# Environmental Stewardship: Controlling Silage Leachate

**Natalie Rector**, MSU Extension Nutrient Management Educator (rector@msu.edu)
**David Stroud**, Missaukee County MSU Extension Director (stroudd@msu.edu)

Silage leachate—seepage from silage piles, bags, bunkers or silos—often occurs on beef and dairy farms and is one of the farm outputs requiring proper management.

Why such concern over silage leachate? Leachate presents an environmental problem when it flows into surface waters. Silage leachate has an extremely high biochemical oxygen demand (BOD). This means that leachate has a very high potential for consuming oxygen, and when it's discharged into surface water, it can remove so much oxygen that fish and other aquatic creatures die. As little as 1 gallon of silage leachate can lower the oxygen content of 10,000 gallons of river water to a critical level for fish survival.

Silage leachate also contains nutrients that can harm groundwater. The most critical is nitrate-nitrogen. In addition, the acidic nature of silage leachate can burn or kill vegetation in the area where it drains. Farmers can opt to capture silage leachate by constructing lined ponds or collection basins. Such structures must meet prescribed setbacks from existing wells and surface water and are generally costly to construct. Systems can also be engineered that will decrease the volume of material to be handled by collecting only the concentrated wastes while diverting the low-concentration wastes to a designed grass filter area.

Once captured, leachate could be pumped or directed into an existing manure or milkhouse wastewater storage. This could contribute a significant amount of volume to the storage, however, particularly when rainwater runoff from a bunker silo is collected. Moreover, because leachate may produce dangerous hydrogen sulfide when mixed with liquid manure, it should be added only to well-ventilated outdoor storages.

As an alternative to costly structures to catch silage leachate, farmers can and should make efforts to minimize silage leachate production. Fortunately, many of the recommended practices for harvesting and storing the highest quality silage also minimize silage leachate.

One of the most critical determinants of silage quality and leachate production is the moisture content of the forage at the time of harvest. Corn silage for bunker silos should be harvested when plants are between 65 percent and 70 percent moisture (30 to 35 percent dry matter). Moisture levels can be even lower for corn silage stored in upright silos or bags, though they should not fall below 60 percent. A range of 60 to 70 percent moisture (30 to 40 percent dry matter) is optimal for alfalfa haylage at harvest.

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Silage harvested at higher than prescribed moisture levels can produce substantially more leachate. Leachate can have negative production-related consequences. It removes nutrients, particularly soluble nitrogen and carbohydrates, from the forage. Because of its corrosiveness, leachate can damage the silo structure. In addition, silage harvested at higher than prescribed moistures tends to have an increased prevalence of Clostridia bacteria. Such bacteria will produce nitrogen compounds and butyric acid, which can reduce animal feed intake and silage protein levels.

Covering the silage is another important management practice for minimizing leachate. Covers not only preserve forage quality by minimizing airflow into the pile but also reduce leachate production by preventing rainfall from penetrating the silage and solubilizing nutrients. A plastic covering secured with tires is one common approach to protect forage quality. Research at Kansas State University shows that covering a bunker silo with plastic can return $8 in reduced forage losses for every $1 spent. Covering a bunker can enhance animal performance by preserving feed value and improving palatability and feed intake.

Plastic covers should be applied so that rainwater and snowmelt are channeled off of the forage pile. The all too common practice of simply diverting water to the walls of the bunker silo should be avoided because water penetrating silage along the walls will still result in a leachate problem. Maintenance of plastic also needs consideration—any holes in the covering of a silo or bag should be repaired immediately.

Though the flow of silage leachate will be greatest during the first month after filling a storage unit, leachate will occur in smaller amounts throughout the feed-out period, particularly when rainfall has access to the pile. The loading area should be kept clean of spilled silage. Silage that is not cleaned off of the loading area could wash off-site with rainwater and, when wet, will continue to produce silage leachate. Divert rainwater away from silage storage whenever possible. Keeping open bunker silo faces vertical will also minimize silage contact with rainwater and reduce spoilage.

An emergency backup plan should be developed for those years when high moisture silage is unavoidable. Temporary runoff containment measures should be used, such as using sawdust to absorb and stop silage leachate runoff. The sawdust could later be collected and applied to fields.

Although heightened awareness of silage leachate and runoff is necessary at harvest time, they pose a serious environmental risk year round. As responsible stewards of the environment, all producers need to be aware of the risks of silage leachate and take appropriate steps to reduce and manage it.

If you would like assistance in assessing your particular silage leachate management situation, contact one or more of the following resource persons: MSU Extension dairy or beef educators, your USDA Natural Resource conservationist or a qualified engineering consultant. For additional information, visit www.animalagteam.msu.edu

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