

Composting

Its Recycling...



Naturally

What is composting?

Using the natural process of decay to change organic wastes into a valuable humus-like material called compost



Composting -

Speeding up the natural decay process

A compost pile or bin allows you to control

- Air (oxygen)
- Water
- Food, and
- Temperature



By managing these factors you can speed up the otherwise slow natural decay process

Why compost yard and kitchen wastes?

- PA recycling goal is 35% of municipal waste by 2003.
- National Composting Council estimates the average U.S. household generates 650 lb of compostables every year.

- Limited landfill space should be reserved for materials that cannot be recycled or composted
- Garbage handling is the 4th largest expense for many cities. Composting can reduce those costs



What do you need to make compost?



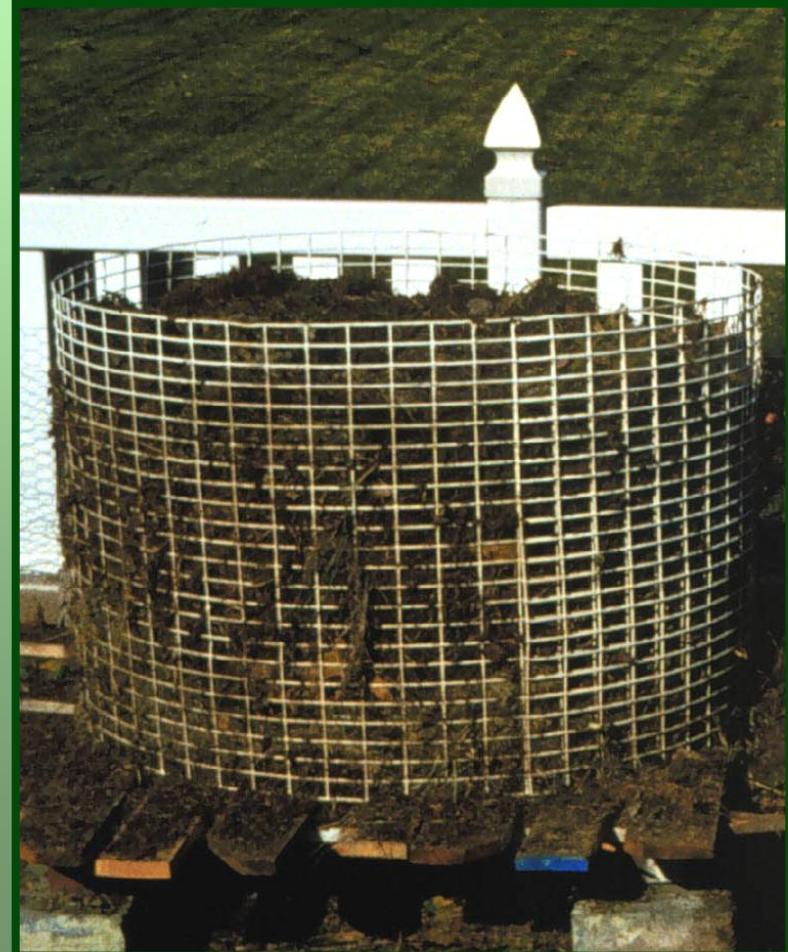
- **Decomposers** – Your composting work crew. These are the microbes (mainly bacteria and fungi) that do all the work for you.
- **Food for the decomposers**
The organic materials to be composted
- The right amount of air, water, and warmth to keep the work crew happy

Where do the decomposers come from?

**If you build it,
they will come...**

- Soil
- Leaves
- Food scraps
- Manure, and
- Finished compost

**Each of these will add
microorganisms
to the compost pile**



One teaspoon of good garden soil to which compost has been added contains

- **100 million bacteria**
- **800 feet of fungal threads**



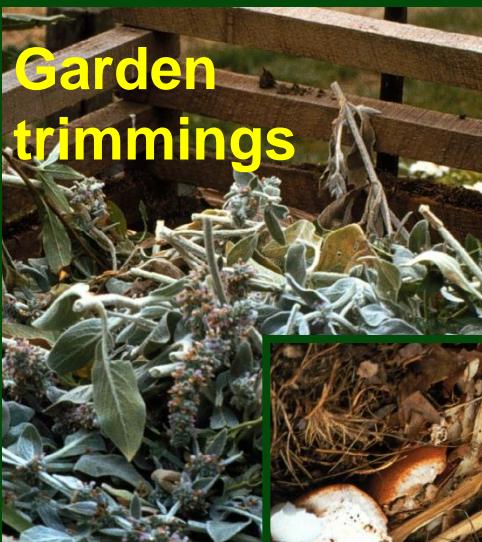
Numerous additives and starters are available but are not needed for good or rapid composting



What is the best food for your decomposers?

All organic materials will compost, but not all should be added to a backyard compost pile

Organic wastes that should be composted include:



Also

- Used potting soil
- Manure
- Sawdust
- Hair

Materials to avoid...

Avoid organic materials that could cause problems during or after composting

- Oil, fat, grease, meat, fish or dairy products, unwashed egg shells (tend to attract pests, vermin)
- Hard to kill weeds (bindweed, quackgrass) and weeds that have gone to seed (could infest garden area when compost is used).

Materials to avoid...

- Cat or dog waste (attracts pests, could spread disease)
- Diseased or insect ridden plants (could infect or attack garden plants when compost is used)
- Other materials to avoid
 - Lime (increases compost pH and promotes ammonia odor problems)
 - Wood ash, add sparingly to the pile (will add some potash to compost but will increase pH and ammonia odor problems)

Is shredding necessary?

- **Smaller particles decompose faster**
 - Have greater surface area per unit volume
 - Allows microbes to get at more of the food
 - Chipping or shredding coarse materials (twigs, stems) will speed up the rate at which they decompose
- **Smaller particles will also decrease airflow into the pile**
 - May lead to anaerobic conditions
 - Pile may need to be turned more often

More about food for your decomposers

Your compost workers will thrive if you give them a balanced diet.

- **Composting will be most rapid if the decomposers are fed a mix of carbon rich and nitrogen rich materials.**
- **Carbon rich organic wastes are known as “browns”**
- **Nitrogen rich organic wastes are known as “greens”**

Browns

High carbon materials such as

- Leaves (30-80:1)**
- Straw (40-100:1)**
- Paper (150-200:1)**
- Sawdust (100-500:1)**
- Animal bedding mixed with manure (30-80:1)**

Greens

High nitrogen materials such as

- Vegetable scraps (12-20:1)
- Coffee grounds (20:1)
- Grass clippings (12-25:1)
- Manure
 - Cow (20:1)
 - Horse (25:1)
 - Poultry (10:1), with litter (13-18:1)
 - Hog (5-7:1)

Browns

- Very slow to decay on their own
- May tie up nitrogen in the soil if not fully composted when used
- Tend to accumulate in the fall
- May need to stockpile until can mix with greens
- Coarse browns can help to keep pile aerated

Greens

- Decay rapidly consuming pile oxygen and producing water
- Tend to mat and create foul odors if composted alone because of lack of good aeration
- Tend to accumulate in spring and summer
- Best composting if mixed with browns

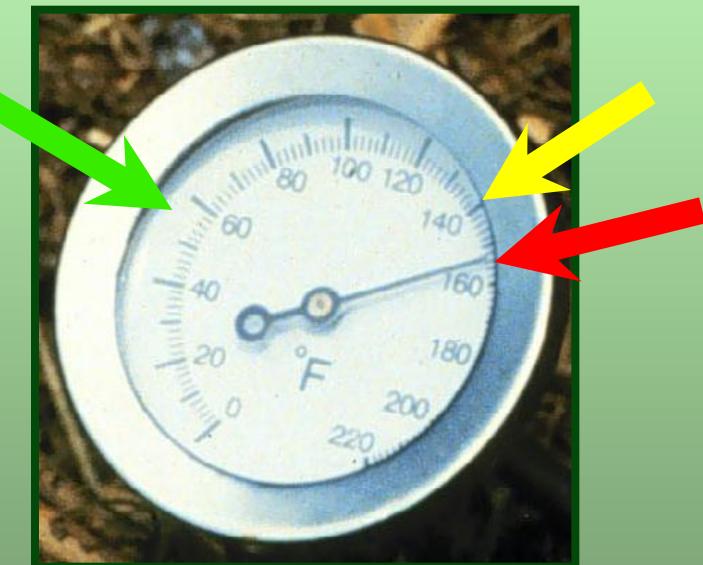
Aerobic composting

- Composting with decomposers that need air (oxygen)
- The fastest way to make high quality compost
- Produces no foul odors
- Aerobic decomposers produce **heat**



Aerobic composting and temperature

- Active composting occurs in the temperature range of 55°F to 155°F
- Pile temperature may increase above 140°F but this is too hot for most bacteria and decomposition will slow until temperature decreases again.
- A thermometer is a nice tool but is not essential for good composting



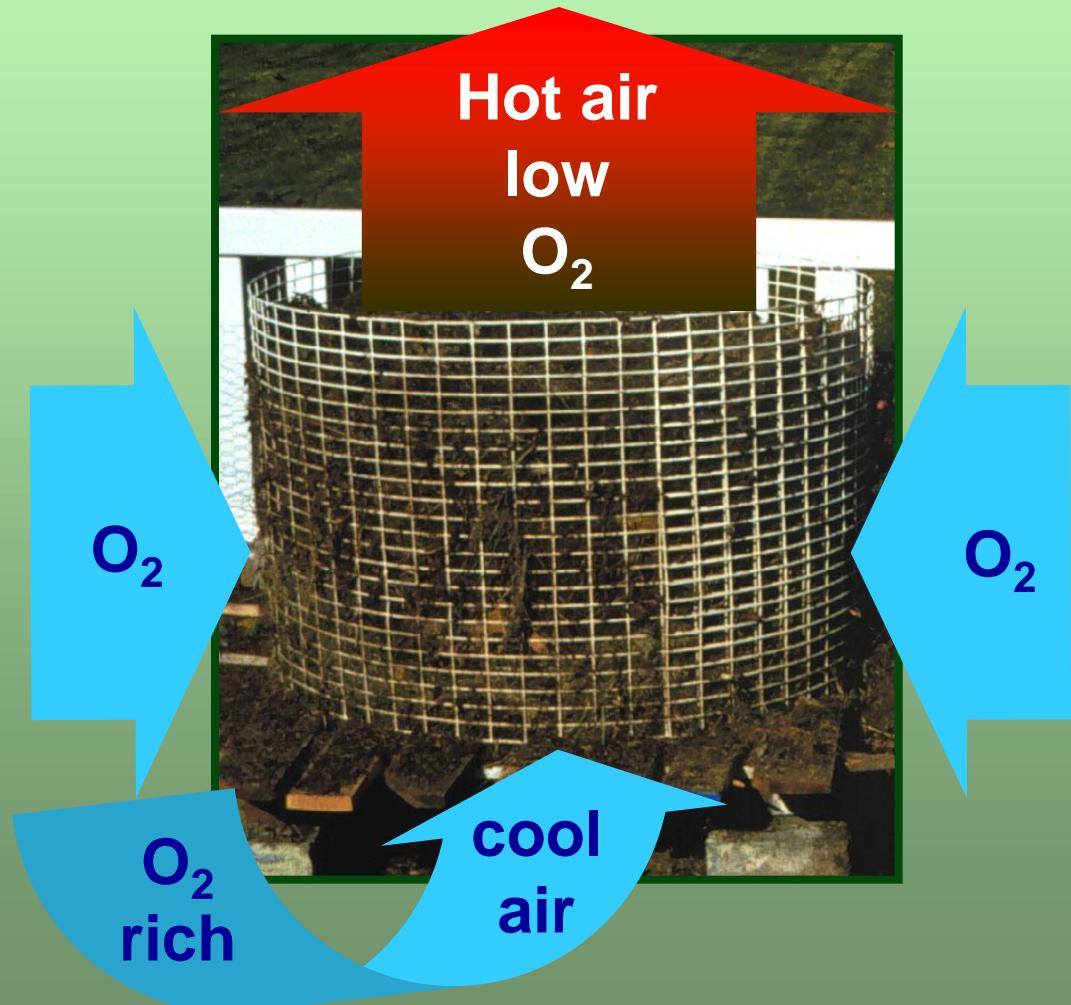
Does my compost pile have to get hot?

- Good compost can be made in a pile that never gets hot, but...
 - Decay will be slower and it will take longer to make compost
 - Not enough air, to little or too much water, or too many browns in the mix could all keep a pile from heating.
- High pile temperature provides the benefits of
 - The most rapid composting
 - Killing pathogenic (disease causing) organisms
 - Killing weed seeds

Getting air to your decomposers

Warm air rising through the pile draws fresh air in from bottom and sides

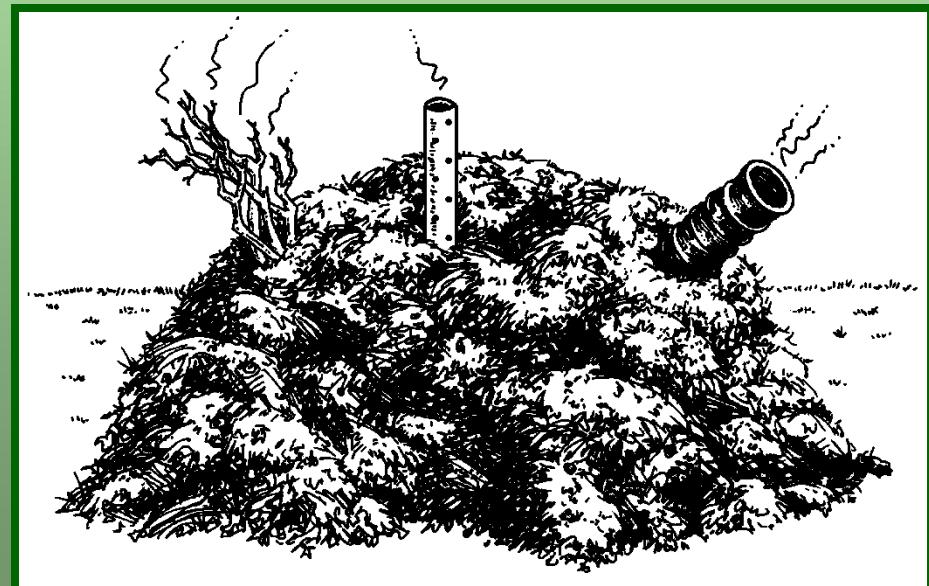
Wind can stimulate aeration



Pile aeration

Depends upon adequate porosity

- Porosity is the air filled space between particles
- “Browns” help to maintain good porosity in the pile
- A compacted pile has lost porosity, can be increased by turning
- Aeration can be increased by inserting sticks, cornstalks, or perforated pipes into or under the pile

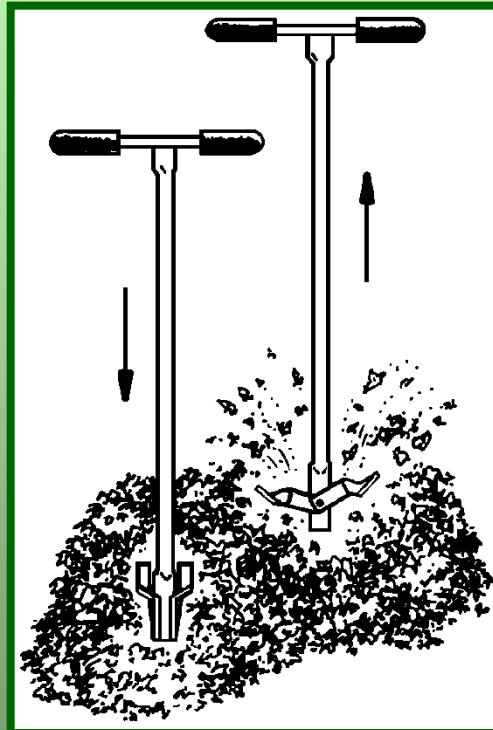


Pile aeration

Getting air to your work force



- Turning the pile mixes fresh air into the pile



- Turning tools can make the job easier

Water

- Rapid decomposition requires optimum water content
 - If too dry, bacterial activity will slow or cease
 - If too wet, loss of air in the pile will lead to anaerobic conditions
- Pile water content should be at 40-60%
- As wet as a squeezed out sponge
- If too dry, add water as you turn the pile
- If too wet, add browns and/or turn the pile



Taking care of your compost pile

- The most rapid composting is achieved by
 - Adding stockpiled materials in mixed brown + green batches
 - Regularly turning (mixing) the compost pile
 - Controlling water content
- When pile no longer heats after mixing, allow it to cure (stand without mixing) for at least 4 weeks before using the compost

Making compost the fast way

(Instructions for active composters)

- Turn pile every 5 to 7 days, moving outer material to the pile center and add water if needed
- During the first few weeks temp should reach 140°F
- After about 4 weeks less heat will be produced and compost will maintain lower temp (100°F)
- After about 4 more weeks the pile will no longer heat after turning and volume will be about one third of original.
- Allow the pile to cure (stand without turning) for 4 more weeks before using the compost

When is compost finished?

- Compost is mature when
 - The color is dark brown
 - Is crumbly, loose, humus-like
 - It has an earthy smell
 - No readily recognizable feedstock
 - Pile has shrunk to about 1/3 of its original volume
- Simple tests for finished compost
 - Bag test: sealing compost in a plastic bag for several days should produce no foul odor
 - Germination test: will seeds germinate in the compost? (good test to use if compost will be part of potting mix)



Where should I put my compost pile?

- Shaded area will help prevent drying out in summer
- Avoid areas that will interfere with lawn and garden activities
- Adequate work area around the pile
- Area for storage
- Water available

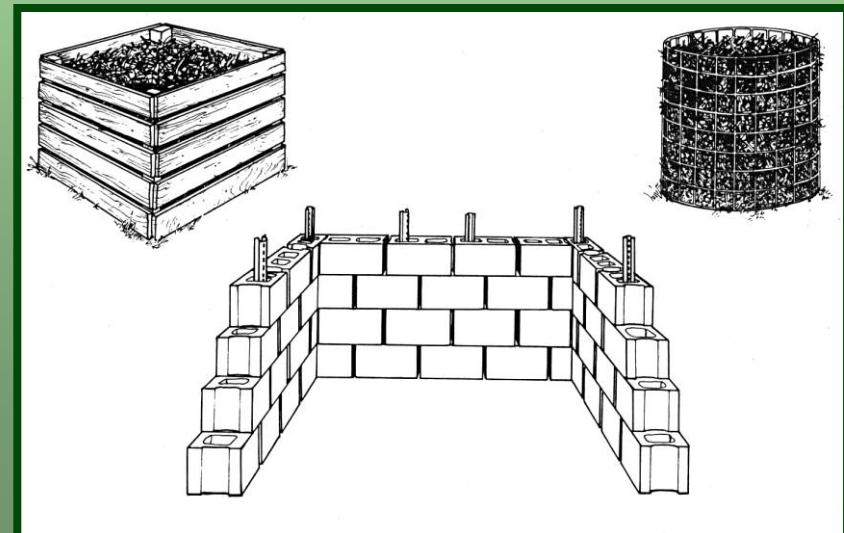
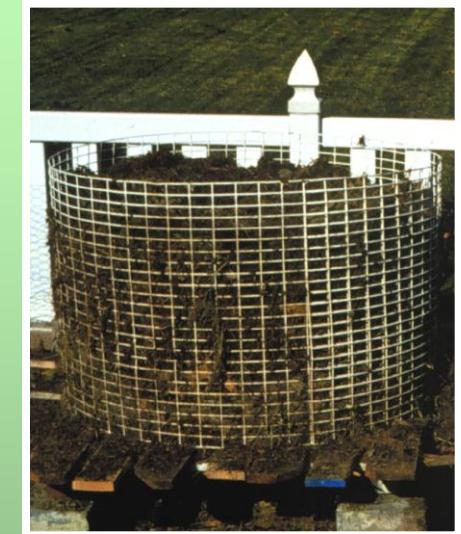


Considerations for locating the compost pile

- Good drainage
- Away from any wells
- Near where finished compost will be used
- Aesthetic considerations
 - Think of your neighbors' view
 - Think of your neighbors' noses

Bin/pile construction

- Ideal size is approximately a 3 foot cube
 - Promotes sufficient aeration
 - Retains sufficient heat to maintain warm temps
 - Piles larger than 5 x 5 x 5 feet are difficult to turn and tend to become anaerobic in the center



Compost Troubleshooting Odors

Odors are one of the most frequent but easily avoidable composting problems.

- Rotten odor

- Putrid smell or rotten egg smell
- Usually results from anaerobic conditions
- Excess moisture, compaction
- Turn pile, add dry porous material (browns), cover kitchen scraps

- Ammonia odor

- Too much nitrogen (greens)
- Add high carbon material (browns), turn pile

Compost Troubleshooting

Temperature

- Low pile temperature

- Pile too small, cold weather, too dry, poor aeration, or lacks nitrogen
- Make pile bigger or insulate sides, add water, turn the pile, add greens or manure

- High pile temperature

- Pile too large, insufficient ventilation
- Reduce pile size, turn

Compost Troubleshooting

- Pests: raccoons, rats, insects
 - Presence of meat scraps or fatty food waste, rotten odors
 - Remove meats and fatty foods, cover with sawdust or leaves, turn the pile
 - Compost in an animal-proof bin
 - Covered bin, trash can bin, cone bin, or barrel bin
 - Wire mesh sides and floor (1/4 – 1/2 in openings)
 - Use worm composting (vermicomposting) for food scraps

Benefits of compost

Promotes soil health

- Supplies organic matter to soil
- Attracts earthworms and other beneficial soil macrofauna
- Stimulates beneficial soil microorganisms
- Increases soil water holding capacity
- Increases soil nutrient retention
- Improves soil tilth and friability
- Improves soil drainage
- Loosens heavy clay soils
- Suppresses soil-borne plant pathogens (diseases)

Benefits of compost

Plant nutrients

Compost is not a fertilizer, but does contain plant nutrients

- **Nitrogen and phosphorus are mostly in organic forms**
 - Released slowly to plants
 - Not readily leached from the topsoil
- **Compost contains many trace nutrients that are essential for plant growth**



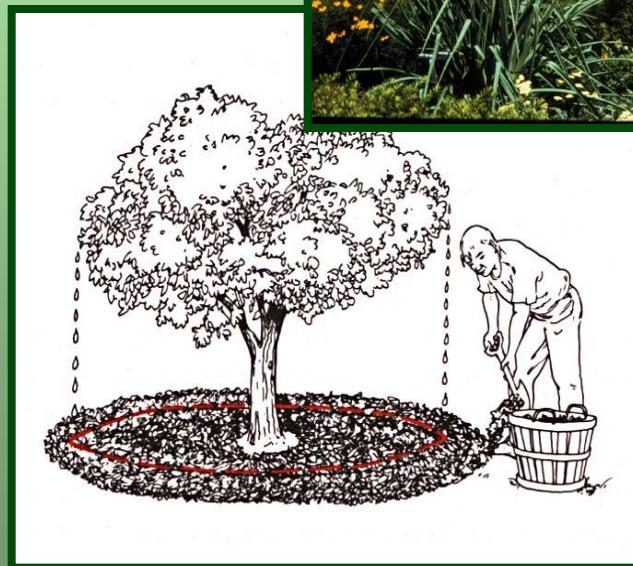
Using finished compost

- **Soil amendment**

- Be sure that compost is mature, has an earthy smell (no ammonia or rotten smell), looks dark and crumbly with no recognizable feedstock
- Compost improves soil health when mixed in the top 4 to 6 inches (work in no more than a 2" layer of compost)
 - Will improve water and nutrient retention of sandy soils
 - Will loosen compacted clay soils and make them more friable

Using finished compost

- Surface mulch in the garden/landscape
 - Maximum 3" depth
 - Start 3-4" from trunk
 - Extend out to dripline
- Mulch provides
 - Protection from temp extremes
 - Slows moisture loss from soil
 - Provides some slow release nutrients



Using finished compost

- Lawn topdressing

- Be sure compost is very mature to avoid harming the lawn
- Use fine (screened) compost, $\frac{1}{4}$ " depth raked over lawn
- Best if lawn is cored before applying compost
- Retains moisture, supplies slow release nutrients, prevents soil compaction

- Potting mix

- Compost must be very mature to avoid injury to plants
- Use fine textured compost
- Mix no more than 1/3 compost by volume

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