



# Managing Feedlot Shutdowns

Whether a feedlot is shut down for a few weeks, a few months or permanently decommissioned, steps are needed to protect people, the environment and neighboring animals. The unused feedlot poses a risk to surface and ground water quality. It is also a potential health and safety concern for humans and neighboring animals. This factsheet describes procedures to minimize these risks.

For the purposes of this factsheet, a feedlot is defined as an uncovered, outdoor feeding facility for any type of livestock and includes both paved and unpaved feeding areas. A few factors (such as soil nitrate accumulation and soil cracking) apply only to unpaved lots.

No matter how short the shutdown period, take steps to minimize the risk of unauthorized entry by people and animals into storage areas and ponds. Manage runoff ponds to prevent discharge (see the soon-to-be published factsheet on shutting down these ponds). Also, ensure that wells will not be contaminated.

During short-term shutdowns of one month or more, turn off water, unnecessary gas and electricity, control weeds and insects, and remove manure from the area.

For longer term shutdowns of six months or more, conditions of the permit and regulations may require a cleanup procedure within a certain time period.

For a permanent shutdown, the area needs to be returned to crop production or other land use. For decommissioning (that is, termination of permitting conditions), notify the permitting authorities. Some jurisdictions may also require a demolition permit for site cleanup.

## Site Security

When a feedlot is shut down, the site needs to be secured against trespassers. Hazardous areas such as storage structures, dugouts and water basins should be fenced and warnings posted. The lack of regular worker traffic and monitoring makes abandoned sites prone to invasion by the curious and the criminal. Such unknowing people can put themselves in dangerous situations and the property owner at considerable liability unless responsible precautions have been taken.

*The unused feedlot poses a risk to surface and ground water quality.*

## Removing Solid Manure

Even for a short-term shutdown, remove as much manure as possible down to the soil surface, immediately after the animals are removed. Manure removal is essential to reduce the risk of contaminants moving down to the water table or being carried by runoff to streams and lakes.

In an active pen, hoof action and compaction by the animals create conditions that minimize movement of nitrogen and salts into the soil below the manure pack (see upcoming factsheet on Feedlot Pen Surface Management). However, after removal of the animals, soil cracking (due to drying, freeze-thaw cycles, and other activities) contributes to changing the pen floor from mainly anaerobic (low oxygen) to aerobic conditions.

Aerobic conditions allow relatively immobile organic and ammonium nitrogen to be converted to mobile nitrate-nitrogen. The cracked soil may allow water to infiltrate deeply, thereby increasing the risk of nitrates reaching the water table.

Manure must be completely removed from fence lines and beneath feed bunks to control rodents and insects, and prevent them from becoming problems for neighboring farms. Whether the shutdown is

**Table 1. Approximate nutrients needed by typical barley crop in selected cropping areas of Alberta**

Nutrient (lb/ac)	Brown & Dark Brown Soil Zones 6 ton/ac silage or 50 bu/ac grain	Gray Wooded Soil Zone 7 ton/ac silage or 60 bu/ac grain	Black Soil Zone 9 ton/ac silage or 80 bu/ac grain	Irrigated Areas 11 ton/ac silage or 100 bu/ac grain
Nitrogen (as N)	75-85	90-100	110-120	150-160
Phosphorus (as P <sub>2</sub> O <sub>5</sub> )	25-30	30-35	40-45	50-55
Potassium (as K <sub>2</sub> O)	75-85	85-90	110-120	140-150
Sulphur (as S)	9-12	11-12	12-15	15-18

Source: Adapted from Western Canadian Fertilizer Association. 1978. Plant Nutrients Used by Crops.

short-term or permanent determines whether cleaning around or complete removal of fences and feed bunks is most appropriate.

In most cases, manure should be hauled directly for application on crop land or to a composting area. Stockpiling manure is only recommended when field conditions are not conducive to spreading. If stockpiling is necessary, you must control runoff seepage and odours from the stockpiling area, as well as insects, birds and rodents. Long-term stockpiling requires proper site design to protect surface and ground water. Seek professional engineering advice on siting and design of stockpiling areas.

Manure should be applied to crop land at rates to meet anticipated crop needs (Table 1), considering nutrients available from all sources. Sources include soil, fertilizer, manure, irrigation water and crop residue. The rate-

limiting nutrient for land application of manure is usually phosphorus or salt on land with a history of manure application.

Take representative soil samples of the land on which manure is to be spread, and follow the soil test recommendations to avoid excess applications of nitrogen, phosphorus, potassium, sulphur and salt. Overapplication of manure creates agronomic problems (e.g. poor germination, lodging) and could harm surface and ground water quality.

The nutrient contents of individual samples from a manure source vary greatly from sample to sample. Thus, it is less expensive and probably as effective to use standard average values, such as shown in Table 2, when calculating application rates.

**Table 2. Average analysis of solid animal manure**

Livestock Type	Moi: (%)	Crop Nitrogen		Phosphorus (as P <sub>2</sub> O <sub>5</sub> )		Potassium (as K <sub>2</sub> O)	
		(lb/ton)	(kg/tonne)	(lb/ton)	(kg/tonne)	(lb/ton)	(kg/tonne)
Beef, unpaved lot	50	5.1	2.6	11	5.6	16	8.2
Beef, paved lot	65	4.4	2.3	4.0	2.0	9	4.6
Turkey hens, toms or broilers	35	21	11	30	15	20	10
Horse	50	5.7	2.9	6.0	3.1	12	6.1
Mink	50	17	8.7	50	26	40	20
Fox	50	3.8	1.9	4.0	2.0	2	1.0
Rabbit	50	4.6	2.4	24	12	10	5.1
Elk or bison	50	4.5	2.3	10	5.1	12	6.1
Sheep ewes or lambs	50	5.3	2.7	9	4.6	25	13

Source: Adapted from Alberta Agriculture, Food and Rural Development. 1995. Code of Practice for Safe and Economic Handling of Animal Manures. Alberta Agriculture, Food and Rural Development.

In Table 2, Crop Nitrogen is an estimate of the nitrogen available to the crop plus the portion of the organic nitrogen that is mineralized over the growing season, minus estimated volatilization losses. Phosphorus is expressed as phosphate equivalent ( $P_2O_5$ ) of manure because phosphorus exists in both mineral and organic forms. All the phosphorus is considered available over time; approximately half is available in the year of application.

For more information, see the Manure Nutrient Management Worksheets available from your local Alberta Agriculture office or seek advice from a professional agrologist for site-specific recommendations.

## Establishing Plant Cover

If the pen or feedlot is expected to be out of use for a season or permanently, establish a plant cover as soon as possible. High nitrogen levels remain in the soil beneath the pens even after manure is removed. Plants will take up the nitrogen before it moves down to the water table. As well, a plant cover will reduce soil erosion. Crop production may also provide some economic returns from the cleanup efforts.

Avoid fallowing. It greatly increases the risk of nitrates and other contaminants reaching the water table.

Crop yields will likely be low in the first few years due to poor soil structure and to excess nitrogen and salt in the soil. Take soil samples and have them analyzed to determine salt content, nutrient requirements and appropriate crop options.

High salt levels can limit plant growth, especially of sensitive crops (Table 3). Salts are compounds of cations, usually sodium, calcium, potassium, magnesium and manganese. Salt concentrations are measured by determining the soil's electrical conductivity in deciSiemens per metre (dS/m).

**Table 3. Salt tolerance of various types of plants**

Tolerant 16 dS/m	Moderately tolerant 8 dS/m	Sensitive 4 dS/m	Sensitive 2 dS/m
barley	sweet clover	alsike clover	
beardless wild rye	perennial ryegrass	red clover	
Russian wild rye	alfalfa	potatoes	
altai wild rye	wheat	corn	
fall fescue	sugar beets	orchard grass	
sea buckthorn	oats		
silver buffalo berry	fescue		
hawthorn	bromegrass		
various wheat grasses	canola		

Source: Adapted from McKenzie, R.C. 1988. Tolerance of plants to soil salinity. Pages 246-251 in Proceedings of the Dryland Salinity Control Workshop, Calgary, Alberta. Alberta Agriculture, Food and Rural Development.

Weakly saline soils (2 - 4 dS/m) reduce yields of salt-sensitive plants. Moderately saline soils (4 - 8 dS/m) reduce yields of many crops. In strongly saline soils (8 - 16 dS/m), only salt-tolerant plants provide adequate yields. In very strongly saline soils (greater than 16 dS/m), only very salt-tolerant plants will grow. In one Alberta feedlot study, researchers measured 20.9 dS/m in the manure pack of feedlot pens and 8.0 dS/m in the soil below the manure pack.

In pen areas, much of the salt is concentrated in the top 30 cm (12 inches) of soil. In this layer, only very salt-tolerant crops will likely grow in the first few years. If sodium is the main salt of concern, gypsum may need to be applied to promote leaching of the salts.

Another option is to remove the top 30 cm layer of salt-contaminated soil before seeding. This removal will speed crop establishment and allow growth of moderately salt-tolerant crops. Take care to avoid simply moving the salt problem to a different area. Seek professional agrologist advice on site-specific soil remediation and land spreading.

A perennial crop is often a good choice for reclaiming a feedlot area because tillage can aggravate the salinity problem. Perennials also have a high capacity for drying out the soil which increases the potential for leaching of salts from the soil surface. Deep-rooted perennial crops, such as alfalfa, greatly enhance recovery of nitrogen deep in the soil profile.

Any crops grown on former feedlots are very susceptible to drought due to high nitrogen availability, poor soil structure and high salt levels. Therefore, it is often beneficial to have supplemental water available when reclaiming a feedlot for crop production.

Even if crop growth is poor, take away any harvested plant material to remove excess nutrients and salts from the site.

Before feeding forage harvested from former feedlot sites, test the forage for nitrate accumulations. High levels of available soil nitrogen can result in high nitrate levels, particularly if the forage crop has had any sudden stress such as drought, hail or frost.

## Feeding Areas

Even for a short-term shutdown, clean the feed bunks and remove the debris beneath them. Feed can attract birds such as sparrows and pigeons which can be a nuisance to neighbors and contribute to spreading weed seeds.

Feed bunks and watering bowls set on risers with open space beneath them should be removed and the debris scraped and hauled for spreading on crop land. The space and debris beneath the feed bunks and bowls attract rodents and provide a medium for insect reproduction.

If any evidence of rodents is found, take steps to control them. If rats are observed or suspected, contact the pest control officer for your municipality or the vertebrate pest specialist for Alberta Agriculture, to maintain Alberta's rat-free status.

Feeding aprons built with slab-on-grade construction make rodent control more difficult. The lack of cattle and vehicle traffic allows rodents undisturbed use of the any space beneath slabs. New construction should include vertical foundations or grade beams at the edges of all slabs to reduce rodent burrowing.

## Feed Storage

Unless silage and grain products are stored in rodent-proof bins or silos, they soon become a major source of rodent reproduction. If silage in open bunker or trench silos is to be kept for future use, the exposed areas should be smoothed and covered with appropriately supported or weighted plastic to minimize spoilage.

Many farmers use materials such as old tires to weight the plastic on bunker and trench silos. Accumulated water in tires and discarded plastic can become a reservoir of mosquito breeding. Either prevent water from accumulating or dispose of the tires in accordance with provincial regulations. For more information on tire disposal, contact the Tire Recycling Management Association of Alberta.

Spilled feed and grain around feed mixing and storage areas attract rodents, birds and sometimes insects, increasing the risk of disease spread, environmental

degradation and problems for neighbors. Clean up spilled feed, and either put it back into storage, use it for feed if suitable, or spread it on agricultural land. Feeds contaminated with toxic materials must not be fed to livestock. Dispose of contaminated feeds in a manner appropriate to the contaminant.

Remove and properly dispose of all debris, such as plastic or other materials, associated with silo operation. Store lumber above ground to minimize harboring rodents.

For permanent decommissioning, the feed may be transported for use by other livestock operators in the area. Old or spoiled silage should be removed and applied on agricultural land.

## Utilities

During shutdowns of a month or more, turn off all unnecessary utilities. Turning off the water, gas and electricity reduces the risk of erosion, wasted water, injury and fire in the event of damage to a water line, gas line or electrical cable by cleaning equipment or failure due to general deterioration.

Water lines and watering bowls should be drained if shutdown occurs during freezing weather. A high airflow capacity commercial air compressor can be used to remove water from lines that are not graded for self-drainage. Water tanks should be drained to prevent freezing and accumulation of stagnant water conducive to mosquito breeding.

Many feedlots use electrically heated watering bowls. Be sure to thoroughly inspect and test all systems when the feedlot is returned to service. Faulty or improperly wired watering bowls can result in tickle voltage or even electrocution of cattle.

## Water Wells

Before even a short-term shutdown, check all water wells to ensure they are properly sealed to prevent rodents, insects or water-carried contaminants from entering the well. Insect or rodent access to a well can cause serious contamination with feces and dead bodies. Not only may the well be made inoperative, but the whole aquifer can be put at risk.

Surrounding grades and surfaces must exclude runoff entry into the well or around the casing to prevent chemical and microbial contamination. Consider pulling pipes and pumps from wells to avoid serious corrosion problems and to facilitate bringing wells back into production.

Permanent decommissioning should include pulling of pipes and pumps from wells, sealing wells with bentonite clay and concrete, and capping the casing below ground to adequately protect the aquifer. Details of procedures and standards are given in Alberta's Water Act.

For more information on well management, see the Water Wells that Last series of publications and videos available from your local Alberta Agriculture office.

## Weed Control

Continually monitor and control weeds around the entire feedlot area, including the lot surface itself, debris basins, runoff control facilities, etc. Weeds can spread to nearby fields, encourage insect breeding and give a poor impression to passersby.

## Petroleum Storage and Spills

Use or remove petroleum products such as stored gasoline, diesel, greases and oils from the site. Spills and leakage of these products could seriously harm the environment, pose a risk to human and animal health, and are a fire hazard. Ingestion of only small amounts of bituminous material by livestock can cause illness or death.

For a long-term shutdown, remove fuel tanks from the site and use them elsewhere or dispose of them properly at a landfill site.

Areas of soil contaminated with oil or fuel (used oil spread, machine parking area, shop floors) can be reclaimed by the methods used in the oil industry. The range of alternatives includes land spreading of contaminated soil, bio-remediation on site, hauling to a secure and capped landfill (class 1), and hauling and decontamination at a hazardous waste facility. The choice will depend on the contaminants and the amount of material. For more information, contact the regional office of Alberta Environment.

## Compacted Areas

Permanent decommissioning and conversion to crop land may require the reclamation of highly compacted areas. Roads and parking lots may have to be deep ripped (60 cm [24 inches]) or deep plowed before crops can grow adequately. Consider deep ripping other high/heavy traffic areas such as the silage pit and dry feed staging area. For best results, deep rip when the soil is dry.

## Drainage Alleys

If the feedlot area is converted to annual crops, the drainage alleys need to be seeded to perennial forages and treated like any other grassed waterway to prevent soil erosion. For more information on grassed waterways, see Watercourse Improvement and Gully Restoration (Agdex FS573-5) available from your local Alberta Agriculture office.

## Landfilling Debris

Permanent shutdown of a feedlot requires the removal of the penning materials, bunks and buildings. Some materials can be salvaged; however, large amounts of material are waste debris and should be landfilled in an appropriate manner. Burying the demolition debris on the feedlot site is not permitted under Alberta's Environmental Protection and Enhancement Act.

Contact your local landfill site (class 1 or 2) for site-specific details on times and rules about demolition debris. For more details on landfilling, contact your regional Alberta Environment office.

Contact your municipal development authority to check if a demolition permit is required. Since demolition is considered a change in land use, some jurisdictions require a permit.

## Medical Supplies, Sharps and Pesticides

All unused medical supplies and pesticides need to be removed from the site. Unopened medical supplies can usually be returned or used by a neighboring operation if not outdated. Opened medicines and used needles should be placed in a puncture-proof container and landfilled at a class 1 or 2 landfill.

Many landfill sites have special areas and procedures for handling pesticides. Contact your local landfill for details.

## Notification Requirements

Permanent decommissioning of a feedlot requires notification of the permitting authority to terminate any conditions of the operation and to comply with any specific decommissioning requirements of that agency.

For a change of land use or demolishing the feedlot, contact the development officer for your local municipality. For closing water wells or changing the water use, contact the regional office of Alberta Environment. For turning off utilities, contact your local suppliers of gas, electricity, etc.

For shutdowns of more than six months, discuss the permitting and requirements with the municipality and the relevant authority for any existing permits.

## Summary

Any uncovered, outdoor livestock feeding facility left unused for any period of time requires proper shutdown. Following the outlined procedures will minimize the risks to people, the environment and neighboring livestock. These procedures also help to ensure that the livestock industry is viewed as a good environmental steward and a good neighbor.

Many of the procedures for temporary shutdowns are very similar to the procedures used for a functioning feedlot on a routine basis. Thus, a feedlot operator practising due diligence will find little difference between the way he manages the operating feedlot and the way he shuts down the lot. Permanent decommissioning requires notification of the permitting authority.

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