A Horse Keeper's Guide to Manure Management

Proper Manure Management

- **Appropriate Storage**
- **Manure Handling**
- **Recycling or Disposing**
- **Protecting Water Quality**

A 1,000 lb. Horse Can Generate:

- **8-10 tons of Manure a Year**

or

- **30-lbs feces plus 20-lbs of urine = 0.75 cubic feet per day**

or

- **12-15 cubic yards of manure annually**

Bedding…

At an average 0.75 cubic feet per day, bedding can add an additional 10 cubic yards of waste materials annually to the manure.

Average nitrogen, phosphorus, and potassium content (NPK) of horse manure and manure with bedding (dry weight basis)

Nutrient	Manure		W/ Bedding
	%	lbs./ton of material	
Nitrogen (N)	0.95	19.0	11.0
Phosphorus (P)	0.30	6.0	2.20
Potassium (K)	1.50	30	1.30

Guidelines for Handling Manure

- **Regular removal of manure**
- **Keep stalls and paddocks clean and dry**
- **Leave behind usable bedding**

This paddock is in need of cleaning…….

Average amount of storage required for manure *

No. of Horses	Manure		Manure w/Bedding	
	250 days	Year	250 days	Year
	cubic yards			
1	7	10	12-14	17-20
5	35	50	60-70	85-100
15	105	150	180-210	255-300
25	175	250	300-350	425-500
40	280	400	480-560	680-800

*Assumes 0.75 cu. ft. manure/day and 0.50 to 0.75 cu. ft. bedding/day.
A cubic yard is 27 cu. ft. and occupies a cube 3ft x 3ft x 3ft.

Pasture Management & Productivity

- Number of Animals Per Unit Area
- Vegetative Makeup of Sod
- Natural Fertility of Soil

Land Application

- **Is an acceptable disposal method**

- **Requires knowledge of soils and application rates**

  - fresh manure : clay and loam soils

  -composted manure: sandy soils

Land Application Guidelines

Average manure application and land base area requirements for pasture crops.*

Forage Crop	Annual Manure Application	Land Area Required
	tons/acre	acres/horse/yr
Red Clover	10	0.8
Ryegrass	11	0.8
Tall Fescue	13	0.6
Wheat Grass	2	3.8

*Adapted form Davis and Swinker, 1996 (assumes 8 tons manure/yr).

Off-Site Disposal

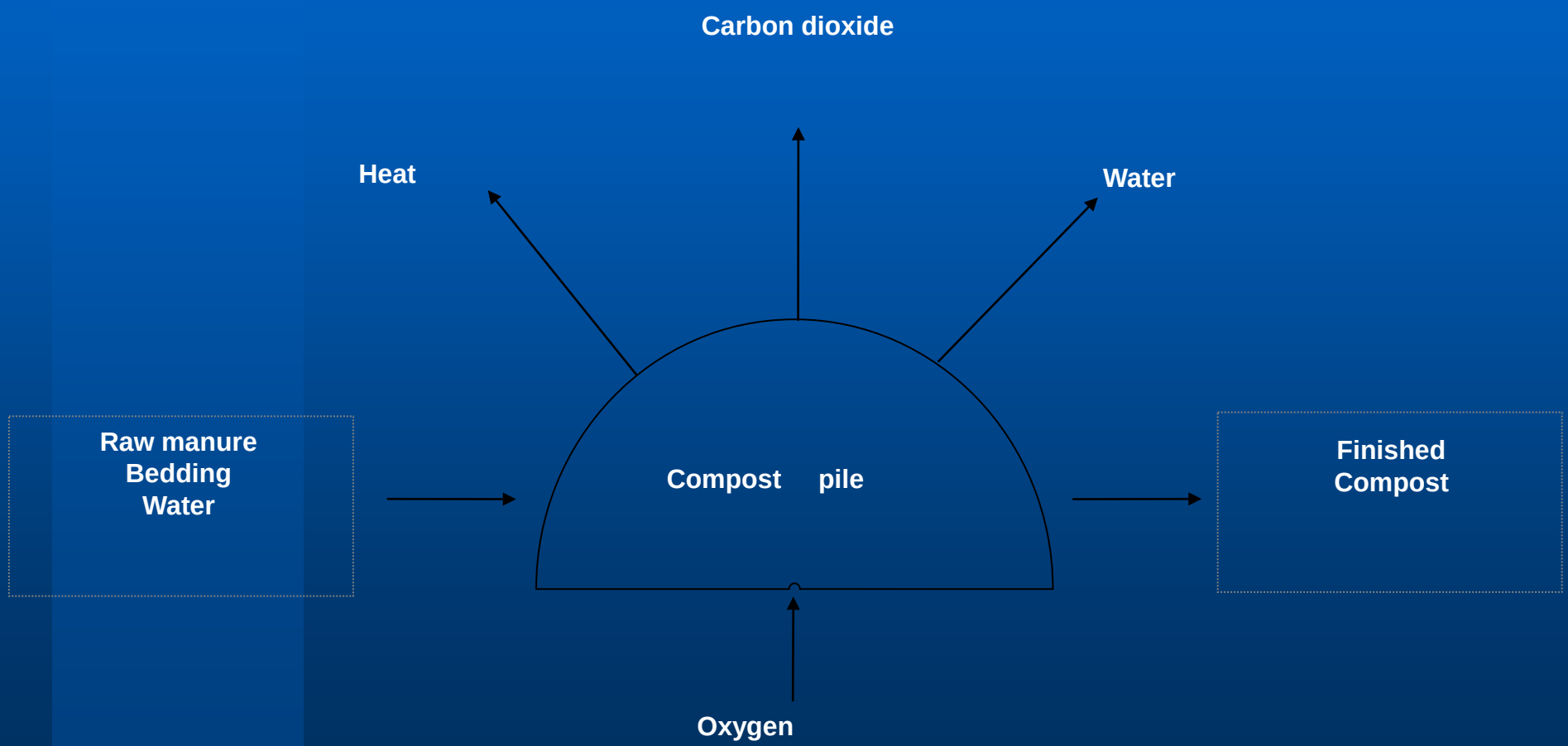
- **Manure bedding is a potentially valuable resource for:**
  - **Gardeners**
  - **Landscapers**
  - **Small Farms**

Composting Manure …..

Good Composting can Reduce the Risk of Manure To Water Quality by:

- ***Reduction and elimination*** **of microbial pathogens**
- ***Reduction*** **of ammonia N-levels**
- ***Reduction*** **in water-soluble phosphorus**
- ***Reduction*** **of water-soluble organic matter (BOD)**
- ***Reduction*** **in total soluble salts**

Aerobic Compost Process



Aerobic Compost Processes and Requirements

- Carbon and Nitrogen
- Air
- Water
- Temperature

Carbon to Nitrogen Ratio

- **Amount of carbon compared to the amount of nitrogen in organic matter**
- **A narrow ratio is optimal**
- **Manure alone has an optimum ratio**
- **Too much bedding material has a negative effect on the ratio**

Aerated Static Pile

Aerobic Composting in Windrows

Appropriate windrow compost management is required for a quality product

More on Aeration/Turning

- Establish a regular turning frequency
- Adjust turning frequency if needed
- You may need to turn/aerate, regardless of your schedule (e.g. following heavy rainfall)
- Allow material to fall from your shovel or bucket
- Raise the bucket to its max-height when turning
- With a hand-shovel, give it a good toss
- Too much aeration can be bad

Moisture Management

Checking Compost Temperature

- **Temperatures will increase within 24 hours and may reach 155°F within 2-3 days**
- **A long-stemmed thermometer and record keeping are all that is needed**
- **Insert the thermometer stem half-way in to the compost pile**

Checking Compost Temperature

- **Record the date, time, bin or pile number, location within the bin and temperature**
- **Take multiple readings for each bin or pile**
- **Measure temperatures daily for the first week and then weekly thereafter**
- **Measure within 24-hours after turning**

The advantages of the Aerobic Thermophillic Composting Method are many:

- Pathogens exposed to thermophillic temperatures for periods of from 24 hours to weeks at a time are destroyed
- Decomposition is rapid, volume reduction occurs quickly
- Less time and space are required in comparison to slower methods

Is That Compost Done?

- **Temperature is a key indicator**
- **Finished when there is a 15 to 20°F difference between internal pile and ambient mid-day air temperature**

Site Selection and Construction

Size of Operation Determines Site and Technology

<u>Size</u> – There must be adequate space available to:

- ***handle the anticipated volume of manure and bedding***
- ***provide equipment access and working area***
- ***accommodate active composting and temporary storage of final product***

<u>Permit Requirements</u> -

- ***check with your local planning department***
- ***a larger stable may already have an operating permit that allows for composting***

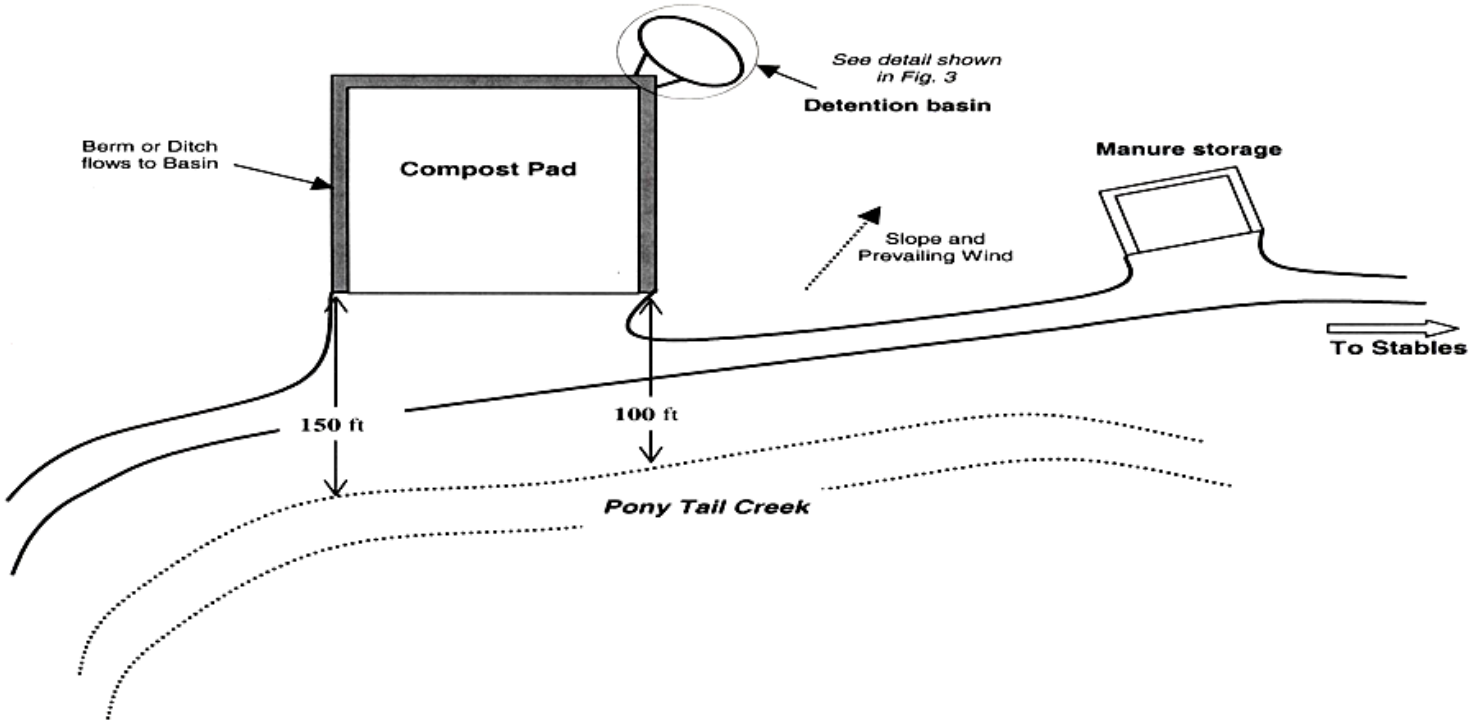
Basic Components of an On-Farm Composting System

- Staging area away from creeks and drainage;
- Bins or piles large enough to maintain temperatures;
- A mechanism for turning and aerating the bins or piles;
- Temperature taking
- Available water irrigation system

There are several ways to design an on-farm composting system, and no single one is appropriate for all sizes and types of facilities.

Site Requirements……

Figure 2. Example of idealized compost site details



Compost Site Construction Specifics

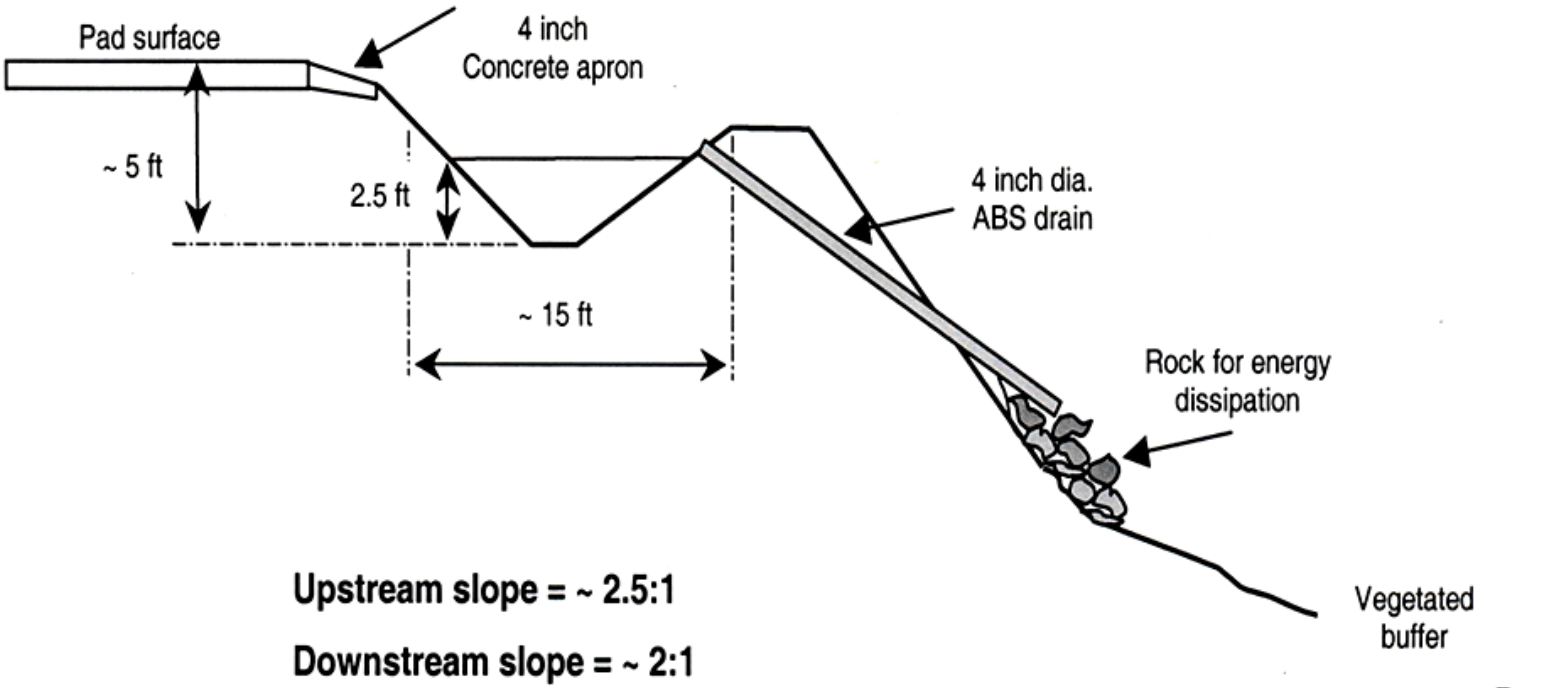
Control Runoff

- **Controlling runoff and drainage from the compost site is very important**

Detention Basin

- **A detention basin should be included in the design at the low end of the compost pad to capture and temporarily hold storm water**

Cross Section of an Idealized Detention Basin



- Notice how the detention system protects runoff from leaving windrows. An improvement would have been to line the inside edge of the ditch with ecology blocks allowing easier operation of heavy equipment moving compost.

Managing the Compost Process

Bins

Windrows


KUBOTA LA950A
L4850
KUBOTA

A five acre horse boarding facility, surrounded by a housing tract, has developed a “modular” manure management and composting system using compost bins. As the number of horses increases to a maximum of ten, the number of bins will increase to meet the need. The bins are located at different sites at the ranch for convenience. The mobile bins can be moved with a forklift around or off the ranch.

Pellet Bedding

- Estimates that it will further reduce volumes by 20-25%
- Requires less time to compost
- Results in a better product with a lower C:N ratio

- Six months of manure is about 300 cubic yards reduced to 150 cubic yards of compost
- It will cover one half acre of soil with about 2 inches of compost

Composting Economics

Basic Economic Considerations:

- *Site Development Costs: materials and labor*
- *Quantity of manure with bedding generated (per day, week, month, and year)*
- *Labor required to collect, store, transport to site, compost and manage*
- *Equipment needed (loader, watering system, transport, thermometer)*
- *Equipment maintenance expense*
- *Other costs (lab sample 2 X per year, other)*
- *Compost use (on site, trucked away or sold – could be a cost or a return*
- *Present manure disposal costs*
- *Being a good conservationist – PRICELESS!*

Cost Summary for Compost Demonstration

40 horses, approximately 747 yards of manure and bedding Annually;Assumes land for site, water source and front end loader already available; Present average annual cost to haul manure & bedding to landfill: $14,400.

- Total Capital (investment) Required: $7,014
- Total Annual Fixed Cost: $ 985
- Total Annual Variable Costs: $8,969
- Total Annual Costs: $9,995

1. Cost per cubic yard composted (747 cu yd): $13.33
2. Cost of trucking compost to neighboring farm: $390

- Estimated Average Annual Savings: $4,055

Composting Summary

- If you manage a larger facility, spend time educating your clients about your goals for manure management with composting.
- Prepare your site to ensure the compost area drains well.
- Collect manure from the corrals and pens carefully.
- Try to ensure good drainage from any outdoor horse pens from which manure is collected.
- Make provisions for adding supplemental water when needed.

Composting Summary, Cont…

- Monitor compost temperatures every few days initially and at least weekly.
- Keep the composting area clean and well maintained.
- Use the finished product in your landscapes, planters, and gardens.
- Have laboratory analysis performed on compost samples from time to time.
- Compost has a value, carefully consider what makes sense to you before you give the compost away.

Why Should You Compost????

BECAUSE IT'S ALL ABOUT RESOURCE CONSERVATION AND <u>WATER QUALITY</u>!

Credits

Funding has been provided to the Council of Bay Area RCD's in part by the U.S. Environmental Protection Agency pursuant to Assistance Agreement No. C9-989697-00-0 and any amendments thereto which has been awarded to the State Water Resources Control Board for the implementation of California's Nonprofit 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.