

## INFOSHEET #10

# STORAGE AND FEEDING OF ENSILAGE

How to address concerns identified in Environmental Farm Plan Worksheet #10



Based on  
Environmental Farm  
Plan Workbook,  
4th ed. 2013

This infosheet outlines options to address concerns identified in your Environmental Farm Plan (EFP) as they relate to storage and feeding of ensilage.

All options are classed as **Actions**, **Compensating Factors**, or **Monitoring**.

- **Actions** address the identified concern, and will change the EFP rating to (3) or Best (4).
- **Compensating Factors** are alternatives that will adequately address the concern, but will not change the rating in the EFP worksheet.

- **Monitoring** is an alternative in special circumstances only. When and how monitoring can be used is explained in this infosheet.

In most cases, you'll need more information before choosing and implementing options. Sources for more information are noted at the end of this infosheet.

For help with technical terms, please see the full glossary in your EFP Workbook.

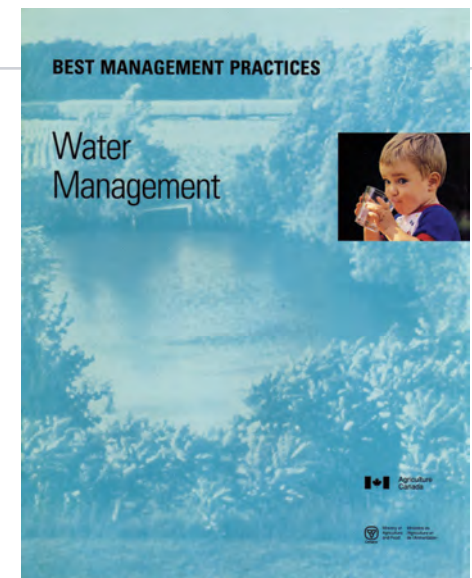
## 10-1. Distance from ensilage storage to nearest surface water

BACKGROUND	WHAT CAN YOU DO?
<p>The greater the distance between the ensilage storage and surface water, the lower the risk of contaminating surface water supplies.</p> <p>Sloping topography and heavier soil will increase the chance of contaminated runoff reaching surface water.</p> <p>Seepage can be the most dangerous contaminating organic surface discharge that can occur on the farm. The high biochemical oxygen demand of the seepage can be deadly to fish if it runs off to surface water.</p>	<p><b>OPTION 1 – ACTION</b></p> <p><b>Relocate the ensilage storage the required distance from surface water:</b></p> <ul style="list-style-type: none"> <li>ensure the new storage location will change the final EFP distance rating to a (3) or (4) Best.</li> </ul> <p><b>OPTION 2 – ACTION</b></p> <p><b>Increase the flow path distance between surface water and the ensilage storage:</b></p> <ul style="list-style-type: none"> <li>reshape land or build a diversion to direct runoff away from the surface water to a location in the field or along a flow path where it will not reach the surface water</li> <li>ensure any land-forming changes will not cause or increase erosion on either your property or neighbouring lands</li> <li>seek professional assistance to site and design berms, particularly along larger watercourses</li> <li>contact your local Conservation Authority for more information and to see whether permit(s) are required – permits are often required for work adjacent to surface water</li> <li>note that the flow path length must meet or exceed the minimum EFP distance specified in the (3) category.</li> </ul> <p><b>OPTION 3 – MONITORING</b></p> <p><i>For ensilage storages in good working condition that have, or will have within two years, a seepage collection system:</i></p> <p><b>Monitor on an established schedule:</b></p> <ul style="list-style-type: none"> <li>visually check for leaks or overtopping of the seepage storage.</li> </ul>



Maximize distance between the ensilage storage and surface water to minimize risk to surface water quality.

For an overview of how water cycles across and below a farm operation, on-site risks to water quality, and practical ways to protect it, see this BMP publication.





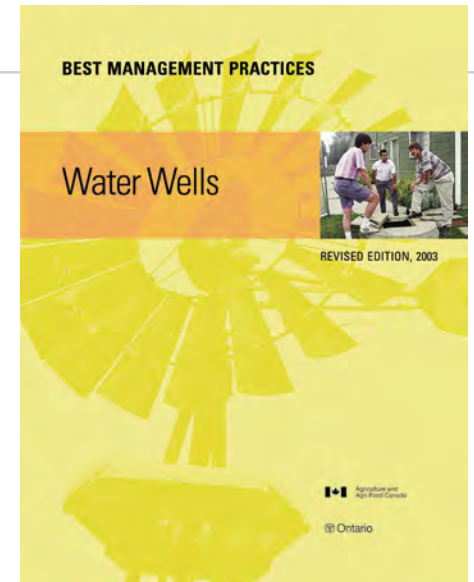
## 10-2. Distance from ensilage storage to water well

BACKGROUND	WHAT CAN YOU DO?
<p>The greater the distance between the ensilage storage and the water well, the better.</p> <p>Sufficient distance lowers the chance of seepage collecting in the vicinity of the well head and causing contamination.</p> <p>Also, if storage leakage occurs, the possibility of contamination reaching the well is lower if the well is located the required distance from the storage.</p> <p>Soil type, depth to water table and bedrock also influence contamination potential.</p>	<p><b>OPTION 1 – ACTION</b></p> <p><b>Relocate the ensilage storage the required distance from the water well:</b></p> <ul style="list-style-type: none"> <li>• locate the storage downslope of the well if possible</li> <li>• ensure the new storage location will change the final EFP distance rating to a (3) or (4) Best.</li> </ul> <p><b>Test the well water 3 times a year for bacteria and once a year for nitrate.</b></p> <p><b>OPTION 2 – ACTION</b></p> <p><b>Drill a new well the required distance from the ensilage storage:</b></p> <ul style="list-style-type: none"> <li>• properly abandon the old well according to Ontario Regulation 903 of the <i>Ontario Water Resources Act</i></li> <li>• ensure the new water well location will change the final EFP distance rating to a (3) or (4) Best.</li> </ul> <p><b>Test the well water 3 times a year for bacteria and once a year for nitrate.</b></p> <p><b>OPTION 3 – MONITORING WELL WATER</b></p> <p><i>For ensilage storages in good working condition that have, or will have within two years, a seepage collection system:</i></p> <p><b>Test the well water 3 times a year for bacteria and once a year for nitrate:</b></p> <ul style="list-style-type: none"> <li>• be prepared in case test results reveal contamination – prepare an action plan to immediately identify and address source of contamination.</li> </ul> <p>Monitoring of well water is NOT A SATISFACTORY SOLUTION.</p>




Test the well water once a year for parameters such as nitrate until the new storage is built or the existing storage is relocated.

Learn more about your water well and how to identify and mitigate risks to your family's water supply with this BMP publication. *Water Wells* explains how wells function, their components, different types, siting and risk issues, maintenance, new well construction requirements, and procedures for unused wells.



# ENSILAGE STORAGE STRUCTURES (tower or horizontal)

## 10-3. Floors, walls and foundations

BACKGROUND	WHAT CAN YOU DO?
<p>Silo floors, walls and foundations can be pathways for seepage.</p> <p>Unsealed floors and cracks in the walls and foundations allow seepage movement to ground water below or to surface water near the silo.</p>  <p>Proper materials and maintenance of the silo's floor, walls and foundation can minimize seepage movement. Structurally sound walls and foundations are also important for operator safety.</p>	<p><b>OPTION 1 – ACTION</b></p> <p><b>Install impervious floors and ensure that walls and foundations are structurally adequate with cracks sealed:</b></p> <ul style="list-style-type: none"> <li>• explore the feasibility of a plastic barrier in the floor of vertical silos to prevent seepage from reaching ground water below</li> <li>• consider installing a silo drainage system that allows any free liquid to drain to a collection system.</li> </ul> <p><b>OPTION 2 – ACTION</b></p> <p><b>Seal the existing silo floor by caulking joints, cracks, etc. Consult a qualified contractor to ensure that walls and foundations are structurally adequate with cracks sealed:</b></p> <ul style="list-style-type: none"> <li>• a brushed-on epoxy coating may be adequate if only hairline cracks exist</li> <li>• consider installing a silo drainage system that allows any free liquid to drain to a collection system.</li> </ul>

 **WARNING**


Lethal concentrations of hazardous gases can be found in confined spaces such as silos. Never assume that the environment inside a silo is safe. See OMAFRA factsheet:

- *Hazardous Gases on Agricultural Operations, Order no. 14-017*

See OMAFRA factsheet:

- *Deterioration of Concrete Tower Silos, Order no. 90-235*

## 10-4. Cover

BACKGROUND	WHAT CAN YOU DO?	
<p>Keeping rainwater out of ensilage is an important preventive measure. Rainwater negatively affects the ensiling process and ultimately ensilage quality.</p> <p>A good silo roof or cover reduces dry matter and nutrient losses, surface freezing, spoilage, and potential seepage production.</p>	<p><b>OPTION 1 – ACTION</b></p> <p><b>Install a permanent roof or a cover on the silo to exclude rain and snow:</b></p> <ul style="list-style-type: none"> <li>• ensure that the roof or a cover is tight-fitting without leaks.</li> </ul> <p><b>OPTION 2 – ACTION</b></p> <p><b>Repair the existing silo roof or cover to eliminate leaks.</b></p>	<p>A roof or cover reduces nutrient losses from seepage.</p>

## 10-5. Lining (tower)

### BACKGROUND

Ensilage juices corrode silo walls. A badly corroded wall increases the risk of silage seepage escaping the silo.

Silo walls should be relined regularly. This helps seal in the seepage and maintain the silo's structural integrity.



Relining silo walls helps to seal in seepage and maintain structural integrity.

### WHAT CAN YOU DO?

#### OPTION 1 – ACTION

##### Reline the silo walls as required, but at least every 15 years:

- use a plaster mix of fine sand and cement or liquid coatings to reline silo walls – the selection will depend upon the condition of the wall interior after it is cleaned.

#### OPTION 2 – ACTION

##### Replace the existing silo with a new silo:

- protect the new interior silo wall by applying an acid-resistant coating such as epoxy prior to its initial use
- ensure the new silo location meets the EFP distance rating of (3) or (4) Best.

#### OPTION 3 – ACTION

Have the silo lining condition checked by a qualified contractor at regular intervals, e.g. every five years.



### WARNING

Lethal concentrations of hazardous gases can be found in confined spaces such as silos. Never assume that the environment inside a silo is safe. See OMAFRA factsheet:

- *Hazardous Gases on Agricultural Operations*, Order no. 14-017

### See also these OMAFRA factsheets:

- *Deterioration of Concrete Tower Silos*, Order no. 08-057
- *How to Handle Seepage From Farm Silos*, Order no. 04-031

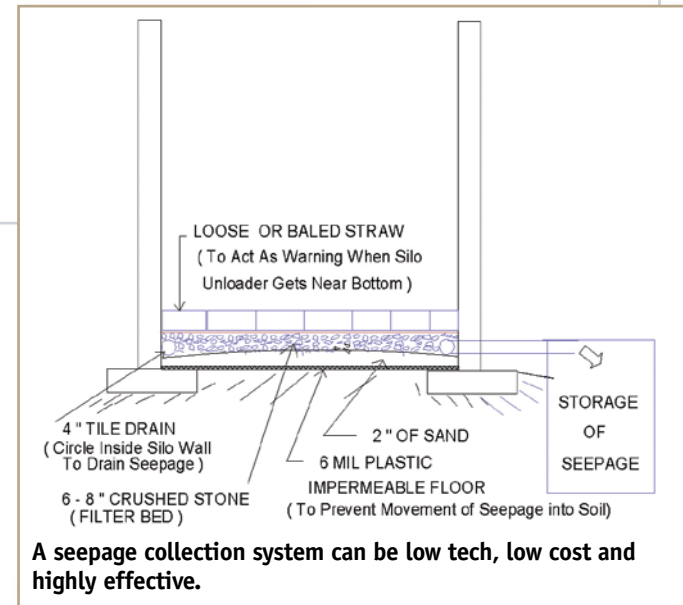
# SEEPAGE MANAGEMENT

## 10-6. Storage and collection, dilution and spreading of seepage

BACKGROUND	WHAT CAN YOU DO?
<p>Large amounts of silage seepage can be produced, especially if the silage is harvested and stored at higher-than-recommended moisture contents.</p> <p>Seepage can be the most dangerous polluting organic surface discharge that occurs on the farm. Its high biochemical oxygen demand can be deadly to fish if it runs off to surface water.</p> <p>A system should be in place to handle seepage from tower and horizontal silos and from balage if the moisture content is 75% or greater.</p> <p><b>Caution:</b> Never mix silage effluent in enclosed manure storage tanks, especially tanks within barns, because silage effluent mixed with manure slurry will accelerate the release of deadly hydrogen sulphide gas. Add seepage only to uncovered outdoor storages.</p>	<p><b>OPTION 1 – ACTION</b></p> <p><b>Install a collection sump at the silage storage location to intercept seepage.</b></p> <p><b>Transfer seepage by a gravity or dedicated pump to an open-top liquid manure or runoff storage – never to an under-barn storage:</b></p> <ul style="list-style-type: none"> <li>• divert all surface water and rainfall away from the silage storage so it does not have to be collected and stored</li> <li>• collect and store all silage seepage and spread effluent on cropland – bearing in mind the acid content and the concentration</li> <li>• install a drainage system in the silo floor to intercept seepage and transfer it to the dedicated seepage storage.</li> </ul> <p><b>OPTION 2 – ACTION</b></p> <p><i>For low flow rates of seepage:</i></p> <p><b>Install a designed collection and storage system.</b></p> <p><i>For high flow rates (diluted):</i></p> <p><b>Construct a vegetated filter strip of the required size to intercept and absorb the seepage:</b></p> <ul style="list-style-type: none"> <li>• hire a professional engineer to design the strip</li> <li>• seek approval for installation from the appropriate agency.</li> </ul>

See also these OMAFRA publications:

- *Vegetated Filter Strip: Design Manual, Publication 826*
- *How to Handle Seepage from Farm Silos, Order no. 04-031*



# LIVESTOCK FEEDING

## 10–7. Management and analysis

BACKGROUND	WHAT CAN YOU DO?
<p>In most cases, forage is the basis of the animal’s ration.</p> <p>Ensilage quality is determined by the maturity and moisture content of the crop at harvest.</p> <p>If the crop matures past optimal harvest time, the crop’s quality and value diminish.</p> <p>The right moisture content is also key. Recent rain increases the moisture content of ensilage, and can cause seepage and other problems. Likewise, insufficient moisture content can disrupt the ensiling process and unwanted moulding may occur. This will reduce the quality of the ensilage and may increase the risk of it catching fire.</p>	<p><b>OPTION 1 – ACTION</b></p> <p><b>Closely monitor the crop and weather conditions as the crop approaches maturity:</b></p> <ul style="list-style-type: none"> <li>• select harvest date based on forage species and stage of maturity</li> <li>• have forage analyzed for nutritional content to confirm harvest timing.</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>See this OMAFRA publication:</b></p> <ul style="list-style-type: none"> <li>• <i>Silo and Hay Mow Fires on Your Farm, Order no. 93-025</i></li> </ul> </div>



Timing of harvest and precipitation are important determinants of ensilage quality.

## 10–8. Feed analysis for ration balancing, including mixer calibration and inventory update

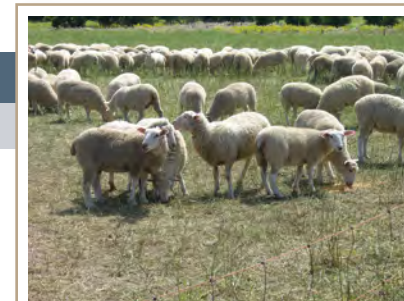
BACKGROUND	WHAT CAN YOU DO?
<p>Maintaining the proper feed ration balance for nutrients and optimum production is an ongoing effort. It requires monthly feed analysis, mixer recalibration, and constant monitoring of inventories.</p>	<p><b>OPTION 1 – ACTION</b></p> <p><b>Pay continual attention to maintain the desired feed ration balance:</b></p> <ul style="list-style-type: none"> <li>• analyze the feed at least monthly – rebalance when the analysis changes</li> <li>• recalibrate the mixer at least monthly</li> <li>• monitor the feed inventory constantly – know how much has been used, how much remains, and what needs to be purchased.</li> </ul>



Analyzing the ensilage at least monthly provides essential information to properly balance the feed ration.

## 10–9. Feed efficiency tools

BACKGROUND	WHAT CAN YOU DO?
<p>Improvements in feed efficiency are being made thanks to continuing research efforts. It’s important to keep up-to-date on the most efficient management techniques and strategies.</p>	<p><b>OPTION 1 – ACTION (PLANNING)</b></p> <p><b>Use a range of feed efficiency tools, and keep up-to-date with the latest information:</b></p> <ul style="list-style-type: none"> <li>• monitor media – articles in print and online, social media, and broadcast commentaries</li> <li>• develop a feeding management strategy – e.g. livestock management groups</li> <li>• use feed additives</li> <li>• maximize feed utilization – use the right equipment for the job with trained operators.</li> </ul>



Feeding livestock in management groups can improve feed efficiency.



## FOR MORE INFORMATION

### Ontario Ministry of Agriculture, Food and Rural Affairs

Many sources of supplementary information are available. Below are some suggestions to get you started. Most can be found online at [www.ontario.ca/omafra](http://www.ontario.ca/omafra) or ordered through ServiceOntario.

- *Agricultural Erosion Control Structures: A Design and Construction Manual*, Publication 832
- *Deterioration of Concrete Tower Silos*, Order no. 08-057
- *Hazardous Gases on Agricultural Operations*, Order no. 14-017
- *How to Handle Seepage from Farm Silos*, Order no. 04-031
- *Silo and Hay Mow Fires on Your Farm*, Order no. 93-025
- *Vegetated Filter Strip: Design Manual*, Publication 826

### BEST MANAGEMENT PRACTICES

BMP publications are excellent sources to better understand on-farm environmental issues and discover a range of proven, practical options to address them. BMP materials are available at no charge to Ontario farmers. To order, see ServiceOntario information.

### Inquiries to the Ontario Ministry of Agriculture, Food and Rural Affairs

Agricultural Information Centre  
Ph: 1-877-424-1300  
Email: [ag.info.omafra.ontario.ca](mailto:ag.info.omafra.ontario.ca)  
Web: [www.ontario.ca/omafra](http://www.ontario.ca/omafra)

### Ontario Ministry of the Environment and Climate Change

[www.ontario.ca/ministry-environment](http://www.ontario.ca/ministry-environment)

*Water Wells and Groundwater Supplies: the Protection of Water Quality in Bored and Dug Wells*

*Water Wells and Groundwater Supplies: the Protection of Water Quality in Drilled Wells*

### Order through ServiceOntario

**Online** at ServiceOntario Publications –  
[www.ontario.ca/publications](http://www.ontario.ca/publications)

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## ACKNOWLEDGEMENTS

At the request of the Ontario Farm Environmental Coalition, consisting of Farm & Food Care Ontario, the Ontario Federation of Agriculture, and the Christian Farmers' Federation of Ontario, the following people and organizations contributed to the revision of this infosheet:

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