

Land Application of Horse Manure

Fact Sheet

Equine Facilities Assistance Program

June 2003

*Horse and stable owners have become increasingly aware of the need to manage wastes generated from horses so as not to negatively impact water quality and the environment they cherish for equestrian activities. Implementing appropriate management practices for the handling and treatment of waste materials can minimize environmental problems from horsekeeping. Managing manure is a major environmental focus for all horse facilities. Methods and practices for the collection, handling, storage and composting of horse manure are covered in other fact sheets in this series and in the manual, *Horse Keeping: A Guide to Land Management for Clean Water*. The focus of this Fact Sheet is the land application of horse manure. As Thornton Wilder once said: "Money is a lot like manure, it doesn't do any good unless you spread it around" to which a conservationist added: "and it doesn't do any good unless you spread it correctly!" ☀*

Basic Considerations

*P*oorly managed manure poses a potential threat to water quality due to nutrients (nitrogen, ammonia, phosphorus, etc), coliform bacteria, organic matter, and other pollutants such as sprays, soaps, wormers and other horse care products that may end up in runoff from a horse facility or in its manure waste pile. A common method of manure disposal is to spread the waste on a pasture, hay field, commercial crop, garden or other land. There are many benefits of re-using horse manure including the recycling of nutrients back into the soil for use by native grasses or a commercial crop, increased productivity while reducing fertilizer costs, soil

enhancement, regulatory compliance, potential reduction of disposal of waste at landfills, and a safe method of disposal that is in harmony with environmental stewardship ethics. Land application practices can apply to both the small (1-2 horse) owner and to very large stables. Manure application can occur daily using fresh manure, or seasonally using stored manure or composted manure. Methods of application may range from a wheelbarrow and shovel to a commercial applicator hooked to a tractor. A number of other factors must also be considered prior to land application of manure as part of conservation planning: regulatory restrictions, soil, nutrient con-

tent of manure, and crop type or land use.☀

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The Importance of Regulations

*M*ost counties now have rules, ordinances or conditional use permit requirements that address confinement of large animals, such as horses. These ordinances may contain specifications on manure management including frequency of collection, storage requirements, management,

composting, spreading, disposal, and control of flies and odors. Land application may be restricted to aged or composted manure and limited as to the amount of manure per acre, which can be spread. Runoff into and out of manure storage and composting areas and proximity to streams may

also need to be addressed. Most ordinances will require some type of manure management plan and/or performance criteria tied to a facility plan. Contact your local city or county planning department prior to applying manure onto your land.☀

Manure Management Plans

A plan to manage and utilize wastes on the ranch or farm is often a local requirement. Even if it is not, consider doing so for the environmental benefits. Often it can be incorporated as part of an overall conservation plan for your land. Typical components of such a manure management and utilization plan include:

- The quantity of manure being produced annually at the facility
- Manure collection methods and type, size and location of storage/composting facilities
- Nutrient analysis of the manure prior to application
- Soils analysis for lands on

which manure will be applied

- Crop and/or pasture production goals
- Manure application methods, costs, location and time of application
- Recommended application rates



Landscape use.

- Monitoring and record keeping

Technical assistance for developing a manure management plan may be obtained from your local Resource Conservation District (RCD), Natural Resources Conservation Service (NRCS) or County Cooperative Extension office (UCCE). ☼



Planning for Manure Application

Quantity of Manure

A 1,000 pound horse can produce approximately 0.75 cubic feet per day of manure. Bedding will add to this daily quantity of waste. There is significant variation in the amount of bedding used in stalls, as well as whether the bedding is lightly or heavily saturated with manure and urine. Use of certain types of bedding, such as pelleted wood, can significantly reduce the volume of waste material that must be disposed of or utilized. Different types of bedding materials break down during storage and composting at different rates. ☼

Collection and Storage

See the Equine Manure Storage Fact Sheet for an in depth discussion of this topic. Also, review local regulations

that may dictate frequency of waste collection and general specifications for storage facilities, such as an impervious base or floor and runoff/leachate management. Sufficient space in the storage facility must be provided to contain the manure until it is to be applied to the land. Manure is not typically spread during the wet winter months when soils are saturated. ☼

Nutrient Analysis

Stockpiled manure that is to be applied to a field should be analyzed for available nutrients including total nitrogen (N), phosphorus (P), and potassium (K), and moisture content. The analysis should be conducted as close as possible to the time of application. Nutrient analysis coupled with the soil analysis in the

field and type of crop to be raised (including pasture grasses for grazing by horses or cattle) will help determine application rates and volume of manure required. Different types of manure should be analyzed individually, such as composted manure, "aged" manure that has been stored but not composted, and raw, fresh manure. Also, the type of bedding used and the ratio of manure to bedding can have a significant affect on how well and how fast the material will break down while it is being stored and after it is applied. For further detail, see the Manure Composting Fact Sheet and the Manure Application Details Fact Sheet that are listed in the reference section of this fact sheet. Nutrient analysis will require use of a qualified laboratory and technical assistance from your local NRCS office or Farm Advisor. ☼

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Soils Analysis

Just as it is important to know the nutrient content of your manure, so is it important to understand the soils to which the manure is to be applied. Analysis of soils includes pH, N, P, and K, and may include additional tests for certain cations and salts (sodium, magnesium, calcium, iron and sul-



Finished compost.

fate). The testing of N is optional, since N is so mobile and levels can change rapidly. Soils can be tested every three years for P and K to monitor levels and trends. Soil testing provides information needed to determine the amount of additional nutrients optimally required for specific crop production. Testing provides the information necessary to manage soil in order to overcome limitations that can reduce nutrient availability to plants and crop productivity. If excess nutrients are leached from the soil into groundwater or surface water runoff, water quality can be impacted. Once again, the equestrian is advised to contact your RCD, NRCS or UCCE Farm Advisor for technical assistance and discussion of crop production goals and manure application planning and methods. ☀

Costs and Time of Application

For an equestrian owning one or two horses, manure can be removed from stalls daily and placed in a set of bins for composting or aging, and then dug into a vegetable or flower garden before planting. For the larger stable owner, some economies of scale must be considered. These may include having sufficient manure stored to warrant the cost of time and labor of land application, the time of year or season in which it is best to use the manure, the readiness of the land to accept the manure (crop planted and ready to take up nutrients), the readiness of the manure if it is being composted, and the availability of appropriate equipment (and trained, available labor) to apply the manure to the land. ☀

Appropriate Areas for Manure Application

Areas to receive manure on a property, such as pastures, fields and orchards/vineyards should be delineated on a map; typically, this is done as part of a conservation and/or manure management plan. Manure should not be applied near seasonal drainages, streams, well heads, wetlands, ponds, lakes, springs or on steep slopes. The thickness of the layer of manure applied to each field should be adjusted as necessary to reduce the possibility that the amount exceeds crop requirements or that material will be washed downhill into water bodies. Fields can vary greatly in slope, soil characteristics, amount of plant material to be fertilized and proximity to water bodies.

Each area that manure is applied to should be assessed individually as needed to maximize crop and plant health and to protect water quality. Incorporating manure is recommended to reduce risk of runoff and assure that N is not lost to the atmosphere. Amounts applied should be measured and approximately coincide with plant P or N needed, depending on the site. ☀

Recommended Application Rate

The amount of manure to apply should be estimated in advance by comparing the nutrients needed for the estimated yield to the nutrient content of the manure. Some provision for estimating the application rate is needed, such as the weight of a pickup load, or other application equipment used. Use the amount of manure per load, the amount of nutrient per unit of manure, the area receiving manure, and the nutrient requirement of the plants to estimate the number of loads to apply to a given area. ☀



Mulch uses.

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Monitoring and Record Keeping

Records should be kept for all farm and ranch operations. The amount of manure produced annually, the amount of storage capacity, tracking of where the stored or composted manure ends up, application times and rates by field, and crop production yields, are all important to management as well as regulatory compliance. Be sure to go out during or just after the first storm following application and look at (and photograph) the areas where manure was applied to see that no material has washed into drainages or other water bodies. Photographing the crop growth later in the same areas may help justify the usefulness of the manure application process. Photo documentation is one popular method of keeping track of your manure

management. Be sure to label photographs as to when the photo was taken and where. For more details on photo monitoring see the fact sheet listed in the references list below. ☀

Economics of Land Application of Manure

Manure should be viewed as an economic resource. The proper use and management of manure is an opportunity to improve crop or pasture production, contribute to operational efficiency, and reduce use of commercial fertilizers while complying with environmental regulations and helping protect the environment. Production of a crop such as hay or silage, or improving a stand of forage grasses in a pasture, using the manure may result in an economic savings in terms of the amount of money spent an-

nually on horse feeds. Manure also has an economic value in terms of fertilizer. Using estimations derived from a 1,000 pound horse generating 0.75 cubic feet of manure daily, the hypothetical amount of total-nitrogen produced can range from 100-110 pounds annually, phosphorus 30-34 pounds, and potassium 90-95 pounds annually. This equates to a value estimated at approximately \$50 annually. Of course



Application of compost on site.

References Cited/ Further Reading

- *Manure Application Details, fact sheet by Dennis Salisbury, 2003*

Fact sheets produced by the Council of Bay Area RCDs and available from your local RCD office:

- *An Overall Guide to Land Application of Horse Manure, report by Dennis Salisbury.*
- *Equine Manure Storage Fact Sheet.*
- *Equine Facility Site Assessment Checklist, San Mateo County RCD.*
- *Composting Horse Manure, CBARCD, June, 2000.*
- *Horse Manure Management CBARCD, June, 2000.*
- *Portable Backyard Garden, CBARCD, March, 1999.*
- *Photographic Monitoring, CBARCD, June, 2000.*
- *Manure Application Details, by Dennis Salisbury, 2003.*

Horse Keeping: A Guide to Land Management for Clean Water, Council of Bay Area RCDs, 2002
Backyard Ranches for Malibu Creek Watershed, Topanga-Las Virgenes RCD
Small Ranch Manual, University of Nevada Cooperative Extension

- **RCD Websites:**
 - 1) *Marin RCD and Southern Sonoma RCD - www.sonomamarinrkd.org*
 - 2) *Alameda RCD - www.baysavers.org*
 - 3) *San Mateo RCD - www.sanmateorcd.org ☀*

The "Equine Facilities Assistance Program" is a grant funded project of the Council of Bay Area Resource Conservation Districts, and the Alameda, Marin, San Mateo and Southern Sonoma RCD's. The manure management fact sheet series was produced with the assistance of the USDA Natural Resources Conservation Service (NRCS).

Funding for this project has been provided to the council of Bay Area RCD's in part by the U.S. Environmental Protection Agency (USEPA) pursuant to Assistance Agreement No. C9-989697-00-0 and any amendments thereto which has been awarded to the State Water Resources Control Board (SWRCB) for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the USEPA or the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.