ALABAMA A&M AND AUBURN UNIVERSITIES

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Animal Waste Management To Protect Water Quality

Managing Open Lots And Pasture Systems To Minimize NPS Pollution

When animal waste from open lots or pastures is exposed to weather, there is potential for leaching and runoff losses. Barnyard effluent carried by rain and melting snow can be a major source of water pollution in rural watersheds. The contribution that pastured livestock will make to nonpoint source pollution is dependent upon the stocking density, length of grazing period, average manure loading rate, manure spreading uniformity by grazing livestock, disappearance of manure with time, distance of livestock from a water body, and quality and quantity of buffer between water sources and animal production and waste dispersion or distribution areas.

Good management practices for small open feedlots and pasture systems can minimize the potential for nonpoint pollution. The key factor in controlling nonpoint pollution is controlling runoff and leaching. Many of the standard practices for erosion and sediment control will reduce losses of animal waste pollutants to surface water systems.

Feedlots

The magnitude of pollution from feedlots can be several times that of land application sites. Under an open lot system almost 50 percent of the phosphorus and 40 percent of the potassium can be lost to runoff and leaching. Losses of nitrogen are usually in the form of ammonia and nitrates. These losses are especially important if the nutrients are getting to receiving streams through surface runoff.

The criteria for determining if a feedlot is a point source of pollution are established under the National Pollutant Discharge Elimination System (NPDES) permit program of the Clean Water Act (CWA). Point source feedlots must have a permit which stipulates the amounts and conditions under which the lot effluent can be discharged. Small feedlots which are classified as nonpoint sources, however, can also contribute significant amounts of pollutants to surface water and groundwater. Thus, small feedlot operators must also incorporate some type of effluent control or treatment into their waste management system.

Runoff can be either diverted, directed to vegetative filters or over land, or held in settling ponds for treatment and land application.

Clear Water Diversion. A livestock yard runoff control system can divert clear runoff water away from the yard to prevent contact with pollutants and to minimize the volume of polluted water. Diverting clear water reduces the size of the facilities needed to collect and treat livestock yard runoff.

Terraces, diversions, and service road ditches installed on a slope above the livestock yard can intercept and redirect clear water so it does not flow through the livestock yard. Changing the shape of the yard often makes diversion easier. Decreasing the open lot surface area can also reduce runoff water volume.

Gutters and downspouts prevent roof drainage from entering the yard area. Tile lines connected to downspouts can be used to carry roof water under the yard. More roofed area can be provided if necessary.

Relocation of manure piles away from gutter downspouts and concentrated flow areas, where water flows naturally following a rainstorm, will prevent runoff of nutrients, organic materials, and bacterial contaminants into nearby streams.

Filter Or Vegetative Strip. Filter strips are very effective in treating animal waste runoff in most regions of the United States. Filter strips can reduce the nitrogen, phosphorus, and organic matter in animal waste runoff by as much as 77 percent, 94 percent, and 96 percent, respectively.

Vegetative filters may be areas such as pastures, grassed waterways, or even cropland, which intercept and slow runoff water following a rainstorm. Vegetative filters are useful for treating feedlot runoff and dairy parlor wastes.

These filters may have either channelized or overland flow. Channelized flow systems such as graded terrace channels or grassed waterways concentrate the flow to a relatively narrow channel. Overland flow systems allow flow of uniform depth over the disposal area.

Overland flow systems appear to be more effective than channelized flow systems for removal of pollutants from runoff. Because of the concentrated flow that occurs in channelized systems, vegetative kill sometimes results, or the vegetation may be overtopped, limiting the effectiveness of this system.

Effectiveness of both systems can be limited by daily heavy loadings. Where loadings of this nature are anticipated, a second filter area for periodic system recovery and drying is recommended. Settling basins can also reduce the amount of solids in the effluent, thus reducing the amount of vegetative kill.

The type of filter treatment system chosen and the degree of treatment achieved will depend on soil type and texture, size of the treatment area, frequency of treatment, consistency and rate of discharged effluent, and time of year.

Settling Ponds. Settling basins receive runoff from open lots and allow solids to settle and liquids to drain to storage or disposal areas. Settling basins will remove as much as 85 percent of the manure solids.

Settling basins should be large enough to store the solids that will settle out during a month. They should be able to detain runoff for at least 30 minutes so that solids can settle. The most effective basins are large and shallow, preferably less than 3 feet deep. Concrete bottoms allow equipment to be used to remove solids.

Detention ponds store livestock yard runoff until it can be safely applied to the land. A detention pond 100 feet square and 12 feet deep with 2:1 side slopes will usually store the runoff from an unpaved dairy lot containing eighty animals for about 8 months. Extension agricultural engineers or engineers with the Soil Conservation Service can assist in design of appropriate facilities to meet specific local requirements.

A waste storage pond or lagoon will reduce bacteria and nutrient pollution of nearby waterways by trapping bacteria, nutrients, and sediment. For proper management, it should be pumped periodically.

Pumps should have the capacity to empty the pond in 10 days (preferably within 2 to 3 days in the Southeast). Whenever the accumulated volume of stored runoff is more than can be disposed of during a day, the pond should be emptied. During the summer when weather and soil conditions permit, accumulated effluent can be land-applied through irrigation systems. Nutrient levels should be matched to soil conditions and crop needs. More information on matching nutrient levels with soil conditions and crop needs is included in another article in the water quality series. Your local soil and water conservation district may be able to assist in locating the appropriate machinery and irrigation equipment.

Pasture Systems

Rangeland management should include restriction of pastured animals from water sources including streams, lakes, and other impoundments. Rotational grazing and stocking rates should be maintained at levels to prevent grass cover reduction. Requirements will be variable depending on site conditions and type of vegetation. Forage specialists can provide this information.

Stocking Rates And Overgrazing. Most of the pollution associated with livestock on pasture or rangeland results from overgrazing. As livestock overgraze an area, grass cover is reduced and soil erosion occurs, resulting in the loss of sediment-bound nutrients. Lack of a grass cover increases runoff and decreases the effectiveness of vegetative filtering, thus allowing more animal waste pollutants to reach receiving bodies of water.

For pasture management to maintain water quality, a grass cover should be maintained to prevent soil erosion and restrict runoff volumes. Stocking rates should be such that the pasture or rangeland is not converted from a grazing area to a holding area.

Restriction Of Animals. Other than causing direct pollution, animals destabilize streambanks making them more susceptible to erosion. They also open areas for direct discharge to streams by destroying riparian (stream-side) vegetation that normally absorbs nutrients and traps pollutants before they can enter the stream.

Animals should be restricted from critical areas such as highly erodible areas, streams, or ponds. Pasture feeding areas should be as far removed from water courses as possible and should be periodically rotated in order to allow the denuded areas around the feed bunk to recover. Salt licks, artificial waterers, and shade should also be located away from water courses.

Artificial watering systems can be designed and built to supply water from streams or ponds without animals having direct access to the water. (For more information, check with the USDA Soil Conservation Service.) Fencing will prevent farm animals from entering streams and eliminate any bacterial contamination threat through direct waste contamination of a waterway.

Animal Management In Alabama

In a survey conducted by Auburn University's Department of Agricultural Economics and Rural Sociology, farmers in Blount and Cullman counties were asked how they confine and water their animals.

Poultry were mainly kept in buildings. About 80 percent of the poultry growers used public systems as water sources for their livestock.

Large animals were confined in pastures or open lots. Springs, streams, and rivers were cited as water sources by many large animal producers. About 65 percent reported that animals had access to a stream on at least an occasional basis. The proximity of animal herds to surface water can be a source of pollution if wastes are not managed properly.

References

Humenik, Frank J., DeAnne D. Johnson, Jonathan M. Greglow, Steven A. Dressing, Richard P. Maas, Fred A. Koehler, Lee Christensen, William Snyder, James W. Meek, and Fred N. Swader. 1982. Best Management Practices For Agricultural Nonpoint Source Control: I Animal Waste. North Carolina Cooperative Extension Service. Biological and Agricultural Engineering Department. North Carolina State University. Raleigh, NC.

Massie, L. R. 1980. Livestock Yard Runoff Control Systems. A3077. Wisconsin Cooperative Extension Service. University of Wisconsin. Madison, WI.

Molnar, Joseph, and Litchi S. Wu. 1989. Environmental Consequences Of Animal Waste Disposal: Farm Operator Perspectives And Practices. Circular 297. Alabama Agricultural Experiment Station. Auburn University. Auburn, AL.

Rouse, Gene, S. W. Melvin, and J. Clayton Herman. 1980. Animal Agriculture And Water Quality. Pm-901i. Iowa Cooperative Extension Service. Iowa State University. Ames, IA.

Shelton, Theodore, and Michael T. Olohan. 1987. Best Management Practices For Soil Conservation And Animal Waste Control. FS192. New Jersey Cooperative Extension Service. Cook College. New Brunswick, NJ.

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For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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