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4.0 SITE MANAGEMENT

Alberta cattle producers need to consider the environmental impacts, legislative requirements and economic practicality of the location of their cattle operations. Generally cow/calf operations are situated where cattle can access shelter, feed and water. The improper management of cow/calf operations has the potential to damage riparian areas, decrease water quality and increase soil erosion. It can also result in lower productivity on the operation and damage the natural habitat of the area.

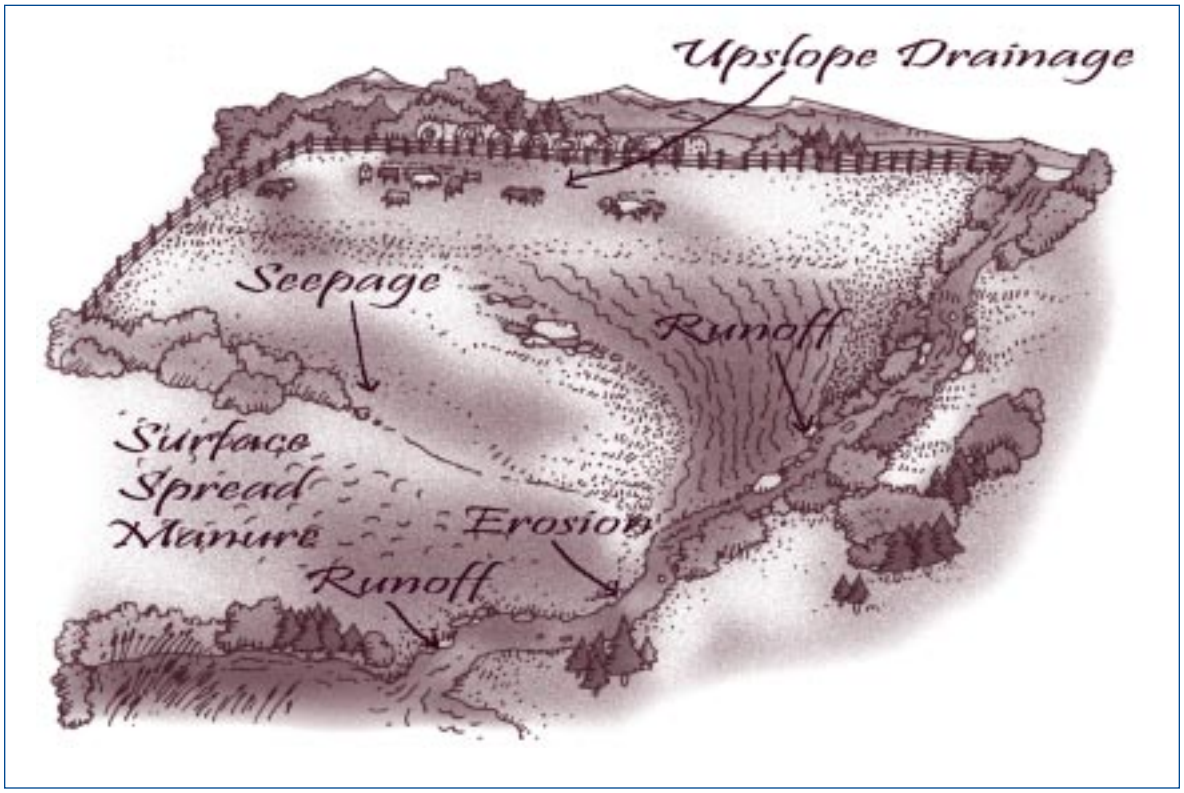
Cow/calf producers rely on a variety of sites for their operations, including summer pasture and wintering sites. The management of wintering sites and manure storage is regulated by the *Agricultural Operation Practices Act* (AOPA). Regardless of whether a permit is required under AOPA, cow/calf operators must follow AOPA regulations. In this section the focus is specifically on pasture and wintering sites.

Successful cow/calf operations plan for the short and long term, and also leave room for future expansion. Producers should consider AOPA regulations during their site selection as any future expansion may fall within the Act's regulatory requirements.

4.1 Site Evaluation

When evaluating a new or existing site, producers need to determine the environmental risks inherent to that site. They must also consider the site's potential impact on neighbours and the legal requirements. Environmental risks are determined by examining the site's topography, soil, and proximity to surface and groundwater. Producers can minimize potential conflicts with neighbours by keeping them informed of operational activities, and any development or expansion plans with open, honest discussion.

Figure 4.1 **Pathways of Nutrient Movement to Water**



4.1.1 Determining surface water runoff risks

It is important to determine the runoff risks of new or existing cow/calf operations. The following factors determine runoff risk:

Slope
The steeper the slope, the more unstable the soil will be. On a steep slope, the velocity of runoff water increases and the water carries more material.

Precipitation/climate
The greater the amount and intensity of rainfall and snowmelt, the greater the risk of water erosion.

Soil drainage/type
Fine (clay) to medium (silt) textured soils are more prone to erosion than coarser (sand) soils.

Surface water entering the feeding area
Clean water flowing from areas upslope of the site will increase the volume of manure runoff.

Vegetative cover
Soils covered by plants and plant residues will be less susceptible to water erosion than bare soil. Vegetative matter slows the flow of runoff.

Flood hazard
Locating wintering sites in high flood risk areas increases the chances of contaminated runoff.

It is also important to recognize situations where the rate of snowmelt is affected by site characteristics. For example, the shade from tall trees on the perimeter of a site may slow snowmelt and runoff, but an open slope facing south will be the first area to melt.

4.1.2 Seepage of manure nutrients into groundwater

Seepage can occur where runoff collects and stands. Manure stockpiles, wetlands and silage storage areas are all potential seepage sites. The risk of seepage is high in a wintering site. While the soil is frozen most of the time the bedding and feeding site is in use, in late spring the risk for manure nutrients leaching into the groundwater increases as the ground thaws.

4.2 Site Management

While some physical properties of a site, such as slope, soil type, water table and climate, may be beyond a producer's control, other factors can be managed. Properties that can be managed include water supply, cattle density, run-on and runoff. In the case of wintering sites, certain feeding and bedding strategies can minimize environmental risk. Section 5 deals with water supply alternatives for both pasture and wintering sites, and Section 7 discusses the management of cattle density on a pasture site. This section covers the management of cattle density on a wintering site, as well as the management of run-on and runoff.

4.2.1 Site location

Wintering sites.
If used properly, seasonal feeding and bedding sites, and wintering sites can be excellent ways to manage manure.

Locate or design wintering sites to protect surface water from manure contamination. These sites must be at least 30 metres from a common body of water. In cases where the sites are less than 30 metres from water, construct a properly designed berm between the site and the water to divert runoff, or remove accumulations of manure and bedding to an appropriate site before runoff occurs. Berming upslope of the site will divert clean run-on water and reduce the amount of manure runoff.

Use wintering sites only for short periods of time and in conjunction with an extended grazing program.

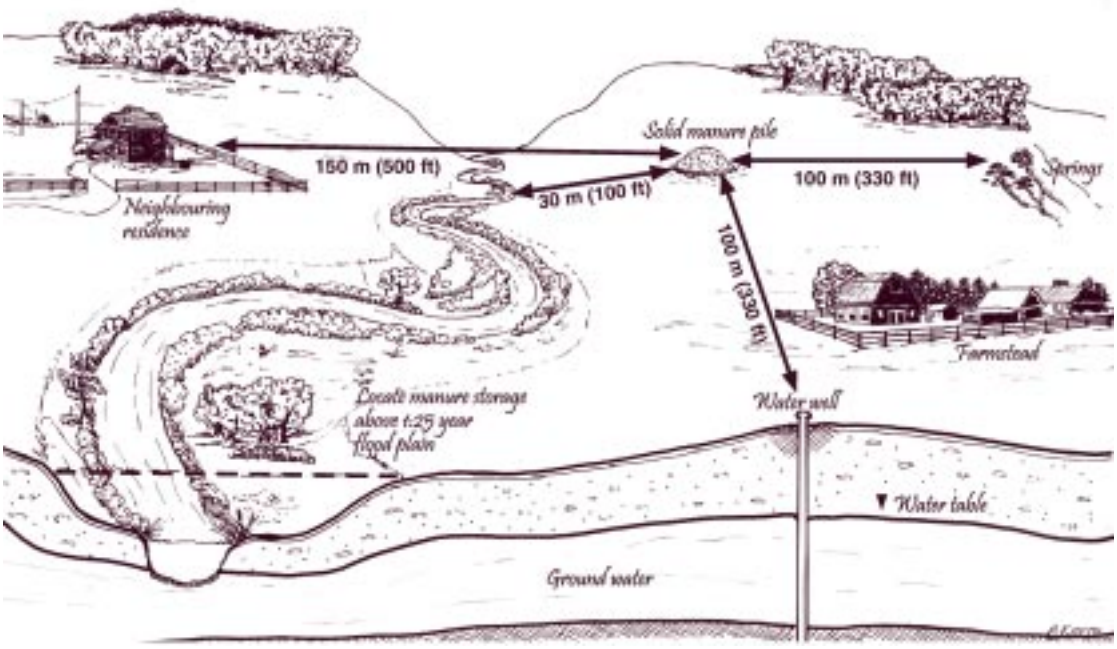
Short-term solid manure storage.
Environmental factors must be considered if manure is stockpiled for short periods of time (under seven months) before it is spread. Take into account safety concerns and relevant municipal bylaws.

Short-term storage of solid manure is regulated. It must be located:

- More than 150 metres from the nearest residence not under the producer's control.
- More than one metre above the water table.
- Above the 1:25 year flood plain.
- 100 metres from springs and water wells.
- 30 metres from a common body of water.

If a site does not meet the last two requirements, then the natural drainage of the site must slope away from the common body of water, or a properly designed berm between the site and the body of water must be constructed.

Figure 4.2 Pathways of Nutrient Movement to Water



4.2.2 Managing cattle density

High cattle density may have a negative effect on several of the runoff factors for cow/calf sites. Minimize manure buildup by spreading cattle out over a larger area of land by changing feeding locations and bedding sites, moving the salt and mineral supplies and, if possible, varying the access to water supplies.

4.2.3 Managing run-on

Run-on is surface water flowing from an upslope location.

When selecting from upland sources, consider spring snowmelt from sources such as shelterbelts and windbreaks in order to avoid run-on problems. Ditch or dyke upslope of the area to prevent surface water from entering the wintering site during spring runoff. This reduces the volume of runoff and the risk of surface water contamination. Reducing the volume of water on the site will limit mud problems and associated livestock health risks, as well as bedding requirements.

4.2.4 Managing runoff

Surface runoff is one of the factors that can be managed on a wintering site. Environmental impact can be minimized by containing or treating runoff.

4.2.5 Managing groundwater seepage

To minimize the potential of nutrients leaching into the groundwater, remove bedding piles before spring thaw and store at a short-term storage site. Do not spread until after the ground has thawed in spring. This also reduces the risk of disease transmission if the same site is used every year.

To manage seepage:

- Avoid areas with a high water table.
- Avoid sites with very porous soils, such as sand, gravel, shale or sandstone outcroppings.
- Choose sites with clay soils, which have the least infiltration.
- Avoid groundwater recharge areas.
- On porous soils, increase the feeding area per animal to reduce manure concentration.
- For wintering sites, move the feeding site and bedding pack regularly during the winter to minimize manure buildup and reduce the incidence of calf diseases.
- Move manure to a short-term storage area before snowmelt to prevent the movement of nutrients into the soil. After thaw, spread the manure on the land as fertilizer.
- Harrow the feeding and bedding area in the spring to disperse manure and straw.
- Decommission abandoned wells properly.

A water well or an abandoned well can act as a direct pathway to an aquifer. Ensure that the well is properly constructed in an upslope location, that runoff is diverted around it and that surrounding activities do not have the potential to contaminate the well water. Also, ensure that abandoned wells are decommissioned correctly to prevent contamination of the aquifer.

4.3 Management Methods

Various management methods can minimize an operation's impact on the environment.

4.3.1 Vegetative cover

The vegetative cover on winter and summer sites affects the flow of runoff. It is of particular importance on a wintering site, as runoff occurs in late winter and early spring long after hoof action has reduced the beneficial effect of residue. Vegetative cover or tall crop residue (15 centimetres in a slightly-sloped area is adequate; more stubble height and residue may be required if the slope is greater), combined with a sufficient buffer (30 metres or more) between the wintering site and the watercourse greatly reduces the risk of water pollution.

4.3.2 Vegetative buffers to treat runoff

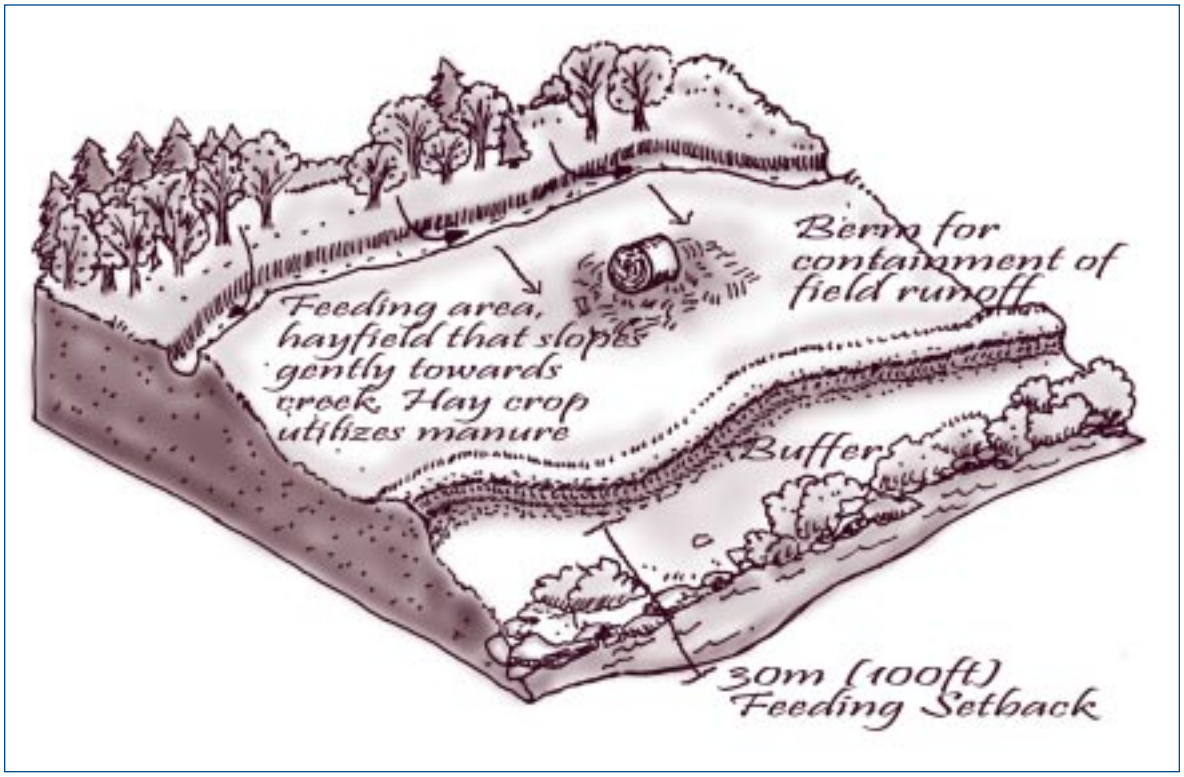
Use a variety of buffers to treat runoff from cow/calf sites. Vegetative filters, such as hayland, pastures with sufficient litter and stubble residue, grassed waterways, treed areas with grass ground cover and cropland with standing stubble, can all be used to dilute and slow runoff. A combination of settling, filtration, dilution, absorption, infiltration and nutrient uptake by plants contribute to the treatment process. Vegetative filter strips are widths or lengths of vegetation that act as a "filter" to trap and use sediments and nutrients from runoff. Manage these properly to prevent excessive nutrient buildup. Management includes harvesting the mature crop.

Vegetative filter strips may be sufficient to minimize runoff contamination from winter feeding sites, calving pens, manure stockpiles and from manure that is spread on cultivated fields.

A number of factors influence the effectiveness of vegetative filters. These factors include:

- Size of the contributing area (area of the feeding/bedding site, assuming upslope runoff is diverted).
- Manure concentration in the contributing area (area per animal unit).
- Amount of precipitation over a given time period, for a given location.
- Slope of the contributing area (increased slope results in increased runoff).
- Slope of the filter strip area and whether the topography lends itself to sheet or channel runoff.
- Soil type in the filter strip (for example, sandy versus clay), and its temperature and moisture content (frozen versus thawed; saturated versus non-saturated).
- Type, density, stability and nutrient uptake of the vegetation in the filter strip (summerfallow, stubble, grass, shrubs, trees). Stem size, stiffness and density affect sediment trapping, adsorption and erosion, while plant variety and species affect nutrient uptake.

Figure 4.3 **Run-on and Runoff Controls**



4.3.3 Constructed wetlands

Constructed or manmade wetlands can be used to collect and treat contaminated runoff or discharge from livestock operations. Research is currently underway to develop design criteria for Alberta conditions.

To design and develop a wetland for effective wastewater treatment, it is necessary to understand the processes that occur in wetlands. Primary processes include:

- Uptake and transformation of nutrients by micro-organisms and plants.
- Breakdown and transformation of nutrients by micro-organisms and plants.
- Filtration and chemical precipitation through contact with plants and soil.
- Settling of suspended particles.
- Absorption and ion exchange on the surfaces of plants, sediment and litter.
- Predation and natural death of pathogens.
- Periodic harvesting of wetland plant material to prevent wetland nutrient overload.

Livestock producers must consider the advantages and limitations of such a system to determine whether a constructed wetland is suitable for their operation.

ADVANTAGES OF A CONSTRUCTED WETLAND:

Provides a high level of treatment. Test results show that phosphorus, nitrate-nitrites, ammonia, biological oxygen demand (BOD) and suspended solids can be reduced to acceptable levels.

Can be relatively inexpensive to construct. A site with accommodating specifications keeps establishment costs low.

Inexpensive to operate. A well-designed wetland transfers water through the system. Once established, properly designed and constructed wetlands are largely self-maintaining. Costs can be offset by harvesting forage from the area.

Reduces, if not completely eliminates, odour. Unlike lagoons, research shows that odours from wetlands are minimal or non-existent.

Handles variable wastewater loadings. Properly-designed wetlands show tolerance for varying amounts of wastewater loading.

Reduces the land area needed for wastewater application. Constructed wetlands reduce the concentration of contaminants, and therefore, the land area needed for wastewater application.

Aesthetically pleasing. Constructed wetlands enhance the landscape with colour, texture and plant variety.

Provides wildlife habitats. Wetlands attract wildlife and can improve the usefulness and attractiveness of an area.

DISADVANTAGES OF A CONSTRUCTED WETLAND:

Requires a continuous water supply. Water must be added if the wastewater supply is insufficient for sustaining plant populations during dry periods.

Can be relatively expensive to construct. Changing the lay of the land, adding soil amendments, liners and/or incorporating pumps add extra cost.

Affected by seasonal weather conditions, which may reduce reliability. Seasonal weather conditions, such as cold and drought, reduce the effectiveness of the system.

Can be destroyed by an overload of solids or ammonia. High ammonia levels caused by inadequate removal of solids destroys plant life in the wetland.

Removes nutrients. Nutrients removed by the wetland system are unavailable for land application and crop production.

4.3.4 Feed management options

Manure buildup occurs in permanent feeding areas. Move feeding areas regularly to minimize manure buildup.

FEEDING OPTIONS:

- Deliver feed bales to a new spot each day.
- Relocate movable feed bunks or feeders.
- Move portable windbreaks.
- Extend the grazing season by using one of the feeding techniques listed below.

FEEDING TECHNIQUES INCLUDE:

Swath grazing

- Cut annual or perennial forage crops and place in windrows to use when supplemental animal feed is required.
- Is most effective if feed wastage is controlled and swath consumption is matched to animal needs.
- Use an electric fence to ration feed intake.

Chaff utilization

- Attach chaff saver equipment to a combine to collect fine particle waste during grain harvesting for use later as animal feed.
- Allow cows to graze chaff piles in the field.
- Ration by using an electric fence, allow self-feeding from a large stack or mix with silage and deliver to animals.
- Chaff quality varies depending on combine settings and moisture, but usually has a higher value feed than straw.
- Chaff is a good supplement in cow maintenance rations.

Stockpiled forages

- Stockpiled or banked forages are unharvested standing perennial forages on pasture or hay fields that are left for grazing at later times.
- Plant growing season is often not the same as the grazing season.
- The annual period of plant growth and mass of growth available at any point in time is controlled by the environment, plant and management.
- Animal grazing of this standing material can be extended into periods when growth is slow or plants are dormant. In order for this to occur, forage yield must be budgeted for periods of the growing season.
- Costs are equivalent to values for summer pasturing, which is usually less than half of hay or silage feeding costs.

Bale grazing

- Feed bales in the field or pasture as an alternative to delivering feed to cows daily.

Figure 4.4a Swath Grazing

Figure 4.4b Chaff Utilization

Figure 4.4c Bale Grazing

- Manage waste by limiting access to bales.
- Bales can be grazed where they dropped from the baler or they can be hauled to another location to meet feed requirements at specific times.

4.3.5 Bedding options

The majority of cow/calf operators use some form of bedding during the winter. However, some producers use other options and do not bed their cattle. If using bedding, plan the site to include several bedding areas and rotate them yearly. The following bedding options can minimize the accumulation of bedding material and manure.

Portable windbreaks. Manure buildup occurs around watering and bedding areas. To better manage the bedding area and minimize straw buildup, create sheltered windbreaks away from the water supply. Use 20 percent porosity fences, fenced or controlled shelterbelts, open front sheds or other structures. When combined with feeding options, portable windbreaks can encourage bedding site relocation. Periodic movement of the portable windbreaks minimizes manure accumulation in any one location.

Fencing. Cattle will seek shelter in treed or brush-covered areas. To minimize runoff and damage to vegetation, locate shelter areas away from a common body of water and related riparian areas. If wintering sites include riparian areas, then management options, such as fencing, should be used to control cattle movement.

Alternative bedding material. Bedding materials have different water absorption properties. Figure 4.6 provides water absorption capacity for common bedding materials.

Bedding methods. The following methods are beneficial for bedding cattle:

- Clear snow and spread bedding material on cleared area.
- Build a bedding pack that generates heat for the cattle.
- Provide clean snow and shelter for bedding animals.
- Clear snow on forage stubble with no additional bedding. Animals prefer bedding in forages with a thatch layer.

Figure 4.5 Portable Windbreak

Figure 4.6 Water Capacity of Common Bedding Material

Material	Pounds of Water Absorbed per Pound of Bedding (Typically 10 percent moisture content)
Wheat straw	2.2
Oat straw	2.5
Barley straw	2.2
Shavings or sawdust	1.5

4.4 For More Information

Contact the following offices for the publications listed or for more information.

Alberta Agriculture, Food and Rural Development (AAFRD)
Agriculture Information Centre 1-866-882-7677
Publications 1-800-292-5697
www.agric.gov.ab.ca

- *Alberta Feedlot Management Guide.*
- *Cattle Wintering Sites: Managing for Good Stewardship* Agdex 420/580-2.
- *An Introduction to Swath Grazing in Western Canada* Agdex 420/56-1.
- *The Standard: The Agricultural Operation Practices Act: How it Affects Cow-Calf Producers.*
- *Reference Guide: Agricultural Operation Practices Act.*

Agriculture and Agri-Food Canada, Prairie Farm Rehabilitation Administration (AAFC-PFRA)
www.agr.gc.ca/pfra
AAFC-PFRA District offices:

Hanna	(403) 854-4448
Lethbridge	(403) 327-4340
Medicine Hat	(403) 526-2429
Peace River	(780) 624-3386
Red Deer	(403) 340-4290
Vegreville	(780) 632-2919
Westlock	(780) 349-3963
Dawson Creek	(250) 782-3116

- *Constructed Wetlands for Feedlot Runoff and Treatment.*

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