

Controlling Runoff From Feedlots and Cow/Calf Wintering Areas

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Introduction

Manitoba is very fortunate to have an ample supply of good-quality surface water. Many communities rely upon surface water for their drinking water supply, as well as for recreational purposes such as swimming and boating. Agricultural uses include watering livestock, irrigating crops and processing food. And, equally important, water is used by wildlife and is home to many aquatic organisms. However, often these same users cause surface water quality problems. Several agricultural practices can harm water quality. Allowing contaminated runoff to flow into surface watercourses is one of them.

What is a “confined livestock area”?

A confined livestock area, as defined by the *Livestock Manure and Mortalities Management Regulation*, is “an outdoor, non-grazing area where livestock are confined by fences or other structures, or topography, and includes a feedlot, paddock, corral, exercise yard and holding area.”



Why should I worry about runoff?

Runoff from a confined livestock area could harm water quality if it is allowed to enter a surface watercourse. Excessive amounts of plant nutrients, such as nitrogen and phosphorus, will increase aquatic plant growth if they enter a surface watercourse. Nitrogen, in the form of ammonia, is toxic to aquatic life. The organic matter in runoff acts as a “fuel” for microscopic aquatic organisms. The breakdown of this organic matter results in a reduction of the amount of dissolved oxygen, sometimes killing fish. Sediment carried in the runoff may contribute to silting, interfering with fish habitat by smothering spawning areas. Runoff may also contain pathogenic (disease-causing) organisms, which if present in sufficient numbers, create a health hazard. For these reasons, contaminated runoff must not be allowed to enter a surface watercourse.

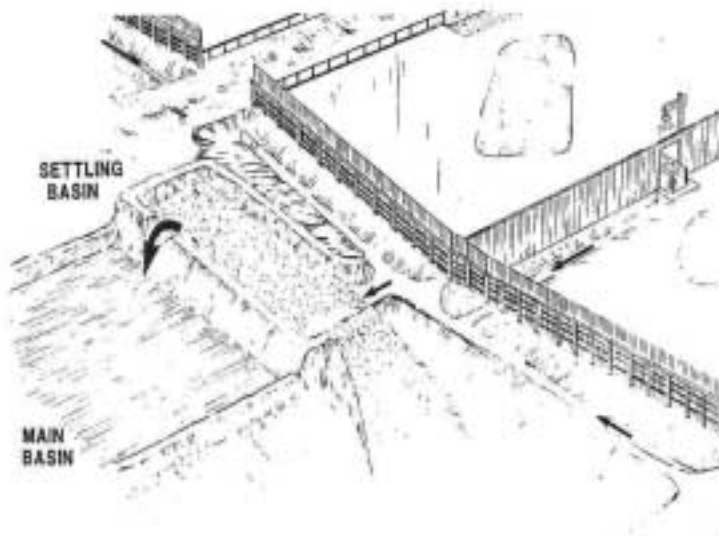
What can I do to control runoff?

The first step in runoff control is to prevent off-site or uncontaminated runoff from flowing into the confined livestock area. It may be necessary to construct diversion ditches or berms to direct clean water away from the area.



The next step is to ensure that all livestock pens are graded, so that the on-site runoff is channeled to a central collection or holding pond. Depending on the site, it may be necessary to provide more than one collection basin. Recommended pen slopes are from two to four percent. Diagonal pen slopes are often provided to ensure proper pen drainage, as well as adequate ditch slope.

The collection basin should hold at least 7.6 cm (3 in.) of precipitation runoff from the collection area. Allowing clean water from outside the facility into the confined livestock area will mean a larger than necessary collection basin will be required. Provide an additional 30 cm (12 in.) of basin depth (“freeboard”) for reserve capacity. The collection basin must be emptied as soon as possible after spring snowmelt or heavy rainfall to be ready for the next runoff event.



Larger facilities should consider using a two-stage collection basin. The first stage is a settling basin, which allows most of the solids in the runoff to be separated from the liquid. The settling basin should be relatively shallow, from 0.6 to 1.2 m (2 to 4 ft) deep. It should have an area of 2.5 percent of the total collection area. The second stage is then the main collection basin.

A runoff collection basin must be used only if it can be made leak proof. It is recommended

that runoff collection basins be constructed to the same standards as earthen manure storages to ensure protection of the groundwater. In areas with sandy sub-soil, it will be necessary to line the collection basin with a clay or plastic liner.

I've collected the runoff. Now how do I get rid of it?

The most practical method of runoff disposal at this time is to spread it onto cropland. The crops will use the water and plant nutrients in the runoff. The organic matter will add to the soil organic matter, helping to improve the soil. Any pathogenic organisms will be destroyed: by drying out, by exposure to sunlight or by other organisms in the soil.

A basic irrigation system should be adequate for most smaller operations. Larger facilities, such as commercial feedlots, may wish to hire a custom applicator to dispose of their collected runoff.

In order to prevent surface runoff, the rate of application should not exceed the rate of soil infiltration. In addition, the application rate must not exceed the annual crop fertilizer needs. On average, runoff from confined livestock areas contains 0.4 percent nitrogen and 0.1 percent phosphorus. In all cases, it is important to prevent contaminated runoff from entering any surface watercourse when spreading it onto cropland.

Treating runoff with a vegetated filter strip

Various researchers in Canada and the United States have evaluated using **vegetated filter strips** (VFS) as a way to safely dispose of runoff from confined livestock areas and solid manure storages. A VFS may be defined as “a system in which a vegetative area is used for treating runoff by infiltration, dilution, filtration and absorption of pollutants”. The size of the VFS depends on the volume of runoff to be treated. The vegetated area should be sloped from 0.5 to 4 percent. Widths start at 9.1 m (30 ft), with lengths from 91.4 m to 274.3 m (300 to 900 ft). Crops grown in the treatment area must be able to tolerate both wet and dry conditions – examples are reed canary grass, brome grass and orchard grass. Vegetated filter strips have not been evaluated under Manitoba conditions, so producers considering using a VFS to dispose of runoff from a confined livestock area are encouraged to “do their homework” before establishing a vegetated filter strip.

Treating runoff with a constructed wetland

Another way of treating contaminated runoff that has been investigated in Manitoba is to use **constructed wetlands**. It has long been known that natural wetlands have the ability, by way of both physical and biological processes, to filter and cleanse contaminated water. A constructed wetland is a man-made wetland built to treat contaminated effluent, such as wastewater and storm water runoff.



In 1996 and 1997, the Prairie Farm Rehabilitation Administration (PFRA) established two full-scale demonstration projects in Manitoba to test the performance of constructed wetlands. These projects have confirmed that constructed wetlands can effectively treat runoff from confined livestock areas.

Where can I find out more about runoff control?

- **Cattle Wintering Sites: Managing for Good Stewardship** – 2001
(available from AAFRD Publications or on the ‘net at www.agric.gov.ab.ca/sustain/cattliewintering.html)
- **Constructed Wetlands For Feedlot Runoff Treatment** – 2001
(available from PFRA – call Pat McGarry at 204-983-4832)

- **Controlling Runoff from Confined Livestock Areas** – 1999
(available from Manitoba Agriculture and Food or on the ‘net at www.gov.mb.ca/agriculture/soilwater/manure/man00s04.html)
- **Farm Practices Guidelines for Beef Producers in Manitoba** – 1994
(available from Manitoba Agriculture and Food – currently out of stock)
- **Holding pond site selection and design** – 1999
(available from Saskatchewan Agriculture and Food or on the ‘net at www.agr.gov.sk.ca/docs/livestock/pork/holdingpond.asp)
- **Vegetative Filter Strip Systems for Animal Feeding Operations** – 2000
(available from Kansas State University or on the ‘net at www.oznet.ksu.edu/library/ageng2/samplers/MF2454.htm)