

MANURE MANAGEMENT CHOICES

For
Wisconsin
Dairy &
Beef Cattle
Operations

USDA Natural Resources
Conservation Service

University of Wisconsin - Extension

Wisconsin Department of Natural Resources

Wisconsin Department of Agriculture,
Trade & Consumer Protection

Farmers with dairy and beef cattle are familiar with the dilemma of manure management – the same nutrients that make manure a valuable fertilizer also make it a threat to Wisconsin’s streams, lakes and groundwater. The challenge for the farmer is to manage manure in ways that maximize its benefits while protecting water resources.

Your operation probably looks very similar to one of the management and housing systems shown on these two pages. This publication provides a guided tour of the water resource issues associated with each of these systems. It will help you look at your operation with an eye toward water quality, point out some common problems, and introduce practical management solutions.



Barn and lot

The traditional system in which cattle are rotated among the barn, lot and pasture. Typically, the barn has stanchions for the cows and a barn cleaner. Paved lots often include feed bunks.



- A** Manure Application
- B** Manure Storage
- C** Animal Lot Control
- D** Streambank & Shoreline Protection



Confined Indoors

Dairy freestall housing and similar systems in which cattle are totally confined. Newer buildings have adjustable fabric sidewalls. Manure is typically collected in alleys.



- A** Manure Application
- B** Manure Storage



Confined Outside with Minimal Shelter

A common system for young stock and beef animals. Structure walls, wind break fences, trees or hay bales shelter animals from high wind but no roof protects animals from precipitation. Some systems have a roofed building with an open side. Manure builds up inside the building as a bedded pack and is removed several times a year.



- A** Manure Application
- B** Manure Storage
- C** Animal Lot Control

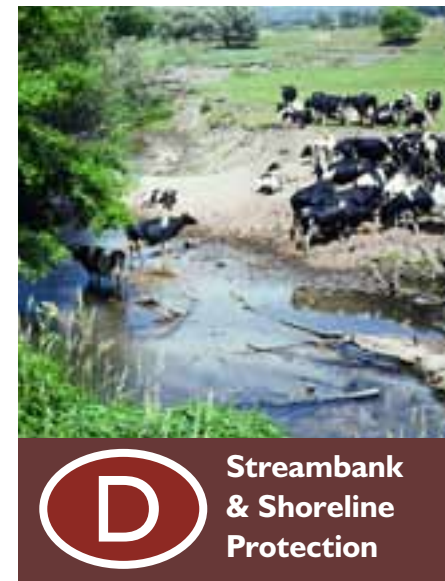
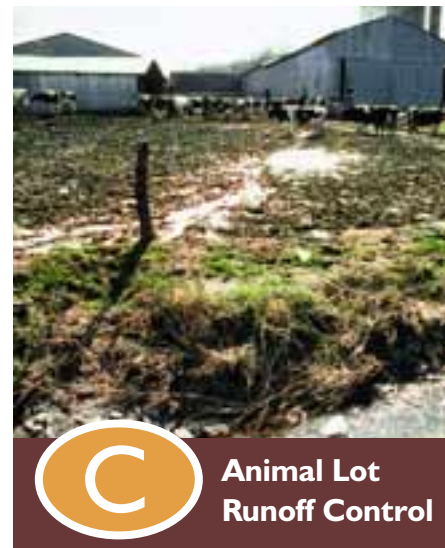
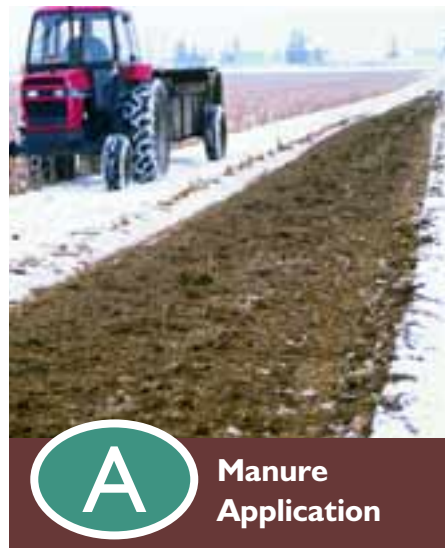


Managed Grazing

Cattle grazed in rotation, mainly from April to November among different paddocks, which are mostly in sod and provide forage. Various housing options are used in winter.



- Other issues may apply, depending on how cattle are housed during the winter months.
- D** Streambank & Shoreline Protection



Careful spreading according to a nutrient management plan can protect water quality and help the farmer get the maximum fertilizer benefit from manure. The key is to put manure in known places at known rates so that it can be credited for its nutrient values. Overapplication of manure or runoff from spreading sites can result in pollution of streams, lakes or groundwater.


In livestock operations where cattle are confined, manure must be collected and eventually spread on the land. Manure storage is primarily a tool to make manure handling and nutrient management easier. Storage facilities allow the farmer to spread manure when conditions are environmentally safe, and to place manure so that nutrients can be credited and used by crops.

Wherever manure is concentrated and exposed to the elements, rain and melting snow can wash nutrients, bacteria and organic matter into nearby drainageways, and ultimately to streams and lakes. Polluted runoff is often associated with barnyards and exercise areas. Runoff control practices help to divert water away from manure-covered areas, retain manure on the lot and capture the runoff or filter it before it reaches a waterway. In addition to the water quality benefits, runoff controls create a drier, healthier environment for cattle, and make manure handling easier.

Livestock operations that allow cattle unrestricted access to streambanks and shorelines can seriously damage water quality and habitat for fish and wildlife. Sediment from trampled banks clouds the water, manure is deposited directly in the water, and the lack of vegetation allows more pesticides and nutrients from cropland to run off into the water. Banks stripped of vegetation are prone to erosion. Several practices can allow cattle access to water while protecting banks and shorelines.

Which Issues Do I Need to Consider?

More than likely, you recognize some or all of the issues listed at left. Depending on your management and housing system, you may need to address one or more of these issues.

	Manure Application	Manure Storage	Animal Lot Runoff Control	Streambank & Shoreline Protection
 Barn and Lot	A	B	C	D
 Confined Indoors	A	B		
 Confined Outdoors/Minimal Shelter	A	B	C	
 Managed Grazing				D

(Other resource issues might apply, depending on how cattle are housed during winter months.)

How to Use This Publication:

The following pages present photos and illustrations of popular, practical options for runoff control, manure storage, land application and streambank and shoreline protection. Under each option you will see one of three symbols:

The + indicates an advantage of the option.

The - indicates a disadvantage of the option.

The * indicates additional information that is neither an advantage or disadvantage, but is something to consider.

Nutrient Management Plan

The key is to spread manure in known places at known rates so that it can be credited as fertilizer. The easiest way to do this is to handle and spread manure according to a nutrient management plan. Applying manure according to a plan allows you to maximize the use of nutrients in manure and legumes, and cut back on commercial fertilizer purchases. A nutrient management plan includes the following:

Soil test – to determine the nutrient status of fields;

Manure test – to determine the nutrient content of the manure (book values are acceptable for daily hauled manure; stored manure should be tested);

Manure spreading plan – to identify which fields get manure, how much they get and when they get it. It also identifies areas with manure spreading limitations (such as land with excess nutrients, areas close to bodies of water, steeply sloped fields, and fields with thin soils above creviced bedrock).

To protect water quality, a nutrient management plan is essential. Information and assistance in developing a plan is available from crop consultants and local offices of UW-Extension, the Natural Resources Conservation Service, and county Land Conservation Departments. If manure is applied according to a nutrient management plan, any of the common application methods can be effective.



Manure Spreader

Spreaders are typically used for solid manure. However, many farmers spread semi-solid manure with a liquid-tight, end-gate spreader or a flail discharge V-spreader.

- + Relatively inexpensive
- + Low maintenance
- Difficult to apply uniformly and difficult to reach fields in winter
- Odor can be a problem
- * Incorporation within three days increases available nitrogen and reduces runoff and odors
- * Spreader should be calibrated (weighed) to determine the amount of manure in a load



Tank Wagon (surface spread)

Tank wagons are used with liquid manure and milking center wastes.

- + Uniform application easier to achieve compared to a spreader
- Soil compaction may be significant
- Odor can be a problem
- * Incorporation within three days will increase available nitrogen and reduce the chance of runoff and odor

Tank Wagon with Knives or Disks

Tank wagons with incorporation might be preferable to broadcast tank wagons because they eliminate the need for later incorporation.

- + More uniform application rate than surface spreading
- + Less odor during application than other methods
- Knives/disks can bury residue, conflicting with residue requirements in low tillage systems
- * Cropland surface is left rough after injection



Flexible Drag Hose

The drag hose is the quickest way to apply manure from large storage facilities on relatively flat fields.

- + Fast
- + Less soil compaction compared to tank wagons
- May require permission to cross property lines
- Works best when transport distance is less than two miles
- Limited field accessibility may lead to build-up in nearby fields
- * System mainly used by custom handlers

On many farms storage is the preferred manure-handling option. It eliminates the inconvenience of daily hauling, and allows manure to be conveniently stockpiled in a single facility until conditions are environmentally safe and agronomically correct for field application. Whether manure is hauled and spread daily or stored and spread seasonally, it should always be spread according to a nutrient management plan.

All storage systems have certain disadvantages. The costs are seldom offset by the fertilizer savings, facilities require unloading during busy spring and fall seasons, and they can pose water quality and safety hazards if not designed and maintained properly. Before making a decision on manure storage, take a careful look at your operation. Consider siting or design limitations on the farm, possible future changes in your operation (because storage systems are difficult to modify once built), bedding, how you will transfer manure into and out of storage, odors, and how much time and labor you can devote to manure handling. Also consider local and state regulations that might affect the project.

Four types of storage are common in Wisconsin:

Can I Afford Storage?

Cost is a big factor in deciding whether or not to build a storage facility. Typical costs run from \$100 per cow for earthen ponds to \$1,000 per cow for above-ground tanks. Various cost-share programs may reduce the initial investment, but annual costs to finance and operate the system can still be significant.

Walled Enclosure

- + Can handle solid, semi-solid or liquid manure
- + Will fit into most farm layouts and are often located next to barnyards for easy loading
- Moderate to high cost
- * Some walled enclosures have roofs to keep out direct precipitation



Storage Pond

- + Low to moderate cost depending on liner requirements
- Site limitations are more likely to limit design options compared to other storage options
- * Stores liquid manure
- * Most appropriate for farms with deep soil and adequate building space

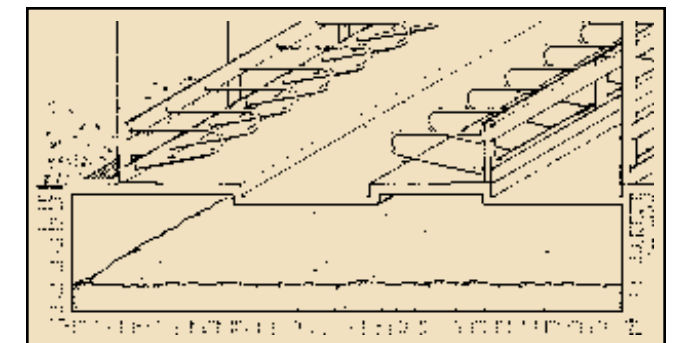
Above-Ground Tank

- + Suitable for site with shallow soil or high groundwater
- + Prefabricated system that fits most farm layouts
- + Most volume in the smallest area
- High cost
- * Stores liquid manure



Under-Floor Storage

- + Low labor requirement
- + Reduced volume because precipitation does not enter storage
- High cost
- Limits bedding options
- * To avoid gas build-up, adequate ventilation is required



Preventing runoff from areas where manure is concentrated involves two strategies:

- Keep clean water from flowing across manure-covered areas
- Filter polluted runoff

Four practices are common in Wisconsin:

Rain Gutters, Downspouts & Outlets

Gutters and downspouts direct clean roof water away from manure-covered areas. In some cases downspouts are connected to an underground tile outlet to carry water away from the heavy traffic areas.

- + Low cost
- + Can be custom fitted to most buildings
- + Helps create drier, cleaner yard
- + Gutters on the ground (photo at right) eliminate problem of ice and snow slide
- Ice can plug gutters and downspouts and sometimes damage them; snow sliding from roofs can also cause damage
- * Gutters must be cleaned to keep them free of debris
- * A roof over the yard helps keep precipitation off, but lack of sunlight may promote sloppy conditions



Diversion

A clean water diversion is an earthen ridge or channel built across the slope upgrade of barnyards or feedlots.

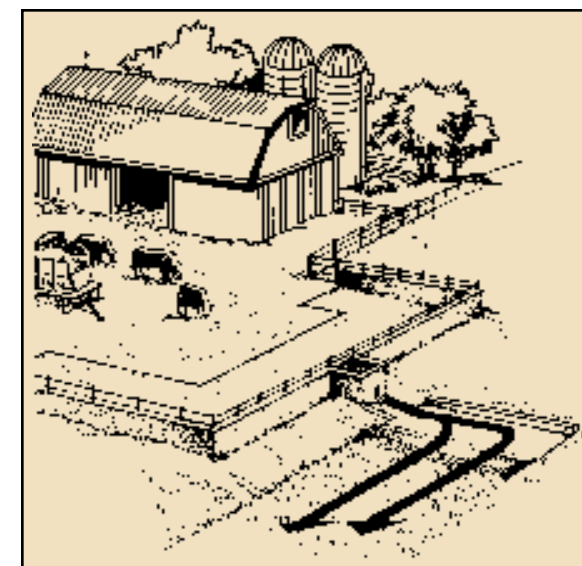
- + Low cost
- + Carries water away and helps create drier, cleaner yard
- Might be a traffic obstacle
- * If the barnyard is at the bottom of a slope, a diversion should be the first step in minimizing runoff problems



Settling Basin

A wall with an outlet box at the lower end of the yard allows runoff water to leave the yard at a controlled rate. A concrete slab along the inside of the wall allows trapped manure to be scraped and removed.

- + Can result in a cleaner, drier yard
- + Good retrofit for an existing barn/lot
- + Cleaning the yard and collecting the manure is easier, especially if entire yard is paved
- + An area for short-term manure stacking can be designed adjacent to the settling area
- Temporary ponding after a storm will limit use of the yard
- May limit future management changes
- Can be expensive
- Runoff water leaving the yard contains organic particles and dissolved nutrients
- * Periodic maintenance is required, including scraping the yard (especially before storms), cleaning the outlet box after a storm and replacing deteriorating boards



Filter Strip

Water leaving a settling basin or barnyard is directed to a grass filter strip or buffer area that traps nutrients and suspended material. A spreader above the filter strip distributes the water so it flows evenly across the filter.

- + Inexpensive to install
- + Can effectively remove solids and nutrients from runoff water
- Size and location of the filter strip can be an inconvenience
- Filter strips can gradually become clogged and nutrients can build up in the soil
- Water percolating through the filter can carry nitrate to groundwater if soils are highly permeable
- * Maintenance includes cutting the grass and removing clippings several times a year, and regrading and reseeding areas that have died off or thinned

When cattle are concentrated along streambanks and shorelines, bank erosion and manure threaten water quality. Excluding cattle usually means fencing the cattle away from the water, allowing controlled access for drinking and crossing, and in some cases providing an alternative source of water. The management and financial benefits of livestock exclusion – cattle safety and health, reduced erosion along cropland edges – are harder to pinpoint than with other manure management practices. And with time and money in short supply on many farms today, these practices are not often a high priority. However, the long-term benefits of cleaner water, improved fish and wildlife habitat and a positive public perception of farming should not be ignored.

Livestock Exclusion

Exclusion usually means fencing. The type of fencing depends somewhat on site conditions, but single or double-strand electric fence with flexible line posts is probably the most common and economical choice. Woven wire tends to trap debris and be damaged during flooding.

- + Allows vegetation to stabilize the bank and shield it against further erosion
- + Improved fish and wildlife habitat
- Can be expensive, depending on the length of fencing required
- Severely eroded banks may need to be stabilized by grading and seeding or placement of rip-rap prior to fencing
- Fencing in flood-prone areas requires high maintenance
- * Undesirable tree growth may need to be controlled; however, problems can be minimized by planting desired grasses and seedlings during fence installation



Crossings

Crossings or access ramps are typically built of gravel or roughened concrete. Swing gates or suspended panels keep cattle from moving up or down stream, but do not permanently block the stream.

- + Cattle have access to the stream for drinking
- + Hard surface crossings provide stable footing and keep cattle from churning up the bottom
- + Crossings allow equipment to easily cross a stream
- + Cattle are less likely to linger in a stream when using a crossing
- Cattle drinking from the stream are more exposed to waterborne diseases than cattle drinking from cleaner sources

Watering Alternatives

If cattle are completely excluded from the water, an alternative water source may be needed.

- * Pasture pumps or hydraulic rams can bring water to cattle if no stream access is provided. Pumps can be cattle-powered, solar-powered, gas-fueled, or electrically powered





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Taking all the steps necessary to maximize manure value and protect water resources can seem like a formidable task. But assistance is available at every step.

Staff with the agencies listed here can help you sort through the options, discuss nutrient management planning, and provide more detailed publications on all aspects of manure management. Cost-sharing is often available, greatly reducing the cost to the landowner.

Contact your local NRCS office, USDA Service Center, county Land Conservation Department or UWEX office for more information on manure management or conservation assistance.





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