TERRENE INSTITUTE
Publications Division
Washington, DC

EPA
U.S. Environmental Protection Agency, Region 6
Water Management Division, Water Quality Management Branch
Dallas, TX

February 1994

Pollution Control for Horse Stables and Backyard Livestock

As more people move to suburban communities and begin to keep horses or other large animals on their property, pollution control for livestock waste is an increasing concern. Owners of only a few acres often find handling and disposing of animal manure and bedding difficult. Locating a community of small landowners with livestock near a more urban development whose owners and users are less tolerant of the odors and flies associated with even the most meticulous facility is also becoming common. Keeping peace with one's neighbors is certainly an important reason to manage backyard manure properly, but environmental and health reasons are also important.

Whenever large animals are stabled on small pieces of property, their wastes are concentrated. Animal wastes contain nutrients—nitrogen and phosphorus—as well as bacteria or other pathogens. With each rain, these wastes can wash off the land and into the nearest creek, stream, lake, pond, or wet area. The wastes travel by overland flow or through storm sewers that are not routed through a wastewater treatment plant. In the water, phosphorus and nitrogen fertilize aquatic plants and weeds. As the plants and weeds proliferate and decay, the dissolved oxygen that fish need to survive is depleted. The bacteria and other pathogens associated with animal waste can make the water unfit for drinking without treatment. They can also make the water unsafe for human contact and recreational sports such as fishing, swimming, or skiing.

These pollutants can also contaminate groundwater supplies, especially if shallow or improperly cased wells are downslope from the animals or their waste. High nitrates, a form of nitrogen, in drinking water are especially dangerous to babies, and bacteria is harmful to everyone. Many of the same communities that allow backyard livestock also get their drinking water from private on-site wells or small water systems. Public water systems that serve 25 or more people must be periodically tested, but individual well-owners are often not regulated.

Confining large animals to small lots

presents another environmental concern for backyard livestock owners. Regardless of the amount of supplemental feed provided, large animals will continue grazing until all palatable vegetation is gone. On especially small lots (one or two acres), the animals that are allowed free and continuous access to vegetation quickly graze-out and trample pasture grasses and forbs. These areas are then replaced by noxious weeds and brush, and even these less palatable species can be trampled into oblivion. The resulting bare ground is more subject to erosion from wind and water, and the sediment and contaminants from these lots can enter waterbodies and interfere with fish and wildlife habitat.

Management Techniques

Owners or managers of backyard livestock facilities have limited options to control animal waste because their operations are small. An animal waste management system designed to protect water quality generally consists of these components:

- correct siting and design of facility;
- collection, storage, and disposal or use of the waste;
- pasture management; and
- exercise or barn lot management.

While different types of livestock produce different quantities and chemical compositions of waste, managers of a limited number of horses, cattle, swine, poultry, goats, or donkeys can generally follow similar guidelines.

Siting and Design

One of the best methods to prevent pollution from backyard livestock is to site barns, corrals, paddocks or lots, and pasture fences properly. A good rule is to keep as much filtering vegetation as possible between animals or animal wastes and any waterbody. Siting barns and other high-use areas on the portion of the property that drains away from the nearest water is also beneficial. Never site high-use areas adjacent to creeks, streams, or wet areas because pollution is difficult to control from these areas. Disease prevention and pest control are also more difficult when high-use areas are located too close to water.

Properly placing barns, paddocks, pasture fences, and water supplies on the property is a simple way to prevent pollution. Drainage, confinement, and fences are important factors to include in the design and placement of these facilities as illustrated in Figure 1.

Drainage must be adequate to keep animals dry and disease free. Runoff should not be allowed to discharge directly into a stream, creek, or other waterbody. Placing a diversion terrace above a high-use area may prevent outside runoff from flowing across the bare or manure-containing paddock and storage areas. A diversion placed below the high-use area will help direct runoff from the lot away from water or wet areas. The terraces must outlet to an area with well-established vegetation that is sufficiently large to filter the flow. Sometimes a vegetated berm, placed around the three upslope sides of the paddock, works as well as a diversion (see p. 5, Lot or Paddock Care).

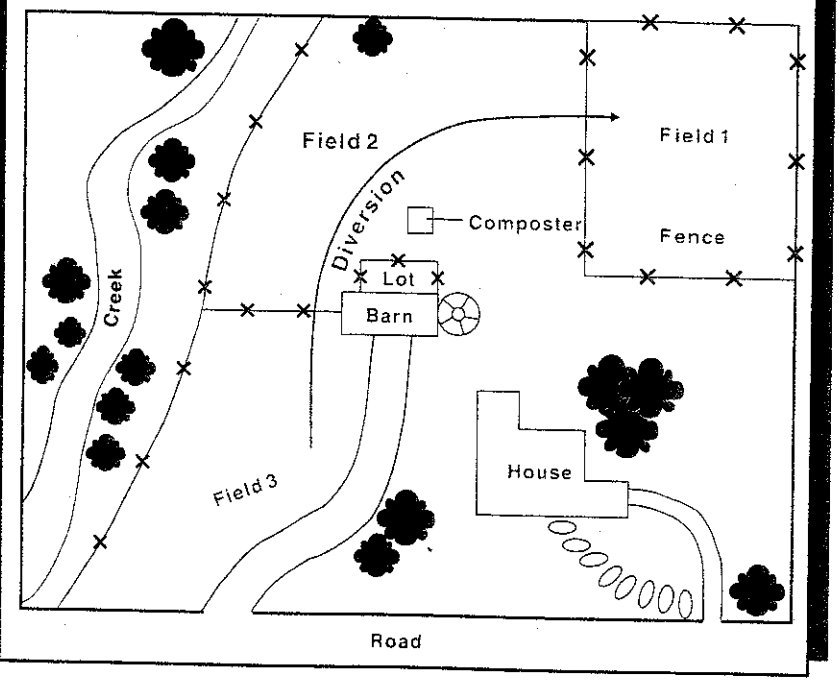
A properly fenced area that confines the animals most of the day and night is essential to protect the pastures, grasses, and forbs on small properties. Horses need adequate exercise to stay healthy, and they can be let out daily for limited periods to exercise and graze. If they are allowed free and continuous access, horses will degrade the pastures.

A small property grazed by livestock needs two pastures or lot areas divided by a sturdy, safe fence. Pastures should not contain a creek or other waterbody. Allowing livestock access to the creek will break down the streambank and deposit waste directly into the water.

Collection and Storage

Collect manure and soiled bedding daily from stalls and paddocks and place in temporary or long-term storage. Expensive collection equipment and storage facilities are not required. Collection may be with a fork, manure shovel and wheelbarrow, or a small tractor, depending on the size of the barn and paddock and the number of livestock.

Figure 1.—Properly designed backyard livestock facility.



Protect the storage facility from rainfall and surface runoff so that the runoff does not carry pollutants to the nearest waterbody. Storage units should be designed to hold a certain amount of waste for a specific period. Regardless of the storage facility chosen, it should be sturdy and resistant to insects, rodents, and other disease-carrying creatures. Effective storage units include

- plastic garbage cans with lids,
- fly-tight wooden or concrete storage sheds,
- pits or level trenches lined with an impermeable layer and covered,
- composters, and
- outdoor storage of manure in piles on top of, and covered with, dark plastic.

Average manure production rates for various livestock can be used to estimate the size of storage units. As a rule, values from Table 1 may be used.

Table 1.—Average waste production rates per day for livestock.

LIVESTOCK	MANURE PRODUCED	BEDDING USED (APPROXIMATIONS)
Horse	0.7 cu. ft./1,000 lbs bodyweight	3-5 gal shavings 1-3 gal sand
Cattle	1.1 cu.ft./1,000 lbs bodyweight	3-6 gal sand
Sheep	0.65 cu. ft./1,000 lbs live weight	1 gal sand
Swine	0.5 cu. ft./1,000 lbs bodyweight	1-4 gal sand 2-6 gal straw
Goat	0.6 cu. ft./1,000 lbs live weight	1 gal sand

Source: Midwest Plan Service

Disposal and Use

The disposal or use method for manure and other waste should be part of the solution, not part of the problem. Ensure that the selected method does not merely transfer the waste from one part of the property to another. Instead, allow the safe and efficient treatment, containment, or uptake of the nutrients, bacteria, and sediment associated with backyard livestock production.

■ **Pasture and cropland fertilization.** Manure or manure and bedding can be spread on pasture or cropland as fertilizer. Soil nutrient levels should be measured before adding the material to determine an application rate that will protect water quality and provide efficient nutrient uptake. The nutrient content of the manure will vary depending on the types of livestock and the feed ratio. Horse manure averages 0.6 percent nitrogen and 0.1 percent phosphorous. It is generally dry and easy to handle.

Apply horse manure or compost to pastures at least two to three weeks before they will be grazed by horses. The application of raw horse manure to land that is being grazed may spread

internal parasites. In some cases, properly composted material may be used. Even with composted material, many horses will not graze pastures with freshly applied material, so the flexibility of a two or more pasture system is essential (see rotational grazing). As with any fertilizer, do not apply the material during or just before rainstorms or to frozen ground. Many suburban lots do not have enough land to properly dispose of their animal waste. An agreement with neighbors to apply the waste to their farms or pastureland may be needed.

■ **Lawn fertilization.** Lawns can be fertilized with raw manure, although composted material is preferred because it is easy to handle and has less odor. As with pasture fertilization, a soil test should be used to set application rates. On lawns that require high maintenance and many nutrients, manure is not likely to meet the nitrogen requirement without exceeding the recommended phosphorus rate. Therefore, some lawns will need an additional application of plain commercial nitrogen fertilizer.

■ **Mushrooms.** Some commercial mushroom growers use composted horse manure as a growing media. These operations need a reliable source and adequate quantities of the material. A single suburban owner with two or three horses would not provide enough material. A group of horse owners, however, might form a cooperative to contract with local mushroom growers for delivery dates and amounts.

■ **Nursery and greenhouse use.** Some containerized nurseries and greenhouses use composted horse manure and bedding as potting material. Nurseries must sterilize the material to eliminate any disease-causing organisms; thus, the price received for the material will likely be low. This option might better be viewed as an environmentally protective disposal and reuse method rather than as a profit generator.

■ **Gardens.** Composted manure is especially valuable as a soil amendment for gardens. It can be incorporated into the garden before spring and fall plantings and to the garden surface at other times during the growing season. Compost improves soil aeration, provides food for beneficial earthworms, increases water infiltration, improves soil tilth and fertility, and over time can even improve soil structure. Composted manure can be used in home gardens, landscape planting beds, commercial truck farms, community gardens, botanical parks, or anywhere the soil would benefit from increased organic matter. As with any soil amendment, proper incorporation and timing are important to prevent runoff and water contamination.

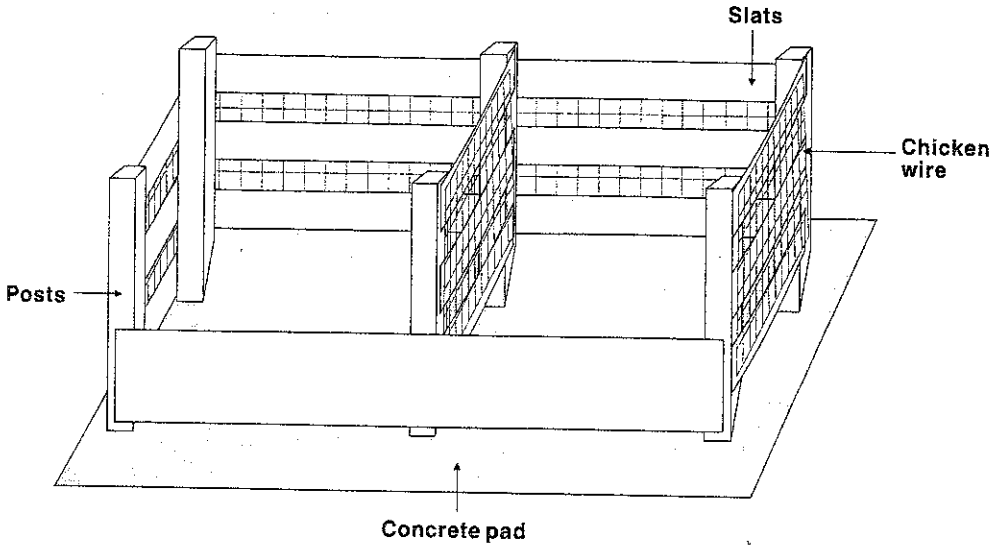
Composting

Composting is a natural process that reduces the bulk, odors, and bacteria in raw manure. While composting results in a product that is easy to handle and transport, it is not a disposal method. Compared to commercial fertilizer, compost nutrient value is low. Thus, it is primarily used as a soil amendment or as supplemental nutrition for plants. Composted material can still be a source of water pollution and, therefore, requires proper storage and protection from rainfall or runoff. Composting is simple and inexpensive.

Detailed guidance on composting is available from books, government publications, and local agricultural agents. Several commercial composting bins are available at discount stores and lawn and garden centers. The local Cooperative Extension Service agent can also provide plans and specifications for homeowners and managers who prefer to build their own compost bins. Composting may also be done by piling materials on a plastic cover that protects the ground. A containment area made of pressure treated lumber is also recommended. A two-bin system is ideal for composting, since once the process begins, no new manure should be added. The second bin can be used as storage for new manure. Piles or bins should be at least 3 feet square and 3 feet deep to maintain the proper composting temperature of at least 160 degrees Fahrenheit.

Mixtures of litter—manure, urine, bedding (shavings, straw, etc.) or other bulking material such as dry leaves, grass clippings, or sawdust—should be combined in the bin. Maintain moisture levels of approximately 50 percent, and aerate the pile by turning it every other day. A batch of compost is completed in about two to six weeks, depending on the season. Bins that are covered and turned correctly and that maintain the proper high temperature are not attractive to insects or rodents. Ammonia odors, large numbers of flies, or small rodents are signs that the composter is not working properly. Figure 2 is an example of a two-bin composter.

Figure 2.—Two-bin composter.



Lot or Paddock Care

To ensure that animal waste deposited in paddocks and stalls will not cause a water quality problem is as simple as frequent and periodic removal of waste and storage in a protected location. Paddock stabilizing and management practices help to prevent erosion and sediment movement from a normally bare area. A vegetative border, diversion terrace, or berm may also help pollution control.

Filter strips and borders of closely spaced perennial grass plants trap sediment moving from the paddock or lot. These areas must be protected from grazing to maintain vegetation height and density. Planting the borders outside the paddock fence, far enough away so that the horse cannot nibble them, is important. Runoff should flow across the border as a shallow sheet.

A diversion terrace that hinders the flow of runoff across the lot also protects the paddock. A different diversion can be used to direct runoff originating in the paddock or lot to a well-vegetated area for further filtering. In this case, a level spreader is required to ensure the flow is not concentrated; if it is, the filter strip is not effective.

Berms may be helpful if vegetated and placed on the upslope perimeter of the paddock. Take special care, though, not to turn the paddock into a pond. A well drained, dry lot is essential to maintaining equine health.

Pasture Care

Pastures and fields in poor condition are a common sight in semirural or suburban areas with backyard livestock. Attempting to graze large animals, especially horses, on small pastures usually results in overuse of pasture grasses and invasion by noxious weeds. Because horses have both upper and lower incisor teeth, they are particularly damaging to grasses when they exceed the areas' recommended stocking rate—the number of animals per acre that can safely graze in a particular climate and grass area. Horses can nip plants at ground level and easily pull plants and their roots from the soil.

Backyard livestock cannot be allowed continuous access to pasture if the number of animals per acre exceeds the recommended stocking rate. Confining animals to lots and pens and providing proper pasture care and use are essential to maintain a steady supply of grass and a noneroding pasture. Local conservation district officials, the U.S. Department of Agriculture Soil Conservation Service offices, and Cooperative Extension Service offices can provide assistance and guidance to private individuals and horse

stable operators on proper stocking rates for local pastures.

Interseeding and rotational grazing are especially effective in maintaining pasture health and vigor. In areas with sufficient moisture, grasses with different growing requirements—such as season of growth or nutrient uptake rate—can be interseeded in existing pastures. This practice provides two benefits—an extended season of use and additional nutrient uptake for pollution control. A warm season pasture, such as coastal bermuda grass, can be overseeded with an annual cool season grass, such as rye, to extend the time livestock have access to green, growing grass. The cool season annual is also effective in using nutrients from compost applied to the land when the warm season grass is no longer absorbing these potential pollutants.

Rotational grazing divides pasture or range land into smaller pastures or units and moves livestock from one area to another before grass supplies become stressed. Many suburban horse owners do not have enough pasture land to graze the area continuously, even with rotational grazing practices. When horses or other livestock are allowed pasture access for only brief periods, grass plants are more uniformly grazed and livestock are assured fresh growing grass.

Where to Get Help

Contact the following list of agencies or groups to help you answer additional questions on pollution control for horse stables.

- Your local Cooperative Extension Service offices (The 4-H youth horse program has excellent materials applicable to all ages)
- Your local Soil and Water Conservation District offices
- Your local U.S. Department of Agriculture Soil Conservation Service offices
- Breed associations often have written materials and technical information available to members and nonmembers
- Many local high schools have a vocational agriculture department that often maintains textbooks and files on various production and agribusiness practices and opportunities
- Your local library has a number of books on horse and pasture care

TERRENE INSTITUTE

This project was produced by the Terrene Institute under a cooperative agreement with the U.S. Environmental Protection Agency, Region 6, Water Management Division, Water Quality Management Branch. Prepared by Susan V. Alexander and the Terrene Institute staff. For copies of this publication and others in the series, contact the Terrene Institute, 1717 K Street, NW, Suite 801, Washington, DC 20006, (202) 833-8317, or the U.S. Environmental Protection Agency, Region 6, 1445 Ross Avenue, Dallas, TX 75202, (214) 655-7140.