

Composting Horse Manure

What is compost?

Nature continually recycles organic materials: grasses, leaves, branches, bark, and dead animals. Microbes and fungi decompose organic materials into an earthy smelling material we call compost. Since ancient times, humans have learned how to manage and speed up the process of composting. The simple steps required to compost horse manure aid in the disposal of waste and produce a useful product.

Why compost?

Caring for your horses can require a considerable amount of time, energy and expense managing manure and soiled bedding. By composting horse waste you can realize the following benefits.

- ✓ Composting manure decreases the volume of waste by over 50%. For a horse owner with limited space this benefit can be very important.
- ✓ Composting reduces the amount of waste going to landfills.
- ✓ Composted manure is easier to handle than rotted manure.
- ✓ Composting reduces the possibility of parasite transmission between horses. The heat generated during composting kills both worm larvae and weed seeds.
- ✓ Composting reduces fly problems by eliminating breeding ground.
- ✓ Compost is a great soil conditioner, adding organic matter that improves soil structure, drainage, and water retention.
- ✓ Compost provides nutrients to fertilize plant growth.
- ✓ Composting lowers the risk of contaminating surface and ground water.
- ✓ Composting reduces odors.
- ✓ Composting makes your property more "desirable," especially to your neighbors.

Non-point source pollution consists of the diffuse discharge of pollutants that can occur over an extensive area. As water from rainfall, snowmelt, or human activity moves over and through the ground it picks up and transports natural and manmade pollutants, eventually depositing them into surface and ground water.

Water quality: a neutral term that relates to water's chemical, biological and physical characteristics. The quality of water often determines its specific use or its ability to support various beneficial uses.

Where to compost

Choose a site close to the source of manure with easy access. However, other factors in selecting the optimum site include:

- ✓ **Soil permeability and drainage** — Locate the compost pile on compacted soil or an impervious surface to lessen the seepage of nutrients and salts into the ground. Composting on top of a concrete pad may help in less desirable locations. Some people like to use a concrete pad to keep the area neater. The soil surrounding the pile should provide moderate drainage and should not be compacted from high traffic or pool up during wet weather. A slight slope of 2-4% will help drain water away from the compost area.
- ✓ **Topography** — Avoid locations near steep slopes or on highly erodible soils. Keep the composting site away from natural drainage areas and wells. The goal is to keep clean water clean and prevent contaminated water from the compost area from entering waterways. Runoff from a compost area may be high in nutrients and adversely affect aquatic life. If you are limited in site selection and a less desirable location is your only option, you may have to consider constructing diversions for capturing runoff from and/or diverting drainage around the compost area.
- ✓ **Regulations and advice** — Your local public health department, planning department and the Regional Water Quality Control Board can provide information on any regulations regarding set-back distances from waterways. Local zoning ordinances may require a set-back from property boundaries. The local USDA Natural Resources Conservation Service, Resource Conservation District, University of California Cooperative Extension and Master Gardeners can help evaluate and help with design of your compost system.
- ✓ **Future needs** — Lastly, consider any long-range plans. Do you intend to expand your operation with more horses, buildings or fencing? You may need a larger composting area to accommodate any planned expansions.

How to compost

Ingredients — Composting horse manure is simple. The basic "ingredients" for composting are carbon materials, nitrogen materials, water and air. As with any recipe, these four ingredients require the proper quantities, mixing, heat and time to produce compost. Horse manure alone provides the desired ratio of carbon material to nitrogen material, 30:1. The addition of bedding like straw, wood shavings or newspaper increases the carbon content, which will have to be balanced with additional material high in nitrogen, like food scraps, grass clippings, or urea. A practical method for calculating the amount needed is described in "Compost Production and Utilization." (See Resources.)

Methods — You can compost in a number of different ways. For a small-scale operation, you would most likely compost in a **pile** or in concrete or wooden **bins**. Composting in a bin system is neater, it keeps the materials enclosed and separated and requires less room. A three bin system works well for managing the waste for four or fewer horses. Construct bins next to one another. One bin being active, where freshly collected waste is deposited. The next bin contains the "composting" pile. And the third bin contains the finished product, ready to use. There are many designs available for bin construction but keep in mind that a bin or a pile needs to be at least 3 feet wide, 3 feet tall, and 3 feet long. Piles

smaller than this will have trouble maintaining a proper temperature. Another system is a **passively aerated pile**. Before you build your pile, line up several four inch PVC pipes (length and number depends on the size of the pile) on the ground. Drill one-inch holes throughout the pipe to allow air to flow freely. The pipes should extend beyond the perimeter of the pile. Build the pile on top of the pipes. You can also place pipes in the middle of larger piles to increase airflow. This method may still require occasional turning.

Forced aeration static piles are even more elaborate. A thermostat triggers a blower to force piped air through a pile or windrow. The compost does not have to be turned. Composting larger amounts of waste works better in long narrow piles called **windrows**. Because of the high density of horse manure, the windrows should not be higher than 3-5 feet and wider than 12 feet. This size will allow for passive air movement through the windrow. The windrow can be as long as you wish. The windrows can be placed side-by-side, but unless a forced aeration system is planned remember to allow room for turning. Turn windrows with a windrow turner, which is an expensive piece of machinery, or a front-end loader tractor. Whether you use piles, a bin system or windrows, a roof, lid, or tarp should **cover the compost**. Covering compost sheds rainwater preventing the compost from becoming too wet. Shedding water away from the compost will also lessen the amount of leaching or washing of nutrients into waterways. Covering the pile also helps retain heat and limits fly breeding opportunities. It may be impractical to cover large windrows with a roof, in this case, cover them in the rainy season with a tarp.

Pile Management

- ✓ **Additional Materials** If you are mixing other organic materials like food scraps in with the manure, make sure they are of a uniform size, about 1/2-inch in diameter. This will help produce a homogeneous product and keep the decomposition rates of the materials the same. Mix additional materials into the pile as it is built. This will help deter pests and flies and help keep the odor down. Avoid adding meat and dairy products to your pile, which may attract scavengers. Also avoid adding cat or dog feces to the pile, they can contain harmful parasites.
- ✓ **Water** — To monitor the pile, you will need to keep track of the moisture content and the temperature. **An ideal compost mixture contains 50-60% moisture.** You can test for moisture by squeezing a handful of compost. It is wet enough if a small amount of water comes out between your fingers. It will feel like a wrung out sponge. The moisture content of fresh horse manure is nearly ideal. Water provides an environment for microbes to live in. Too wet or too dry a pile will cause the essential microbes to die. So pay attention to the moisture content of your compost pile and, if necessary, add water when adding material or turning the compost. Keep the pile covered to help maintain proper moisture content.
- ✓ **Turning** — **The more often you turn the pile, the faster it will compost.** Turning the pile mixes the ingredients, provides oxygen to the microbes, rebuilds the porosity of the pile, and exposes all of the pile equally to the air in the outer layer and to the high temperature in the center of the pile. Turning the pile also eliminates anaerobic organisms that cause foul odors. For faster composting, turn the pile 3 times per week. Small compost piles can be turned in a few minutes with a pitchfork. Larger piles require more labor, a tractor or a windrow turner.

- ✓ **Temperature** — Decomposition of organic matter by microbes produces heat. **The optimal temperature range of your pile should be between 122 and 145 degrees Fahrenheit.** These high temperatures will kill pathogens and weed seeds. Don't allow temperatures to rise much higher or the microbes will also die. When the pile reaches 140 degrees, start turning the pile more and remember to keep it moist. The moisture will help keep the temperature from getting too hot. Spontaneous combustion can occur but generally in conditions when the pile is over 12 feet high and has only a 25-45% moisture content. Long probed compost thermometers can be purchased in many gardening catalogues and at some gardening stores. Monitor the temperature, in the middle of the pile, every day if possible, and keep records.
- ✓ **Time** — **The compost will be ready to use in 3 to 8 weeks** depending on how it is managed and the climate; it will take longer in the cooler months. High-grade compost, used in potting mixes, needs more time and more management. Lower grade compost, used on pastures or around the yard, requires less time and management.

When is compost ready?

You will know the compost is ready when the temperature in the middle of the pile subsides to the ambient surrounding temperature and does not reheat with turning. The moisture content will be near 50%. Mature compost is evenly textured and has an earthy smell. Or, you can buy kits to test for readiness. The tests measure the amount of carbon dioxide and the amount of decomposition that is still possible. Before you use the compost, check the pH. The pH value desired for growing most food crops are around 6.8-7.0 and compost is generally neutral (7.0) to slightly alkaline (7.1-8.0). Check with the University of California Cooperative Extension or Master Gardeners on plants that may require a more acidic (lower pH) or alkaline (higher pH) soil. Add lime if the compost is too acidic. Add aluminum sulfate if it is too alkaline.

What is compost used for?

Compost can be applied as a soil amendment and fertilizer. You can incorporate it into gardens or spread it on your pastures. It can be used as a mulch and top dressing around trees and shrubs or in vineyards and orchards. Compost is not very effective as an immediate nitrogen fertilizer, although it will contribute to soil fertility in the long term. Compost should be spread just before or during the growing season when there is little likelihood of immediate rain washing the compost into waterways. If the compost is well aged and cured (allowed to sit for an additional 1-3 months), it can be used as a potting mix or seed starter. Less mature compost will prevent roots from developing because it is still decomposing and using up oxygen in the process. Compost can also be used to cushion the footing in arenas and on trails. Remember that compost can be an asset to your property. It may not solve all of your waste disposal problems but it will help reduce the amount of waste and provide you with a valuable product to use, sell or give away.

Trouble Shooting		
Symptom	Problem	Solution
<ul style="list-style-type: none"> Compost has bad odor 	<ul style="list-style-type: none"> ✓ Not enough air 	<ul style="list-style-type: none"> → Turn pile more often
<ul style="list-style-type: none"> Compost has bad odor and soggy 	<ul style="list-style-type: none"> ✓ Not enough air and too wet 	<ul style="list-style-type: none"> → Mix in dry ingredients like leaves or straw
<ul style="list-style-type: none"> Pile dry inside 	<ul style="list-style-type: none"> ✓ Not enough water 	<ul style="list-style-type: none"> → Add water when turning
<ul style="list-style-type: none"> Pile damp and warm in middle but nowhere else 	<ul style="list-style-type: none"> ✓ Pile too small 	<ul style="list-style-type: none"> → Add more raw ingredients to increase pile size – pile has to be at least 27 cubic feet
<ul style="list-style-type: none"> Pile damp and smells fine but not heating 	<ul style="list-style-type: none"> ✓ Too much carbon 	<ul style="list-style-type: none"> → Add a high nitrogen source: manure, green grass, food, blood meal, or a synthetic fertilizer such as urea or ammonium sulfate

Resources:

“Compost Production and Utilization: A Growers Guide” Publication 21514. 1995.
 Division of Agriculture and Natural Resources, University of California
 6701 San Pablo Ave., Oakland, CA 94608-1239
 1-800-994-8849
<http://danrcs.ucdavis.edu>



“Compost - It’s a Natural, A Farmers Field Guide to Compost Products and Use”

California Integrated Waste Management Board
8800 Cal Center Drive, Sacramento, CA 95826

Biocycle (monthly magazine)
419 State Avenue, Emmaus, PA 18049
(610)-967-4135
Biocycle@jgpress.com

“On-Farm Composting Handbook,” (NRAES-54), 1992
Northeast Regional Agricultural Engineering Service
152 Riley-Robb Hall
Cooperative Extension, Ithaca, NY 14853-5701
(607) 255-7654
nrraes@cornell.edu

State Composting Regulations
California Integrated Waste Management Board
(916) 255-3884

California Organics Recycling Council
(916) 652-4450

National Composting Council
(703) 739-2401

Agricultural Compost Use Demonstrations
(916) 255-2433

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