

Cattle Producer's Handbook

Miscellaneous Section

1065

Cow-Calf Management for Water Quality Protection and Odor Control in the Pacific Northwest

*Ron E. Sheffield, Waste Management Engineer
Scott Jensen, Livestock Extension Educator, Canyon County
University of Idaho*

Beef cattle production in the Pacific Northwest is strong because of bountiful natural resources: Water, soil, rangeland and forests, and clean air. Yet competition exists for these resources from other activities such as tourism and rural development. Cattle producers have a vested interest in protecting these natural resources. The challenge exists to find a balance between sustaining the environment and the social well being of all natural resource users. When and where producers place cattle on their land is important when considering the environmental health of the landscape.

The objective of this fact sheet is to recommend best management practices (BMP's) to help beef producers manage cattle to protect water quality. By voluntarily adopting these practices, environmental concerns can be addressed on the farm with the freedom and flexibility not available through regulation.

Beef cattle produce large volumes of manure (Table 1). Good manure management prevents water pollution and improves herd health, forage management, and parasite control.

Maintaining water quality should be a concern for all cattle producers. The key concept to protecting water quality is to prevent manure and manure-contaminated runoff from entering water resources. The environmen-

tally sound management of animals and the manure they generate can protect the quality of water.

Improper management of water resources can result in manure accumulation, soil compaction, and loss of vegetative cover. Such conditions increase the potential for erosion and manure runoff, which reduces water quality by contributing to non-point source pollution.

The goal in pollution prevention is to avoid contaminating ground and surface water with undesirable microbes and excess nutrients. Ecological problems can result if manure and sediments are discharged into the water. Excess nitrogen and phosphorus can encourage excessive aquatic plant growth. When this plant material dies, the resulting decomposition removes oxygen from the water, which can result in the death of desirable fish and other aquatic life. Fish species, such as carp, that can better tolerate the low oxygen conditions often increase in numbers, and desirable species (trout, bass, and crappie) decline.

Animal manure can also be a source of disease-causing organisms. These pathogens can infect humans and animals through contact with a contaminated water source. By implementing the following BMP's, beef cattle producers can work to protect water quality and maintain an environmentally sound operation.

Grazing Management

Manure distribution and disposal are generally not problems for cattle grazing good quality pastures, however, environmental damage and impaired water quality can be the result of overloading soil with manure by overgrazing pastures. Even farms with few animals, if mismanaged, can contribute to the degradation of water quality. Grazing animals can contribute to non-point source pollution through their impact on vegetation.

Table 1. Typical beef manure characteristics.

Animal (wt) (lb)	Nutrient content (lb/day)			
	(lb*)	(N)	(P ₂ O ₅)	(K ₂ O)
500	30	0.17	0.13	0.15
750	45	0.26	0.19	0.22
1,000	60	0.34	0.25	0.30
1,250	75	0.43	0.31	0.38

*Pounds produced per day on a wet or "as excreted" basis.
Source: Adapted from Livestock Waste Facilities Handbook.

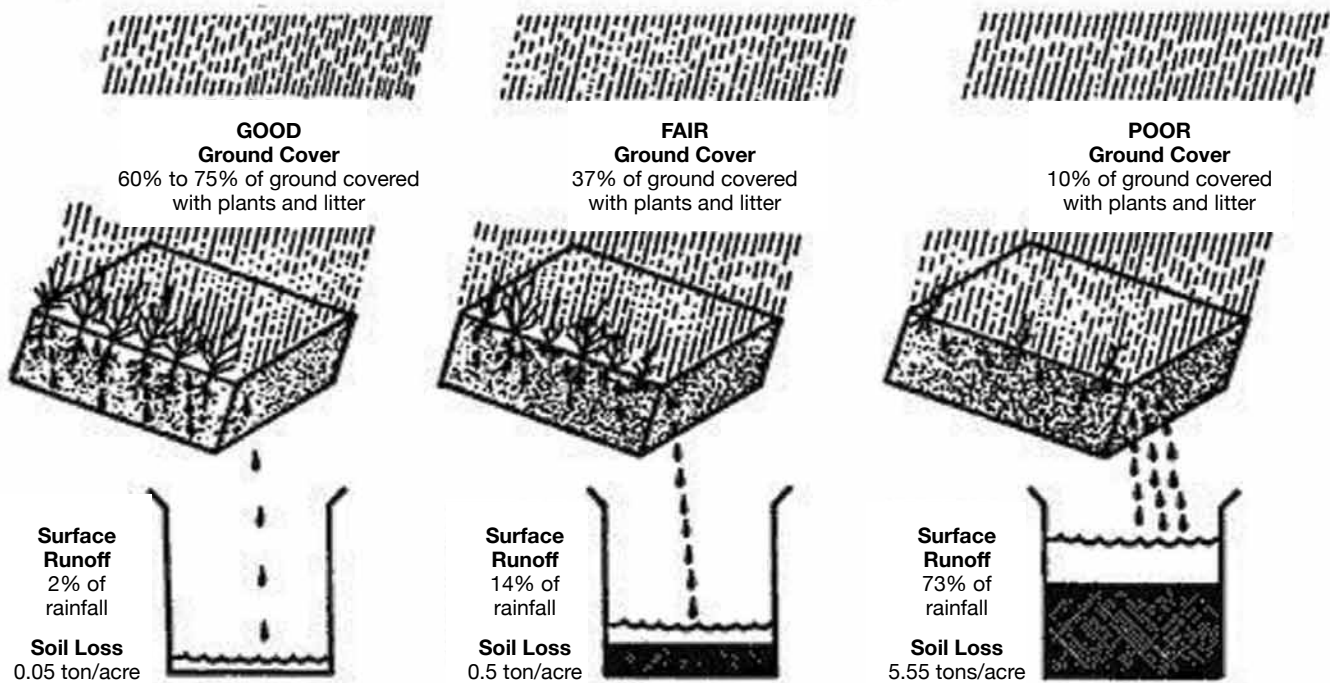


Fig. 1. Soil loss (tons/acre) are shown on an annual basis.

Proper grazing management favors pasture productivity and reduces the potential for soil erosion and manure runoff. Healthy and vigorous plant cover protects and enhances water quality. Good vegetative cover lessens the impact of rain, which dislodges soil particles, thereby reducing the amount of sediment in surface runoff (Fig. 1).

Heavy Use Areas

Heavy use areas are those where livestock tend to congregate. Examples include feeding and watering areas, shade, loafing areas, travel lanes, working facilities, and holding pens. The typical site has little or no vegetative cover and substantial manure accumulation. Emphasizing soil, vegetation, and animal management in these areas can reduce the potential for water quality damage or the generation of flies or odors from collected manure.

Wintering Sites

A wintering site is the area where cattle are fed during the winter months. Wintering sites include feeding areas, shelter areas, and water sources. Manure will build up in the feeding area, resting area, and around the water source. As a result, producers need to take measures to avoid manure contamination of adjacent water bodies.

Wintering sites are important in many areas due to the limited growing season in the Northwest. Herd's often use existing naturally sheltered areas near the farmstead and may include low areas, stream sides, or south-facing slopes protected by trees. The operation may include a specific calving site.

Cattle producers can minimize wintertime manure buildup by encouraging the herd to deposit manure over

a larger area. This is achieved by periodically moving the feeding and bedding locations throughout the winter. If feed, bedding, and water are separated, less manure buildup results at any of the locations. Other feeding methods, such as extending the grazing season with annuals or stock piled forages, swath, chaff, and bale grazing, forces cattle to spend more time over a larger area.

Size of Heavy Use Areas

Heavy use areas are generally characterized by a lack of vegetative cover, compacted soil, and a concentration of manure. Cattle cannot graze these areas because little if any forage is available. Heavy use areas cannot be completely avoided, but producers can minimize the size of the heavy use areas. Travel lanes should be no wider than necessary to provide movement of cattle and equipment from one part of the farm to another. Holding pens and working facilities should be designed to make maximum use of a minimum amount of space.

Location of Heavy Use Areas

The location of a heavy use area can impact management efficiency and water quality. Producers should select sites with higher elevation and slight to moderate slope to promote drainage and reduce the amount of standing water. Uniform slopes are less likely to puddle. The location chosen should not be steep slopes, which increase the chance of nutrient runoff and erosion.

Studies of settling channels (areas designed to allow soil particles to settle out of runoff water) for unpaved feedlot runoff showed an accumulation of about 2 cubic yards of solids per head-year from a lot with a 15 percent slope and 340 feet long. From a 7 percent and shorter slope, the settled solids were only 0.6 cubic yard per

head-year. Berms or grassed waterways may be necessary to direct water away from heavy use areas.

When producers determine the location of heavy use areas, they should avoid environmentally sensitive areas, which include creeks, ponds, wells, sinkholes, or any access to surface or ground water. The purpose of this special emphasis is to protect water quality from manure and sediment runoff.

Cattle should be managed in ways that limit access to ponds, streams, and creeks. Constant action and movement of cattle can cause erosion problems and premature destruction of pond and creek banks. Water quality can be lowered by the increase in sediments due to erosion and the addition of bacteria and nutrients from manure.

Fencing is the most effective management tool for limiting access to these areas. If fencing is not economically feasible, other options include:

- Using water tanks to provide water for cattle away from the stream.
- Providing shade in an environmentally safe area.
- Reviewing the external parasite control program used on the farm. Perhaps fly pressure is driving cattle to the pond for relief.
- Using streamside pastures for hay production instead of grazing.
- Developing a grazing system that allows grazing in streamside pastures during the cool season, which confines cattle to non-streamside pastures during the summer months. Streamside pastures could be used for hay production during the warm season.

Management of Heavy Use Areas

Advantages of a well-maintained heavy use area are reduced amount of mud and standing water in the area, as well as increased animal comfort, health, and safety.

Heavy use areas require routine management or maintenance. Filling in low spots and maintaining a uniform grade help minimize areas of standing water and mud. Concrete, gravel, or gravel over a geotextile mat may be needed to prevent excessively muddy conditions.

In most cases, scraping the area to remove excess manure is not needed. If scraping does become necessary, excess manure collected from these sites can be used as an excellent fertilizer. The nutrient value will vary with the production phase and the ration being fed. It is estimated that 1 ton of manure from beef cattle would provide about the equivalent of 100 pounds of 11-7-10 fertilizer. Laboratory manure analysis is available. Local agents in the Cooperative Extension Office can be a resource for assistance.

To avoid stockpiling or manure storage problems, producers should be sure to land apply excess manure as it is collected. It is recommended to apply at a proper agronomic rate when no rain is in the forecast, or in accordance with a nutrient management plan.

Table 2. Vegetative filter strips.

Slope	Length of flow
(%)	(ft)
0 to 3	30
3 to 8	50
over 8	100
Critical landscape feature	100

Filter Strips

Filter strips are an important tool in nutrient management and are maintained to reduce the nutrient and bacterial content of runoff from the entire farm. Locating vegetative filter strips downslope from heavy use areas helps protect water resources. Quite often, the regular pasture forage found downslope of the heavy use area serves as an effective filter strip. This filter strip vegetation should be well managed, in the same manner as the rest of the pasture vegetation.

Research conducted by several universities demonstrates that, assuming there is adequate vegetative cover, a filter strip's effectiveness is determined by the width and slope of the filter (Table 2). The wider the filter strip, the better the filtering action. A filter strip on a flatter slope will be more effective than on a steeper slope. As the slope increases, so should the width of the filter strip.

Critical landscape features (rock outcroppings, sink holes, boggy areas, etc.) also affect the necessary width of a filter strip. Assistance is available from the Cooperative Extension Service and the Natural Resources Conservation Service (NRCS) for the proper design of filter strips in accordance to a specific land type.

Feeding Areas

Cattle tend to defecate near where they are fed, therefore, management of the feeding area is a major portion of the manure management aspect of a beef program. The point has already been made that the feeding site should be located away from any environmentally sensitive areas. When feeding grain or a mixed ration, producers should use feed bunks or troughs. Permanent bunks or feeding sites may need to be on a concrete or geotextile mat. Producers are advised to move portable feeders as needed so these areas can recover.

Beef producers should also rotate hay feeding areas throughout the feeding season. Portable rings are used to help reduce waste, but they do not totally eliminate lost hay as cattle tend to pull hay out of the ring and tromp it into the ground. Waste can be reduced by limiting the number of cows fed at one time.

Two feet of space is needed for each mature cow to access hay in a ring. This limits the number of cattle that one hay ring can efficiently feed to approximately 15 head. Moving the portable rings on a regular basis to reduce excessively muddy conditions, spreading the manure over a larger area, and minimizing long-term damage to the pasture are important.

After the hay feeding season is over, producers should drag and smooth the feeding areas. A tire drag is an inexpensive and quite effective tool for this job. It does not clog up with debris, but rather breaks clods, spreads cow patties, and helps level rough areas. Spreading the cattle manure smoothes the ground and helps reduce spot grazing.

Watering Systems

When possible, producers should provide cattle water from watering tanks, rather than allowing them ready access to ponds and streams. Animals provided with these alternative water sources spend less time in or near ponds and streams. Water provided in tanks is better for the cattle, which can improve performance, and the chances for manure contamination and stream bank erosion are minimized.

Using freeze-free watering systems to supply water eliminates the increased labor required to break ice in the winter. Proper distribution of watering facilities promotes even grazing and discourages overgrazing near water sources.

Shade

Shade is important to cattle productivity and should be managed properly. Cattle may select natural shade as a loafing area, or producers may provide artificial shade to provide heat relief for their cattle. If cattle use the shade a few hours each day, manure accumulation and loss of vegetation will result.

When shade is portable, producers should move it to new locations on a regular basis to allow for vegetative regrowth. Producers can rotate pastures or use electric fencing to keep cattle from concentrating in one small area if they are loafing under natural shade. This reduces the potential for damage to trees and vegetation.

Confinement Areas

A confined animal feeding operation (CAFO) is classified as any lot or facility where cattle are confined and a significant portion of the vegetation is not maintained during the normal growing season. Due to the high concentration of animals and the absence of vegetation in these facilities, proper manure management is critical to preserve water quality. These facilities should be designed to allow for the collection, storage, and utilization of the manure generated.

Confined operations of more than 1,000 cows or 1,000 heifers will require a permit from the state water quality agency or directly from the EPA. Smaller facilities may also be required to have a permit depending on a state's regulations. Several factors determine if a permit is required, including the number of head at the facility, whether the stockpiled manure is protected from the weather, and the location and topography of the facility.

For details about permit requirements and the permitting process, producers should contact the EPA's

Region-10 Office in Seattle (telephone 206/553-0531), <http://www.epa.gov/region10/>. If a confined operation is in use or is being planned, the local Cooperative Extension Service, state land-grant university, and the NRCS can assist in developing one or more alternative manure management plans.

Managing Odor from Heavy Use Areas

Beef finishing setups using a feedlot and shelter produce a greater quantity of objectionable odors than other housing systems, especially during warm, wet weather. In unpaved lots, concrete sidewalks to feed, water, and shelter help eliminate mud. Rain gutters on the shelter and a concrete splash apron under its open side also help.

Earthen mounds are a low-cost means to keep cattle out of the mud in unpaved lots. About 25 square feet of mound per head are needed. Mounds should be 6 to 8 feet high with a 6-foot-wide rounded top and side slopes pitched at 4 to 1 or 5 to 1.

To help stabilize a mound, lime should be incorporated into its upper half. (Work at least 1 pound of agricultural or barn lime per square foot into the top 4 inches of soil.)

Because wet areas cause odors, a 4 to 8 percent slope is best for unpaved lots. A slope of less than 2 percent should be paved. While paving prevents mud problems, it also requires regular cleaning, especially before rains, to prevent odor and flies. Paving also results in the need to control increased runoff.

Good management practices include cleaning lots, emptying storages when needed, and using proper manure disposal techniques. Planting trees and painting buildings and fences can improve appearance.

Conclusion

The best management practices covered in this fact sheet promote a sound manure management program for cow-calf producers in the Pacific Northwest. By following these practices, cattle producers can improve herd health, forage production, and overall management efficiency while protecting the quality of water and air resources.

- A well-managed grazing system is essential to good cattle manure management. Use stocking rates that do not exceed the pasture's carrying capacity.
- Minimize the size of all heavy use areas.
- Select sites for heavy use areas that have good drainage and minimum slope. Avoid environmentally sensitive areas. Limit cattle access to bodies of water.
- Maintain a vegetative filter strip downslope of all heavy use areas. Maintain proper widths corresponding to the slope of the site.
- Rotate feeding sites to allow recovery from heavy use. Move temporary structures, such as feeders, hay rings, or mineral boxes, on a regular basis.
- Water cattle from tanks when possible.

References

- Boles, J. C., Jr., K. VanDevender, and J. Langston. 1995. Beef cattle management for water quality protection in Arkansas. MP375-6M. Coop. Ext. Ser., Univ. of Arkansas.
- MidWest Plan Service. 1993. Livestock Waste Facilities Handbook, MWPS-18, Iowa State Univ., Ames.
- Schmidt, J. L., and B. F. Wolfley. 1992. Clean water for Washington, protecting groundwater: Managing livestock on small acreage, EB1713, Coop. Ext., Washington State Univ., Pullman.
- Sweeten, J. M. 1991. Cattle feedlot waste management practices for water and air pollution control, B-1671, Texas Ag Ext. Ser., The Texas A&M Univ. System.
- Welch, T. G., R. W. Knight, D. Caudle, A. Garza, and J. M. Sweeten. 1991. Agricultural and silviculture non-point source pollution management, "Grazing Management," L-5041, Texas Ag Ext. Ser., The Texas A&M Univ. System, Texas State Soil and Water Conservation Board.
- West, B. 2001. Cattle wintering sites: Managing for good stewardship. Agdex #420/580-2. Agriculture and Agri-Food Canada: Prairie Farm Rehabilitation Administration.



©2016

Issued in furtherance of cooperative extension work in agriculture and home economics, Acts of May 8 and June 30, 1914, by the Cooperative Extension Systems at the University of Arizona, University of California, Colorado State University, University of Hawaii, University of Idaho, Montana State University, University of Nevada/Reno, New Mexico State University, Oregon State University, Utah State University, Washington State University and University of Wyoming, and the U.S. Department of Agriculture cooperating. The Cooperative Extension System provides equal opportunity in education and employment on the basis of race, color, religion, national origin, gender, age, disability, or status as a Vietnam-era veteran, as required by state and federal laws.

Fourth edition; December 2016 Reprint