does any of the following describe the concentration of animals on your livestock yard or feedlot?
❑	❑	•**dairy cows**: less than 50 square feet (ft^2) per cow on concrete, or less than 100 ft^2 per cow on an earthen surface
❑	❑	•**dairy replacements**: less than 75 ft^2 per head
❑	❑	•**beef feeders**: less than 30 ft^2 per head on concrete, or less than 150 ft^2 per head on an earthen surface
❑	❑	•**beef cows/heifers**: less than 200 ft^2 per head on an earthen surface
❑	❑	•**sheep/ewes**: less than 10 ft^2 per head on an earthen surface
❑	❑	•**feeder lambs**: less than 10 ft^2 per head on an earthen surface
❑	❑	•**hogs/sows**: less than 10 ft^2 per head on an earthen surface
❑	❑	•**horses**: less than 1000 ft^2 per head on an earthen surface, with shed
❑	❑	7. Does your waste management plan focus only on *disposal* of manure, and not on efficient use of the resource it offers?
❑	❑	8. Do you have abandoned livestock yards on your property?

bodies. It is the source of drinking water for many Tennesseans. Up to 20 million gallons of groundwater may be stored under the typical farmstead—stored within 100 feet below fertilizer and pesticide storage areas, fuel tanks, livestock pens, and septic systems, all potentially major sources of pollution. The management decisions you make on your farmstead can significantly affect the quality of your drinking water and your family's health. These decisions can also affect your potential legal liability and the value of your property.

Surface water includes bodies such as ponds, lakes, rivers, and streams. Besides their aesthetic and recreational value, they are often an important source of drinking water for livestock.

Livestock yards—such as barnyards, holding areas, and feedlots—are areas where livestock wastes are concentrated, and thus they can be a source of nitrate and bacterial contamination of surface or groundwater. This is especially true if there is no system to divert water flow from the livestock yard, or to collect polluted runoff from the yard for diversion to an area where its effect on surface or groundwater is minimal. The potential for livestock yards to affect water quality is greatest if the yard or the area where polluted water is discharged

- is located over coarse-textured soils, such as sand or sandy loam;
- has a water table at or near the surface; or
- is within a few feet of bedrock.

High nitrate levels in drinking water have been linked to human health problems. In infants under six months of age, for example, excess nitrate can interfere with oxygen metabolism and cause what is known as "blue baby syndrome," due to the bluish tinge it gives the baby's skin. The current maximum contaminant level (MCL) set by the U.S. Environmental Protection Agency (EPA) for nitrate in drinking water is 10 parts per million (ppm).

Young livestock are also susceptible to health problems from excessive nitrogen. Levels of 20 to 40 ppm in the water supply may be harmful, especially in combination with high levels of nitrogen from feed sources. The EPA and the National Academy of Sciences recommend an *upper limit* of 10 ppm for livestock consumption.

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 your health, but their presence does suggest that other contaminants are flowing directly into groundwater.

Farm•A•Syst is only for your own use and benefit. It is a voluntary program intended to provide general information about protecting and improving water quality. Information from a *Farm•A•Syst* assessment will not be collected by Extension or any other outside agency and should remain in your private records.

What you should know about . . .

1. Distance from well

Wells should be located upslope from the livestock yard so that runoff does not drain into the vicinity of the well. A minimum separation of 100 feet should exist between livestock yards and new wells. With good farmstead planning, livestock facilities should be 300 to 400 feet from the house. Since the well is often near the house, there will then likely be more than 200 feet between the well and the livestock yard.

Minimum separation distances apply legally to new well installations, as well as to the distances from existing wells to new sources of contamination. Existing wells are required by law only to meet separation requirements in effect at the time of construction. Make every effort, however, to meet current regulations whenever possible, because current regulations are based on recent findings concerning well-water contamination.

2. Site characteristics

Groundwater protection is a major consideration in siting a livestock yard, and soil characteristics are the most important factor to consider. Important soil characteristics include surface and subsoil texture, depth, **permeability** (ability to let water pass through), and drainage class. The best site has a deep, well-drained silt-loam/clay-loam soil with low permeability. A very poor site has shallow soil and a high water table, or a very sandy/gravelly soil with excessive drainage and high permeability. A good site prevents the rapid movement of contaminants to surface and groundwater, while a poor site encourages **leaching** (the movement of contaminants *with water* through the soil).

For existing livestock yards on poor sites, the best option for protecting groundwater may be to eliminate the yard and completely confine the livestock, or to provide paved yards and liquid-tight basins to store yard runoff.

Livestock yards should be located as far as possible from **sinkholes**, which are depressions that drain directly to groundwater through holes in underlying limestone bedrock.

3. Clean water diversion

One way to reduce water pollution from livestock yards is to limit the amount of clean water entering the yard. Several structures can help to accomplish this:

- roof gutters
- waterways or small terraces
- an earthen ridge or terrace upslope from the yard
- a catch basin with a tile outlet upslope from the yard

These structures must be well-maintained to be effective.

4. Runoff control systems

A livestock yard without a runoff control system typically has an earthen surface compacted by animal traffic. This surface usually has poor drainage; the soil is alternately dry and muddy. Manure accumulates on the surface and is mixed into the soil by animal traffic.

Both water running off concrete pads near the barn doors and clean water from roofs and upslope areas can flush manure from the yard. Water can also create mudholes in the yard and in adjacent areas that receive runoff.

Wastes are difficult to manage in such a yard, and the absence of runoff controls may lead to water-quality problems. Contaminated runoff from an active feedlot may leach and threaten groundwater quality. This risk is particularly high on sites with coarse-textured soils, such as sandy soils.

Runoff control systems can remedy such problem situations. Only clean water (water that has no contact with manure) should be routed to open fields. Water which has been routed through a livestock yard should be collected and applied to the land at an appropriate rate, which depends on soil type and crop cover.

5. Yard cleaning or scraping

Clean livestock yards regularly. The amount of manure on a livestock yard depends on the number of animals and the hours per day animals spend on the lot. Cleaning and scraping at least once a week is best. Heavy concentrations of animals may require more frequent removal of solids. Earthen yards are cleaned only when they are dry, so solids may be removed less frequently than from concrete yards.

6. Concentration of animals and type of yard surface

The area needed per animal for minimizing the risk of groundwater contamination depends on the type of animal and the type of lot surface. The amount of concrete surface area needed is much less than that required for an earthen lot.

The size of a concrete yard is determined by both traffic on the lot and the resting area needed for animals. Too large an area results in manure freezing to the surface due to the infrequency of animal traffic. On the other hand, too small an area makes it difficult for animals to move around.

For dairy operations, the best way to protect surface and groundwater is to confine animals to a freestall barn or roofed yard. Where a yard is needed, 75 square feet (ft^2) of fenced concrete per cow is recommended (400 ft^2 of earthen surface), and roughly 2000 ft^2 of exercise area per cow, if one is used. Direct runoff water carefully from the concrete onto the earthen exercise area. Install curbs to keep runoff from flowing off the edges of the concrete lot.

Yard management involves considerations besides just surface and groundwater protection. A combination of yard surfaces offers the most flexibility in adapting to weather conditions. Livestock location can be chosen based on the amount of mud in the yard: on concrete in sloppy conditions, on an earthen surface in dry weather, and on a mound in intermediate conditions.

If bedrock is close to the surface where your livestock yard is located, pave the surface with concrete, or totally confine your livestock.

7. Waste management plan

In addition to improving the condition of your livestock yards, your animal waste management plan should account for waste storage and use.

Lots used for animal confinement should be included in your crop rotation plan, if they are large enough for this to be feasible. Crop production will help remove nutrients from manure that have accumulated in the soil. High nutrient concentrations in the soil from the application of poultry litter make this especially important.

Animal manure can be a valuable fertilizer and soil conditioner. When managed properly, the nutrients in manure can be substituted for commercial fertilizers, which saves money. However, matching nutrient applications to crop nutrient needs is critical in order to protect surface and groundwater.

8. Abandoned livestock yards

In active feedlots or yards, the surface layer of manure mixed with soil covers another layer of more compact soil through which water moves very slowly. Therefore, leaching of nitrate and bacteria to groundwater is not likely within the livestock yard itself. Studies have found little nitrate in the soil of active feedlots.

Abandoned yards, however, pose a particular contamination risk. As the manure pack breaks up from lack of traffic, water can leach through and reach groundwater.

If you have a permanently abandoned yard, dig it up, spread the manure-and-soil combination on fields, and refill the former yard with other soil. Another option is to till and plant the yard with a crop that consumes a high amount of nitrogen released by the soil during manure decomposition.

Remove manure from a feedlot that will not be used for an extended period of time. Otherwise, cracks developing in the surface may allow leaching of nitrates.

Remember:

- Locate your livestock yard at least 100 feet downslope from your drinking-water well.
- Choose a site for your yard based on these soil characteristics: texture, depth, permeability, and drainage class.
- Confine your livestock and eliminate the yard if your soils drain excessively or are highly permeable.

- Divert clean water such as rain or snowmelt away from the yard with gutters, waterways, terraces, or catch basins.
- Route only clean water to open fields.
- Store water which has been polluted in the yard for application to the land.
- Clean your livestock yard regularly.
- Allow the recommended amount of space for each animal in the yard.
- Pave your yard if limestone bedrock lies near the ground surface.
- Collect animal waste for application to fields at rates determined by the results of soil tests and waste analysis.
- Dig up permanently abandoned yards and apply the manure-and-soil combination to fields. Refill the old yard with clean soil.
- Remove any manure from a yard that will not be used for a while and apply to the land at recommended rates.

If you want more information . . .

Contact:

- Your county Extension office

- Tennessee Pork Producers Association
  1312 Central Court
  Hermitage, TN 37076
  (615)871-0610

- EPA Safe-Drinking-Water Hotline (M-F, 8:30 a.m.-5:00 p.m. EST)
  (800)426-4791

- Tennessee Department of Environment and Conservation (TDEC)
  Division of Water Pollution Control
  Field Offices

Memphis	(901)368-7939
Jackson	(901)661-6200
Nashville	(615)650-7240
Chattanooga	(423)634-5745
Knoxville	(423)594-6035
Johnson City	(423)854-5400

- Agricultural Nonpoint Water Pollution Control Fund
  Tennessee Department of Agriculture
  Division of Agricultural Resources
  P.O. Box 40627
  Melrose Station
  Nashville, TN 37204
  (615)360-0120

- Your local Soil Conservation District office

- Your local Farm Service Agency (FSA) office

Read:

- *Beef Housing and Equipment Handbook*. MWPS-6.
  Sheep Housing and Equipment Handbook. MWPS-3.
  Swine Housing and Equipment Handbook. MWPS-8.
  Dairy Housing and Equipment Handbook. MWPS-7.
  Livestock Waste Facilities Handbook. MWPS-18.

These publications are available from the Midwest Plan Service at

122 Davidson Hall
Iowa State University
Ames, IA 50011

- *Pork Industry Handbook*
  Systems of Runoff Control. PIH 21.
  Fertilizer Value of Swine Manure. PIH 25.
  Controlling Odors from Swine Buildings. PIH 33.
  Legal Guidelines for Swine Manure Management. PIH 35.
  Lagoon Management. PIH 62.
  Flushing Systems for Swine Buildings. PIH 63.
  Swine Waste Management Alternatives. PIH 67.
  Methane Gas from Swine Manure. PIH 76.
  Pumping Liquid Manure from Swine Lagoons and Holding Ponds. PIH 91.
  Gravity Drain Gutter Systems. PIH 95.
  Scraper Systems for Removing Manure from Swine Facilities. PIH 105.

This publication is available from the University of Tennessee at

Swine Extension Office
P.O. Box 1071
Knoxville, TN 37901-1071

- *Animal Waste Management and Tennessee Agriculture.* PB 1459.
  Swine Waste Management Alternatives. PB 1425.
  Dairy Cattle Waste Management. PB 1422.
  Preventing Water Contamination from Beef Cattle. PB 1426.

These publications are available from your University of Tennessee Agricultural Extension Service county office.

Download:

These sites on the World Wide Web (WWW) are good places to start when browsing the Internet for information about water quality:

- http://funnelweb.utcc.utk.edu/~utext
  (University of Tennessee Agricultural Extension Service)

- http://www.epa.gov
  (U.S. Environmental Protection Agency)

- http://www.usda.gov
  (U.S. Department of Agriculture)

- http://h2o.usgs.gov
  (U.S. Geological Survey)

- http://wwwdtnnsh.er.usgs.gov
  (Tennessee division of USGS)

- http://hermes.ecn.purdue.edu:8001/server/water/water.html
  (National Extension Water Quality Database Website, Purdue University)

- http://www.nppc.org/EnvironmentalSection/envmain.html
  (National Pork Producers Council)

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