Evaluating Open Lot Runoff Compliance

Minnesota requirements for open feedlots without NPDES permits

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Minnesota Pollution Control Agency

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Contents

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http://www.pca.state.mn.us/hot/feedlots.html

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Purpose

These guidelines describe the State requirements and options for treating feedlot runoff that discharges into waters of the state from feedlots that do not require NPDES permits. Information about options to control open lot runoff at NPDES permitted feedlots, can be found at: http://www.pca.state.mn.us/publications/wq-f6-57.pdf.

Storage vs. Treatment

Often producers who are out of compliance with state feedlot rules will be faced with a choice of a) constructing a liquid manure storage and runoff collection basin, or b) using vegetative treatment areas, often in conjunction with earthen clean water diversion berms, rain gutters, moving fences, a solids settling area, and possibly a solid manure storage area. Both options can potentially result in a dryer lot, improvement in animal health and productivity, improved neighbor relations, and improved water quality. Choosing between storage and runoff treatment will depend on a number considerations, including:

- **How permanent the fixes need to be** – how long might the operator be in business, is an expansion planned in the future, etc.
- **Long term ease in management** – Vegetative filters require management of the manure solids on a regular basis, stockpiling, or regular land application. Storage basins are often designed to contain all manure and runoff for up to a full year.
- **Out of pocket costs** – Consider total project costs, long term management costs, possible savings from fertilizer reductions, costs of converting cropland to grassed treatment areas, and the availability of cost share.
- **Water quality protection assurances** – A basin can capture all pollutants in runoff including bacteria. A basin can often make it easier to manage land application activities in a way that protects water quality.
- **Odor** – Sometimes a storage basin can lead to more odor than treatment, depending on management.
- **Soils, slopes, and proximity to waters –** Vegetative treatment requires relatively flat land that can be devoted solely to treating runoff. A basin requires a liner comprised of clay/cohesive soils, concrete, synthetic materials, or a combination of materials and sufficient separation to bedrock.
- **Other treatment options –** While vegetation is the most common way to treat feedlot runoff, ongoing research is looking at other ways to treat runoff in conjunction with grass buffers (e.g. woodchip bioreactors).

Facility Categories and Compliance Required

Your facility will fall into one of four categories listed below, which will determine what measures are required of you to be considered in compliance and also, potentially, the maximum dollar amount you are required to spend in order to be in compliance. The types of compliance along with statutory cost protection are explained in more detail later in this document.

Facility Categories

1. Under 300 animal units (AU) **with** a signed open lot agreement.
2. Under 300 AU **without** a signed open lot agreement.
3. 300 to 500 AU.
4. Over 500 AU.

Compliance Required

1. **Under 300 AU <u>with</u> a signed open lot agreement.**

   Interim Compliance should have been achieved by October 1, 2005, with Full Compliance necessary by October 1, 2010. Statutory cost protection does apply, limiting required expenditures on fixes to $3,000 unless 75 percent cost share is available.

2. **Under 300 AU <u>without</u> a signed open lot agreement.**

   Full Compliance is necessary, which is typically accomplished through the use of an interim permit. The interim permit allots two years to complete the required fixes. Statutory cost protection does apply, limiting required expenditures on fixes to $3,000 unless 75 percent cost share is available.

3. **300 to 500 AU.**

   Full Compliance is necessary, which is typically accomplished through the use of an interim permit. The interim permit allots two years to complete the required fixes. Statutory cost protection does apply, limiting required expenditures on fixes to $10,000 unless 75 percent cost share is available, or $50,000 whichever is less.

4. **Over 500 AU (non-CAFOs).**

   Full Compliance is necessary, which is typically accomplished through the use of an interim permit. The interim permit allots two years to complete the required fixes. Statutory cost protection does <u>not</u> apply.

<u>Types of Compliance</u>

Several items must be considered in evaluating open lot runoff compliance. The first consideration is the type of compliance that is required at the feedlot in question. There are two types of compliance that could potentially apply to a feedlot, Interim Compliance and Full Compliance.

Interim Compliance

Interim Compliance is available for those who signed an Open Lot Agreement (OLA) in accordance with Minnesota feedlot rules (Minn. R. 7020.2003, subp. 4). The rule allowed eligible owners of feedlots with less than 300 AU to enter into an agreement with the MPCA to make substantial pollution reductions by October 1, 2005, and correct all passive manure runoff problems from eligible open lots by October 1, 2010, without the risk of civil penalty from the MPCA regarding past violations of Minn. R. 7050.0215 associated with passive runoff problems.

Feedlot operators who enter into an OLA must immediately begin the process to phase into compliance. The OLA requires producers to:

1. Immediately manage and operate the feedlot to minimize discharges at all times;
2. Install interim fixes by October 1, 2005; and
3. Complete full compliance fixes to meet effluent limits in Minn. R. 7050.0215 by October 1, 2010.

The OLA was included in Minn. R. 7020.2003, subp. 4, so that pollution problems from open lots are corrected. The OLA allows a reasonable timeframe and relatively little up-front costs to reduce and later fix pollution problems at feedlots with less than 300 AUs. Under the OLA, producers may install clean water diversions, gutters/roof drainage, and a 100-foot long grassed buffer, or alternatively use the feedlot runoff model to demonstrate a 50 percent reduction in phosphorus and biochemical oxygen demand (BOD) loading. Either the FLEval model or the MinnFARM model may be used to evaluate the 50 percent loading reduction. Note that this is not a 50 percent reduction in the rating number, but instead is a loading reduction. The 50 percent reduction option in the OLA uses feedlot conditions that existed on October 23, 2000, as the baseline condition. The rules require that the feedlot owner "maintain records of the model results until completing final corrective measures, and make results available to the commissioner or CFO upon request."

Under the OLA, reduced discharges exceeding effluent limitations are allowed until October 1, 2010, if: a reasonable attempt is made to minimize discharges at all times, the site is not a concentrated animal feeding operation (CAFO), and the site does not pose an immediate environmental or human health threat.

In general, engineer designs are not needed for moving fences, installing rain gutters, building simple berms to keep out upslope runoff, installing grassed buffers, etc. However, it is recommended that producers and their technical advisors look toward the final solution needed to meet full compliance when considering the best option for the interim compliance fixes.

Full Compliance

In order to reach Full Compliance, feedlot runoff must not create "pollution hazards," and runoff must meet numeric effluent limits which are slightly above background levels, as described below.

Eliminating Pollution Hazards

In order to reach full compliance with state rules, feedlot owners must first eliminate "pollution hazards" determined through inspection by a county feedlot pollution control officer or MPCA staff. Pollution hazards can be declared if any violation of state technical standards in the Minnesota feedlot rules is found or the feedlot presents a potential or immediate source of pollution taking into consideration the following:

1. The size of the animal feedlot or manure storage area;
2. The amount of pollutants reaching or that may reach waters of the state (pollutant loading);
3. The location of the animal feedlot or manure storage area relative to waters of the state;
4. The means of conveyance of animal manure or process wastewater into waters of the state; and
5. The slope, vegetation, rainfall, and other factors affecting the likelihood or frequency of discharge of animal manure or process wastewater into waters of the state. (from Minn. R. 7020.0300, subp. 19a)

In certain situations a pollution hazard can be determined based only on potential ground water impacts. For example, the following types of conditions could potentially lead to a ground water pollution hazard:

- *Runoff into conduits to ground water* – Feedlot runoff directly entering conduits to ground water, including sinkholes, poorly sealed wells, mines, quarries, fractured bedrock, or subsurface tile.

- *The size of infiltration and vegetative treatment area is inadequate* – Feedlot runoff infiltrates in relatively small depressional areas, rather than being widely dispersed over lands adjacent to the feedlot.
- *Infiltration into course-textured soils without perennial vegetation* – Feedlot runoff entering fields with sandy soils that do not have a perennial vegetative cover.
- *The depth to bedrock is less than five feet* – Feedlot runoff infiltrates onto land with fractured bedrock that is less than five feet below the soil surface.

Numeric Effluent Limits

Minnesota Rule 7020.2003 requires owners of feedlots that are not CAFOs to comply with the effluent limitations in Minn. R. 7050.0215. Non-CAFOs discharging pollutants to surface waters must store or treat the runoff so that the monthly average BOD of all samples taken after the treatment area(s) is less than 25 milligrams per liter (mg/L); and, if discharging into a lake, the monthly average total phosphorus concentration must be less than 1 mg/L. These requirements are not applicable during extreme climatic events as outlined in Minn. R. 7050.0215.

Because ongoing "sampling" of the effluent is not practical or feasible at most feedlots, the MPCA has encouraged use of computer modeling to evaluate the potential for achieving compliance with Minn. R. 7050.0215. While modeling does not provide a definitive answer about compliance, when used by trained staff it provides a relatively uniform means of objectively evaluating open lot runoff and the potential compliance with required effluent limitations. Modeling also enables a producer to evaluate how management changes or new runoff treatment areas will affect predicted compliance with state rules, thereby enabling a producer to proceed with greater confidence to make improvements to his/her feedlot.

Practices That Meet Full Compliance

The use of NRCS standards 635 and/or 313 will usually result in improvements that meet MPCA requirements for open lot runoff, if these types of systems are located, designed, constructed, and maintained in accordance with the NRCS practice standards.

In addition to the NRCS practices noted above, combinations of other practices can meet the MPCA open lot runoff requirements. A feedlot runoff prediction model can help determine which combinations of practices will achieve adequate treatment. The feedlot model currently in use is the Minnesota Feedlot Annualized Runoff Model (MinnFARM). The annual loading predicted by the MinnFARM model will replace FLEval, in 2008, as the primary method used to evaluate compliance. Where proper use of FLEval indicated compliance in the past, those feedlots will remain in compliance unless changes are made to the feedlot or to the management of the feedlot which increases pollution potential.

Beginning in 2008, the MinnFARM model will be used as a primary indicator to evaluate the potential for achieving compliance with Minn. R. 7050.0215. The annual BOD MinnFARM loading which was found to most directly correlate with the required effluent limits is **50 pounds (lbs) BOD, plus an additional 0.25 lbs per animal unit on the lot, with a maximum annual discharge of 125 lbs of BOD**. This is considered the BOD threshold, serving as an indicator that Full Compliance is expected. If feedlot runoff enters a nearby lake (i.e. lake in same minor watershed), the MinnFARM model full compliance loading threshold for phosphorus (P) is **2 lbs of P plus 0.01 lbs per animal unit on the lot, with a maximum annual discharge of 5 lbs of P**.

The MinnFARM model offers several advantages over the FLEval model, allowing for a better evaluation of open lot runoff compliance. Some of the key advantages include:

- MinnFARM models the entire year, including all seasons and all storm events; whereas FLEval models a single storm event (25 year-24 hour storm) during the growing season only, and winter months were not considered.
- MinnFARM considers the buffer width and length; whereas the old FLEval only generally considers the buffer length.
- MinnFARM accounts for the actual time that cattle are on and off the lot during different seasons; FLEval only assesses management during a single day and does not account for seasonal changes affecting the time that the animals are on the lot.
- MinnFARM incorporates results of recent research; FLEval uses equations developed prior to 1982.
- FLEval compliance evaluations were influenced greatly by dilution waters that are naturally or artificially routed onto the buffer area; whereas MinnFARM loading results are less affected by dilution waters. Therefore, the discharge point selection (which is often subjective) has less of an influence on the compliance outcome in MinnFARM as compared to FLEval.

The MinnFARM loading thresholds were determined after analyzing the results of thousands of modeling scenarios. The objectives were to develop suggested thresholds which:

1. Are reasonably consistent with the types of buffers allowed in the past when based on the FLEval modeling results, except where narrow buffers or other site characteristics resulted in FLEval predictions showing more treatment than scientifically justifiable;
2. Are protective of water quality and expected to prevent pollution hazards; and
3. Are developed from the effluent limits established in rule. Typical annual feedlot runoff volumes for different size facilities were multiplied by the 25 mg/L BOD and the 1 mg/L P standard to obtain annual loadings that on average meet the effluent limits.

Considerations When Using MinnFARM Results as an Indicator of Full Compliance

Here are some additional considerations when using the MinnFARM model as a tool to evaluate compliance with the MPCA rules.

Previous zero ratings with FLEval

Where feedlots have been previously evaluated with the FLEval model and found to achieve a zero rating and no pollution hazards, then the feedlot does not need to be re-evaluated with MinnFARM in the future if all the following are met:

1. The feedlot situation has not changed in ways that are expected to significantly affect the pollutant loading or concentration;
2. The original assumptions made by the modeler are valid and are agreed upon by the feedlot officer; and
3. Records show that the producer was notified of their compliance status based on the earlier modeling.

Room for judgment

FLEval and MinnFARM provide an indication of compliance or non-compliance with effluent limits. But in many cases, best professional judgment (BPJ) is also needed. Predicted loading below the BOD and P threshold will not always mean that compliance is achieved. Additionally, a pollutant loading above the thresholds does not always mean that effluent limits will necessarily be violated. Due to uncertainties and assumptions in modeling, a county feedlot officer or MPCA staff person may determine that a feedlot is complying with effluent limits even when FLEval or MinnFARM shows that the defined thresholds may be exceeded. The type of conditions that may cause the inspector to make this decision include a combination of all of the following:

- Low predicted pollutant loading (close to the defined thresholds);
- No threats to human or animal health; and
- The feedlot is either a long way from waters with aquatic life or the runoff enters wetlands which are marginally considered to be a water of the state (e.g. farmed wetlands, Type II wetlands that dry up annually, etc.).

When BPJ is used, provide specific documentation in the feedlot file regarding the reasons and scientific principles used in making your determination.

Buffer soil hydrologic group

The buffer soil type can greatly affect the predicted BOD loading. When hydrologic groups for soils in the buffer are classified as "A," best professional judgment becomes important. If the soil hydrologic group is "A" consider the following:

With sandy soils, suggested BOD compliance thresholds are met with relatively small buffers because the runoff is predicted to rapidly infiltrate into the buffer. There are at least three potential problems with this. First, if the infiltration into the buffer soils occur as fast as the model predicts, there could be a ground water pollution concern at larger lots. Second, infiltration into the soils could slow over time as soil pores clog with manure particles. In that case a larger buffer is needed than originally predicted to adequately treat for surface runoff.

BPJ considerations with hydrologic group "A" soils include:

- Runoff should be contained and spread over grass at agronomic rates if high amounts (e.g. 500 to 1000 lbs) of nitrogen flows onto a small buffer, depending also on the geologic sensitivity and the proximity of nearest wells and surface waters; and/or
- The size of the buffer should be at least the size needed to achieve compliance with hydrologic Group B soils. Short buffers that are close to waters will often continue to represent a pollution hazard.

Buffer length determinations

During some modeling scenarios, buffer lengths of less than 100 feet may show BOD loading that is less than the defined thresholds. Because of the inherent uncertainties in the modeling approach, it is recommend that the minimum buffer length at all sites be at least 100 feet, unless solid justification for a shorter buffer length is documented in the project file.

Buffer width determinations

The buffer width has a large influence on the MinnFARM model outcomes. To determine the buffer width, follow the guidance provided within the model.

Runoff onto neighboring property

The MPCA highly recommends that feedlot runoff be treated to meet effluent limits on the feedlot owner's property. From a feedlot permitting standpoint, inadequately treated feedlot runoff onto the neighboring property should not be allowed unless the neighboring property owner has expressly authorized the use of his/her property as part of the treatment system for feedlot runoff. The feedlot owner should obtain a written authorization from the neighbor, with a copy of the authorization provided to the permitting authority. Staff should be aware that the authorization could be limited in scope (e.g. time, conditions, etc.) and, thus, may not provide regulatory certainty of pollution prevention into the future.

Runoff onto multiple buffers

If a feedlot or several sub-lots have runoff which flows onto separate buffers which discharge into the same receiving water, then the predicted loadings from each buffer should be added together to determine the total loading for the feedlot. The total suggested loading threshold is determined by adding all the animals in the lot or sub-lots and using the formula **50 lbs BOD, plus an additional 0.25 lbs for each animal on the lot or combined sub-lots with a maximum annual loading of 125 lbs of BOD**.

Other feedlot-related sources of pollution

In order to be in Full Compliance with MPCA requirements, the feedlot must also prevent pollution from other sources in addition to open lot runoff, including milkhouse wastewater, feed storage areas, and dead animal storage. The MinnFARM model does not evaluate potential for achieving compliance from these other parts of the feedlot. Additionally, state rules for land application and stockpiling must be followed.

Statutory Cost Protection

The Minnesota legislature established limits on how much feedlot owners can be required by regulatory officials to spend on upgrades when 75 percent cost share is not available (Minn. Stat. § 116.07, subd. 7(p)). The law states that unless the upgrade is needed to correct an immediate public health threat under Minn. Stat. § 145A.04, subd. 8, the Agency may not require the feedlot operator:

1. to spend more than $3000 to upgrade an existing feedlot with **less than 300 animal units**, unless cost-share money is available to the feedlot operator for 75% of the cost of the upgrade; or
2. to spend more than $10,000 to upgrade an existing feedlot with 300 to 500 animal units, unless cost-share money is available to the feedlot operator for 75% of the cost of the upgrade, or $50,000, whichever is less.

Note: A temporary statutory that prevented the MPCA from requiring feedlots with less than 100 animal units to spend any money on feedlot fixes no longer applies.

Guidance on applying this statute:

The Agency understands that the intent of this statutory provision was not to encourage producers to achieve the goal of cost protection. The goal is Full Compliance. However, due to the high costs at some farms of achieving Full Compliance, the statutes offer protection from expenditures that could otherwise cause undue hardship at farms where low-cost options will not be sufficient to achieve full compliance, and 75 percent cost share is not available. Note that the Natural Resource Conservation Service (NRCS) cost share rate polices recently changed to a fixed dollar amount that varies with

each type of improvement that is constructed. Therefore, producers will need to consult with their county NRCS and Soil and Water Conservation District (SWCD) offices to determine the rate of cost share that would be provided for their farm.

Consider the following guidelines regarding statutory cost protection:

Statutes and Cost Share Availability Can Change

If a producer is not currently eligible for 75 percent cost share and the producer spends the required amount on partial fixes, this does not ensure that the producer will never be required to make additional improvements. For example, if statutes change or 75 percent cost share becomes available in the future, then more improvements may be required.

Producers Need Good Documentation

If a feedlot is potentially eligible for 75 percent cost share (e.g. in a shoreland area or other sensitive area or is otherwise contributing a high pollutant loading to waters), the producer must apply for cost share if he/she intends to potentially use the statutory cost protections. If the producer is rejected for cost share, they should keep all written documentation of the attempt to obtain 75 percent cost share. Producers who proceed to make fixes on their own need to keep track of all costs incurred and keep a detailed record of improvements. Photo documentation is helpful. Inspections by a county feedlot officer, SWCD, NRCS, or MPCA staff person are highly recommended. The time that producers spend on the feedlot management improvements is not considered part of the improvement costs. Reasonable costs for time incurred on structural improvements can be considered.

What Improvements Should Be Made?

The statutes do not provide any specific information about which practices the producers would need to implement in order to meet cost protection compliance. The MPCA recommends that, as practical and feasible, the low cost practices in Attachment A should be used, generally following the priority order that they are listed in Attachment A. Also consider which improvements will be helpful for achieving full compliance in the future. For example, clean water diversions are often useful as both a low cost fix and in conjunction with a basin or filter strip constructed as a full compliance fix.

If Over 500 AU

A feedlot with more than 500 AUs can be required to spend whatever amount is necessary to bring the feedlot into compliance, even if cost share money is not available.

Public Health Threats are Rare

A producer can be required to exceed the $3,000/$10,000 expenditure amounts when 75 percent cost share is not available if the feedlot is determined by Minnesota Department of Health or a local health board to cause an immediate “public” health threat under Minn. Stat. § 145A.04, subd. 8. Declaration of an immediate “public” health threat can be made by local health boards following a process described in statute. Declaration of a public health threat is rather uncommon and is a completely different process than the MPCA or county feedlot officer determination of an immediate “human” health threat associated with eligibility for an OLA.

Attachment A

Options for Improving Open Lot Runoff Problems

The most common types of pollution abatement measures for open lot runoff are noted below, beginning with those that have the highest potential to positively impact water quality.

Lower Cost Improvements:

Move Fences/Change the Lot Area

- If water flows through the feedlot, adjust fencing so that the feedlot area does not enclose any part of a stream, intermittent stream, or waterway.
- Relocate all manure stockpiles away from any areas that create a discharge to "waters of the state".
- Move fences so that runoff from the open lot areas is directed away from waters and channels, and instead directed into areas where treatment can occur (e.g. onto cropland, grassed buffers, etc.). Reduce the open lot area to no more than what is needed to: i) maintain good animal health, ii) provide adequate feeding and watering space, and iii) prevent animals from becoming too agitated.
- Vegetate the abandoned portion of the lot that is no longer in use to utilize the accumulated nutrients.

Eliminate Open Tile Intakes and/or Feedlot Runoff to the Intake

Eliminate any open tile intakes where feedlot runoff may discharge to waters of the state and/or divert feedlot runoff away from the intake.

Install Clean Water Diversions and Rain Gutters

Where "clean" water enters the lot from the land upslope of the feedlot and flows through the lot, construct clean water diversions. Attach rain gutters to the open lot side of the buildings when and where needed.

Install Grass Buffers

Grade the soil and plant grass buffers downslope of the feedlot. Also construct spreaders where appropriate to prevent channelization within the grass buffers.

Maintain Buffer Areas

Remove any accumulated debris or undesirable organic matter from the vegetated filter strip and/or buffered areas and maintain the grasses to maximize treatment of pollutants in runoff. Terminate and reconstruct any areas where runoff is channelized upslope of the buffer or within the buffer. Use level gravel spreaders where appropriate.

Construct a Solids Settling Area(s)

Construct a solids settling area and picket dam to settle solids prior to reaching the grassed buffer. This may require some re-grading of the feedlot area. Concrete lips and slabs should also be considered where budget allows.

Prevent Manure Accumulations

- Scrape and haul at least once every seven days in areas where heavy defecation takes place such as around feeders, bunks, and watering devices.
- Relocate feeding areas away from potentially impacted areas and watering devices.
- Frequently move feeding devices to reduce any manure build up and accumulation.

Manage Feed Storage

- Relocate any feedstuff stockpiles or any decaying feedstocks that may produce leachate or contaminated runoff away from any receiving waters.
- Reduce feed spoilage and spillage from free-choice feeders by ensuring that they are properly adjusted.
- Do not overfill feed bunks, troughs, or other feeding devices where excessive feed waste may accumulate.
- Remove all non-palatable and spoiled feed from feeding devices and land-apply.

Manage Watering Devices

Adjust watering devices to prevent overflows and excessive leakage.

Higher Cost Improvements

Total Runoff Control and Storage

Total runoff control involves collecting all manure and feedlot runoff in liquid manure storage areas for storage and later use as a soil amendment to cropland/grassland. All liquid storage areas must meet Minn. R. 7020.2100. All new and existing storage structures must have sufficient capacity to manage their manure and feedlot runoff in accordance with land application requirements.

Roofs

Roofs constructed over the entire feedlot area can be used to eliminate contaminated runoff at the feedlot site. Clean water diversion berms are also needed at some locations to prevent runoff waters from entering the feedlot on the upslope side of a roofed area.

Runoff Containment with Irrigation onto Cropland/Grassland

This option involves constructing a runoff containment basin to hold runoff liquids until they can be pumped out of the basin and spray irrigated onto adjacent cropland or grassland. The irrigated liquids must be applied using rates, times, and methods which meet all land application requirements described in the General National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Permit and which do not exceed the hydraulic loading capacity of the soil (i.e. no ponding or runoff).

Basin capacity: If the basin only collects feedlot runoff, and manure is not deposited or stored in the basin, then the basin must be sized to contain the 25 year, 24-hour storm event runoff *plus* storage capacity required to contain all runoff between land application events in accordance with the facility's Manure Management Plan *plus* at least one foot of freeboard. The basin must meet liner requirements established in Minn. R. ch. 7020.2100

Vegetated Infiltration Area

Vegetated infiltration areas are described in the Minnesota NRCS 635 practice standard as a Level 2 system. These systems have a settling basin followed by a large flat vegetated area that is completely surrounded by berms. The settling basin must hold at least a 10 year, 1 hour rainfall. The vegetated area generally must:

- Maintain live vegetation during the growing season;
- Have soil permeability of 0.2 to 6 inches per hour down to a five-foot depth;
- Be large enough to assimilate all nitrogen in runoff;
- Have more than ten feet of separation distance to fractured bedrock;
- Be relatively level with spreaders to ensure even distribution over the grass;
- Have a seasonal water table depth of five feet or more during the typical growing season; and
- Provide for even distribution of runoff at the top end of the vegetative treatment area using level gravel spreaders, gated pipe, small distribution tubes, concrete curb, weir, or the equivalent.

Tile-Drained Vegetated Infiltration Area with Secondary Vegetated Filter Strip

This design is essentially a standard infiltration area which has tile drainage below the infiltration area to drain saturated soils. The tile drains outlet onto a secondary vegetated treatment strip. More information about this type of design can be found at http://www.heartlandwq.iastate.edu/ManureManagement (click on "alternative technologies" heading and then go to "VTS Guidance Document" and see - chapter 7 VIB design).

Sunny Day Release onto Vegetated Infiltration Area or Filter Strip

The grassed treatment area for this type of design is similar to a standard vegetated infiltration area. However, instead of a settling basin, there is a runoff impoundment designed to hold runoff from November 1st to May 30th or the 25-year, 24-hour event, whichever is greater. Controls on the outlet of the impoundment allow release into the vegetated area during optimal times of growing vegetation and relatively dry soils.

Vegetated Filter Strips

The MPCA recommends that filter strips constructed as a permanent solution to runoff pollution be designed and maintained in accordance with the standards and principles set forth by Minnesota NRCS practice standard 635. For example, include settling basins or impoundments to settle manure solids prior to the vegetated treatment area and construct level spreaders to maintain sheet flow across filter strips.

The size of vegetated infiltration areas and filter strips should be designed in accordance with NRCS practice standard 635.

In some situations, filter strips may be expected to meet effluent limits and prevent pollution hazards immediately after construction, but may ultimately lead to pollution problems in the long term. This can occur when the filter strip does not function as designed, feedlot fencing or management is modified, or the runoff control is inadequately maintained, including failure to:

- Remove solids from the settling area;
- Clean feedlot outlet;
- Harvest vegetation;
- Prevent animal traffic on the treatment area;
- Maintain level spreaders; and
- Properly manage controlled releases.

Even though a filter strip on the edge of a stream may be able to show acceptable model results at the time of construction, it may be inspected at a later date and found to be a pollution hazard due to poor performance. The risk of becoming a pollution hazard in the future decreases when a margin of safety is built into the treatment system selection, siting, and design. Buffering lands between the end of the filter strip and waters can provide an added degree of treatment and margin of safety.