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EC98-750 Farm*A*Syst Nebraska's System for Assessing Water Contamination Risk Worksheet 12: Silage Storage

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WORKSHEET 12

Silage Storage

Why should I be concerned?

Silage is an important 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 loss of nutrient value from the silage.

Silage liquid is 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. The oxygen demand of silage leachate is 100 to 200 times greater than raw municipal sewage. Leachate from 300 tons of high-moisture silage has been compared to the sewage generated daily by a city of 80,000 people.

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. Groundwater contaminated with silage juices also has a disagreeable odor and shows increased levels of acidity, ammonia, nitrates, and iron.

Nitrate is another important potential contaminant to consider. Levels of 35 milligrams per liter (mg/l; equivalent to parts per million in water measure) should be avoided for livestock, especially young animals and animals in gestation. For most livestock, health effects are normally observed only for concentrations of greater than 100 mg/l nitrate-nitrogen. Water with over 10 mg/l nitrate-nitrogen should not be used for human consumption. Infants under six months of age are at greatest risk.

The goal of Farm*A*Syst is to help you protect the groundwater that supplies your drinking water and recreational uses of surface waters.

How will this worksheet help me protect my drinking water?

- It will take you step-by-step through your silage storage practices.
- It will evaluate your activities according to impact on the groundwater that provides your drinking water supplies and surface water.
- It will provide you with easy-to-understand "risk level scores" that will help you analyze the relative safety 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 15 minutes to complete this worksheet and determine your risk level.

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

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Elbert C. Dickey, Interim Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

Silage Storage: Assessing the Risk of Surface Water and Groundwater Contamination

1. Use a pencil. You may want to make changes.
2. For each category listed on the left that is appropriate to your farm, read across to the right and circle the statement that best describes conditions on your farm. (Skip and leave blank any categories that don't apply to your farm.)
3. Then look above the description you circled to find your "risk number" (1, 2, 3, or 4) and enter that number in the blank under "YOUR RISK."
4. Allow about 15 minutes to complete the worksheet and figure out your risk for livestock manure storage practices.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
LOCATION RELATIVE TO SURFACE AND GROUNDWATER.					
Distance from well to concrete or glass-lined storage.	_____	Well is within 100 feet.	_____	Well is more than 100 feet away.	
Distance from well to earthen trench or plastic tubes.	Well is within 100 feet.	Well is 100 to 250 feet AND Downslope or at grade.	Well is more than 250 feet AND Downslope or at grade.	Well is more than 100 feet AND Upslope.	
Distance from silage storage to nearest surface water source.	Less than 100 feet; OR Leachate drains into road ditch or surface water.	100 to 500 feet.	Greater than 500 feet.	Silage effluent is collected and stored for field application.	
SEEPAGE MANAGEMENT					
Leachate collection system	No system in place. Leachate collects in low area or moves to ditch, surface water, or wetlands.	No system in place. Leachate moves to crop land or pasture area without pooling in single location.	Designed system in place and seepage is distributed over grassed filter area.	Design system in place and seepage is land-applied.	

Your groundwater vulnerability score from *Worksheet 2* was _____
Note: If the surface texture, subsurface texture, or depth to groundwater used to calculate this score are not characteristic of the site conditions present for the activities / practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your groundwater vulnerability score is:
- 1 to 1.4: your site has a LOW VULNERABILITY to pollution reaching groundwater.
- 1.5 to 2.4: your site has a MODERATE-LOW VULNERABILITY to pollution reaching groundwater.
- 2.5 to 3.4: your site has a HIGH-MODERATE VULNERABILITY to pollution reaching groundwater.
- 3.5 to 4.0: your site has a HIGH VULNERABILITY to pollution reaching groundwater.

Your surface water vulnerability score from *Worksheet 2* was _____
Note: If the surface texture, slope toward surface water, or distance from surface water used to calculate this score are not characteristic of the site conditions present for the activities / practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your surface water vulnerability score is:
- 1 to 1.4: your site has a LOW VULNERABILITY to pollution reaching surface water.
- 1.5 to 2.4: your site has a MODERATE-LOW VULNERABILITY to pollution reaching surface water.
- 2.5 to 3.4: your site has a HIGH-MODERATE VULNERABILITY to pollution reaching surface water.
- 3.5 to 4.0: your site has a HIGH VULNERABILITY to pollution reaching surface water.

Look over your worksheet scores for individual activities:

- **Low risk** practices (1's): are ideal and should be your goal regardless of your site's vulnerability to pollution reaching ground or surface water. Cost and other factors may make it difficult to achieve a low risk rating for all activities.

- **Moderate-low risk** practices (2's): provide reasonable water quality protection unless your site's vulnerability to pollution reaching ground or surface water is moderate-high or high.

- **High-moderate risk** practices (3's): do not provide adequate protection in many circumstances, especially if your site's vulnerability to pollution reaching ground or surface water is high or high-moderate. They may provide reasonable water quality protection if your site's vulnerability to pollution reaching ground or surface water is low to moderate-low.

- **High risk** practices (4's): pose a serious danger of polluting water, especially if your site's vulnerability to pollution reaching ground or surface water is high, high-moderate, or moderate-low. Some high risk activities may not immediately threaten water quality if your site's vulnerability to pollution reaching ground or surface water is low, but still pose a threat over time if not corrected.

Read ***Fact Sheet 12 Improving Silage Storage*** and consider how you might modify your farm practices to better protect your drinking water supply and other ground and surface water supplies. Some concerns you can take care of right away; others could be major or costly projects requiring planning and prioritizing before you take action.

Summary Evaluation for Silage Storage Worksheet

Summarize your potential high risk activities in the following table and consider the response options you can take to reduce the potential for water quality contamination.

High Risk Activities and Activities Impacted by Site Vulnerability	**Response Options (Check One)**		**Taking Action** For "immediate action possible" items, note practices and when each will occur. For issues "requiring further planning," note estimates, consultations, or other activities necessary and when each will occur. Establish a target date for making necessary changes.
	Immediate Action Possible	**Further Planning Required**	

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