



Worksheet #9

Assessing the Risk of Groundwater Contamination from Silage Storage

Why should I be concerned?

Silage is an essential feed for livestock-based agriculture. When properly harvested and stored, silage poses little or no pollution threat, but improper handling can lead to a significant flow of silage juices (or leachate) from the silo. Leachate is an organic liquid that results from pressure in the silo or from extra water entering the silo. It is usually a problem only when silage is fresh, or just after storage. This loss of leachate represents a major loss of nutrient value from the silage. Canning company wastes, which are often used for silage, frequently contain excess moisture, which increases the potential for leachate to cause groundwater contamination.

Silage liquid is often highly acidic and can be corrosive to concrete and steel. If it enters a stream, its high organic content feeds bacteria that rob the water of oxygen. Groundwater contaminated with silage juices has a disagreeable odor and shows increased levels of acidity, ammonia, nitrates and iron.

Along with the pollutants found in silage leachate, an even greater potential threat is that the low pH created by the presence of acids in silage leachate can free up and release naturally occurring metals in the soil and aquifer, which can increase their concentrations in groundwater.

Nitrate is the most important potential contaminant to consider. Levels of 20-40 milligrams per liter (mg/l; equivalent to parts per million in water measure) can cause livestock problems, especially if feed contains more than 1,000 ppm nitrate-nitrogen. Water with levels over 100 mg/l nitrate-nitrogen should not be used for livestock. Water with over 10 mg/l nitrate-nitrogen should not be used for infants under 6 months of age.

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 silage storage 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 silage storage 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.

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.

Worksheet #9

Silage Storage: Assessing Drinking Water Contamination Risk

- Use a pencil. You may want to make changes.
- 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.)

- 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."
- Directions on overall scoring appear at the end of the worksheet.
- Allow about 15-30 minutes to complete the worksheet and figure out your risk ranking for silage storage practices.

	RANK 4	RANK 3	RANK 2	RANK 1	YOUR RANK
Silage moisture content*	Below 65%	Between 65% and 70%	Between 71% and 85%	Over 85%	_____
Silage storage location	At least 100 feet downslope from well (silos, glass-lined feed storage, plastic tubes). At least 500 feet downslope (earthen trench). Water drains away from storage to field or pasture.	At least 50 feet downslope from well (silos, glass-lined feed storage, plastic tubes). At least 250 feet downslope (earthen trench). Water drains to field or pasture.	Within 100 feet upslope of well (silos, glass-lined feed storage, plastic tubes). Within 500 feet upslope (earthen trench). Water pools or stands near storage.	Within 50 feet of well (silos, glass-lined feed storage). Within 250 feet (earthen trench)Water pools on soil surface.	_____
Silage storage floor or surface condition	Concrete or asphalt surface. No cracks.	Concrete or asphalt surface has some cracks.	Surface has some permeable soils (silt loam) and has some cracks.	Surface has permeable soil (sand), not compacted.	_____
Silage storage cover condition	Cover tight fitting. No leaks.	Cover tight fitting. Minor leaks repaired.	Cover, but many large leaks not repaired.	No cover.	_____
Silage storage lining	New or relined in last 5 years.	Relined 6 to 25 years ago.	Relined 26 to 40 years ago.	Relined more than 40 years ago.	_____
Leachate collection system	Designed system in place and maintained.	Designed system in place but not maintained.	No system in place. Leachate moves to waterway.	No system in place. Leachate collects in low area.	_____

*For this worksheet, categories on the left are listed in order with the most important factor for groundwater contamination listed first.

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 silage storage risk ranking. Total the rankings for the categories you completed and divide by the number of categories you ranked:

$$\frac{\text{_____}}{\text{total of rankings}} \text{ divided by } \frac{\text{_____}}{\text{\# of categories ranked}} \text{ equals } \boxed{\text{_____}}^* \text{ risk ranking}$$

*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 silage storage 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 silage storage 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 #9, *Improving Silage Storage*, and consider how you might modify your farmstead practices to better protect your drinking water.