

Compost Production and Utilization

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Whether you have one horse...

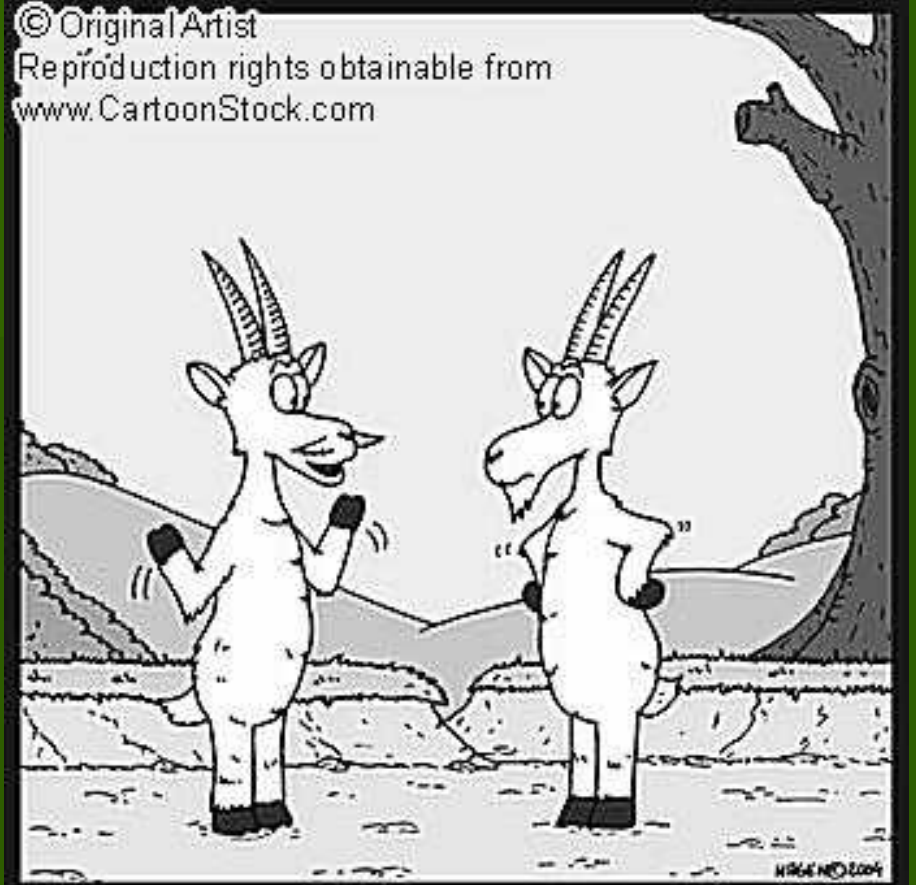




many cows,



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I was tired of my goaty,
so I decided to grow a moustache...

a few goats,

or food waste...



Organic matter is a resource!! Don't waste it!

Methods of Composting

- Active windrows/bins: This presentation
- Passive windrows
 - Requires passive aeration technology
- Worms: Online Fact Sheet (vermicomposting)
 - Building a Worm Bin: <http://www.ext.colostate.edu/sam/vermicompost.pdf>
 - CSU Extension Compost Site: <http://www.ext.colostate.edu/sam/compost.html>
 - Worm Digest: <http://www.wormdigest.org/>

What Are the Benefits of Composting?

- Reduces volume of material by approx. 30%
- Minimizes pathogen, weed, odor, and insect problems
- Stabilizes nitrogen and phosphorus compounds which minimizes water pollution
- Produces a useful and marketable soil amendment
- Sequesters carbon into a stable form that can be put back into the soil (instead of in a landfill)

What is Composting?

- Composting is the
 - managed,
 - biological,
 - oxidation process that converts
 - heterogeneous organic matter into a more
 - homogeneous, fine-particle humus-like material.

from FIELD GUIDE TO ON-FARM COMPOSTING (Rodale Institute)
http://www.css.cornell.edu/compost/OnFarmHandbook/onfarm_TOC.html

MANAGED: what YOU do!

- Provide carbon (C) and nitrogen (N) in 30:1 ratio
- Provide oxygen for oxidation process at 5-50%
- Provide water to keep moisture at 50%

Estimated Carbon-to-Nitrogen Ratios

Browns = High Carbon	C:N
Ashes, wood	25:1
Cardboard, shredded	350:1
Corn stalks	75:1
Fruit waste	35:1
Leaves	60:1
Newspaper, shredded	175:1
Peanut shells	35:1
Pine needles	80:1
Sawdust	325:1
Straw	75:1
Wood chips	400:1
Greens = High Nitrogen	C:N
Alfalfa	12:1
Clover	23:1
Coffee grounds	20:1
Food waste	20:1
Garden waste	30:1
Grass clippings	20:1
Hay	25:1
Manures	15:1
Seaweed	19:1
Vegetable scraps	25:1
Weeds	30:1

BIOLOGICAL:

what microorganisms (MO's) do

- Many species of bacteria and fungi metabolize the C and N to grow and multiply, using oxygen and water in the process
- Composting is farming MO's, which are present in the soil!

OXIDATION

- “In the presence of air”
- Used by MO in respiration
- Oxygen is in pore space in compost windrow
- Use bulking material and turn to maintain pore space for air

A variety of initial materials creates lots of air pockets, or pore space.



Heterogeneous Organic Matter/ Feedstocks

- Kitchen scraps
- Bedding
- Waste hay
- Spoiled feed or grain
- Leaves and grass clippings
- Horse manure

Homogeneous, Fine-particle Humus-like Material

- This is the final product that you are aiming for at the end of a successful composting process.



How to Make Compost!



For any scale that you choose

Choose a site

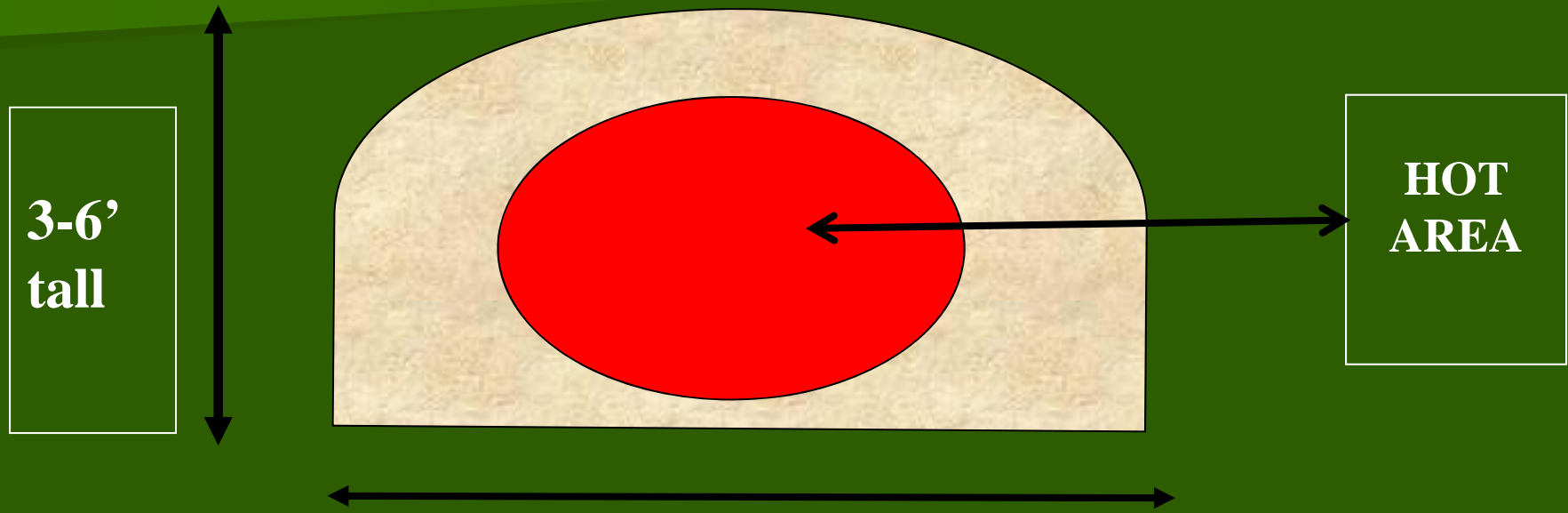
- Mowed area, smooth, slightly sloping
- Near feedstock source
- Near water tap and **at least** 100 ft. from “waters of the state” or wells
- Control run-on and run-off

Building the Pile

- Layer nitrogen-rich feedstock loosely with bulking material, adding water to 50%
- Manage the batch or continuous pile a little differently.



What happens inside the pile?



Height and width depend on your feedstock volumes and equipment

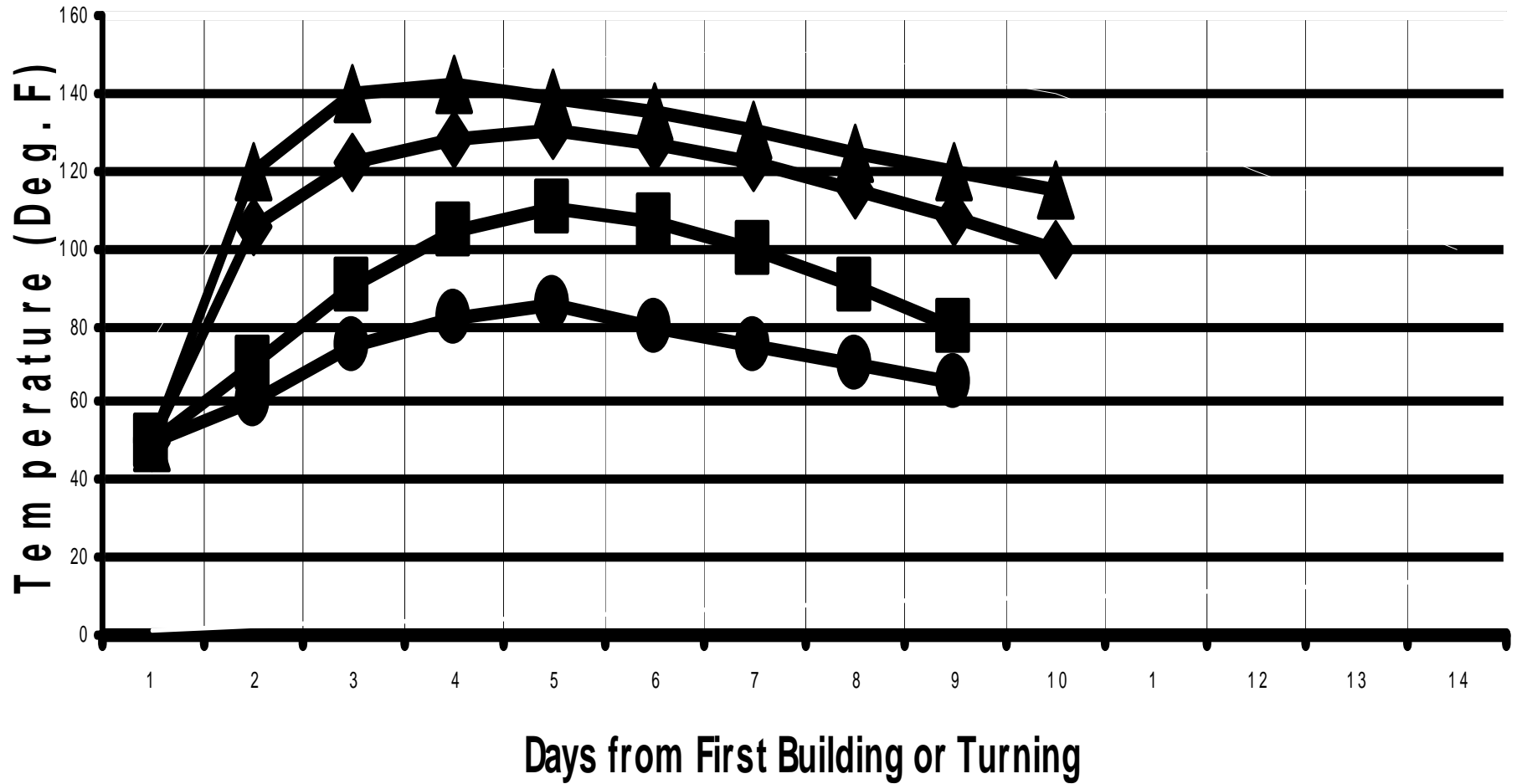
Monitor the Windrow

- Check temperature with compost thermometer (www.reotemp.com)
- Heat is an indicator of biological activity
 - GOAL: 130+°F for at least 15 days where pile was turned at least 3 times during this heat cycle
- Graph or observe heating cycle: increase then decrease (future slide illustrates this)
- After decrease, turn to aerate and add water, use graph to help with timing



Even in winter composting organisms metabolize enough to produce substantial heat.

Relationship of Time and Temperature to Compost Turning



Continued Monitoring...

- After turning, monitor heat cycle again
- Turn when temperature decreases
- Check moisture and add if necessary
- Repeat turnings until temperature ceases to rise (about 4-5 turning cycles)



Curing Phase

- When temperature curve flattens, mesophyllic (mid-temperature) MO's take over to finish process
- Keep windrow moist, less than 50%
- Cure for 1-2 months



Why cure?

- Assures highest quality product
- pH shifts to neutral
- Soil MO's re-colonize compost, impart disease suppressing qualities to compost
- If too much C left, use of this compost as a soil amendment may cause a temporary N deficiency, just the opposite of what you want!
- Makes compost optimum for plant growth

When is my compost done?

- After heating cycles stop
- After curing
- Check for homogenous, fine-particle humus-like appearance (unfinished material might need to be screened out and reintroduced to another pile)
- Earthy smell (*Actinomyces*)
- Maturity tests: Solvita test (becoming recognized by highway departments), and others, experience!
 - www.woodsend.org

To Assure Quality...

- Keep meat/cheese/bones out of your compost bin
- Know where your feedstocks came from
 - Antibiotics? De-wormer? A mature compost will be antibiotic free
 - Herbicides? Some broadleaf herbicides (chlopyralid) do not break down in the composting process and may deter growth of your broadleaf garden plants
 - Heavy metals? This is typically not an issue in compost unless you are composting biosolids

To Assure Quality...

■ Know that your compost is mature

- Maturity = low microbial activity = fully composted
- You will avoid ammonia burn in your plants
- Nitrogen in your garden soil will not be immobilized by unfinished compost and 'rob' your plants of nutrients
- Pathogens (E .coli/Salmonella) are destroyed during a well managed composting process

■ Test your compost!!! And your soil!!!

- This will help you determine how much compost your soil needs. More is not always better!



QUESTIONS?

Happy Composting!

