

# Composting

It's 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's goal is to recycle 35% of municipal waste – composting helps!
- National Composting Council estimates the average U.S. household generates 650 lb of compostables every year.

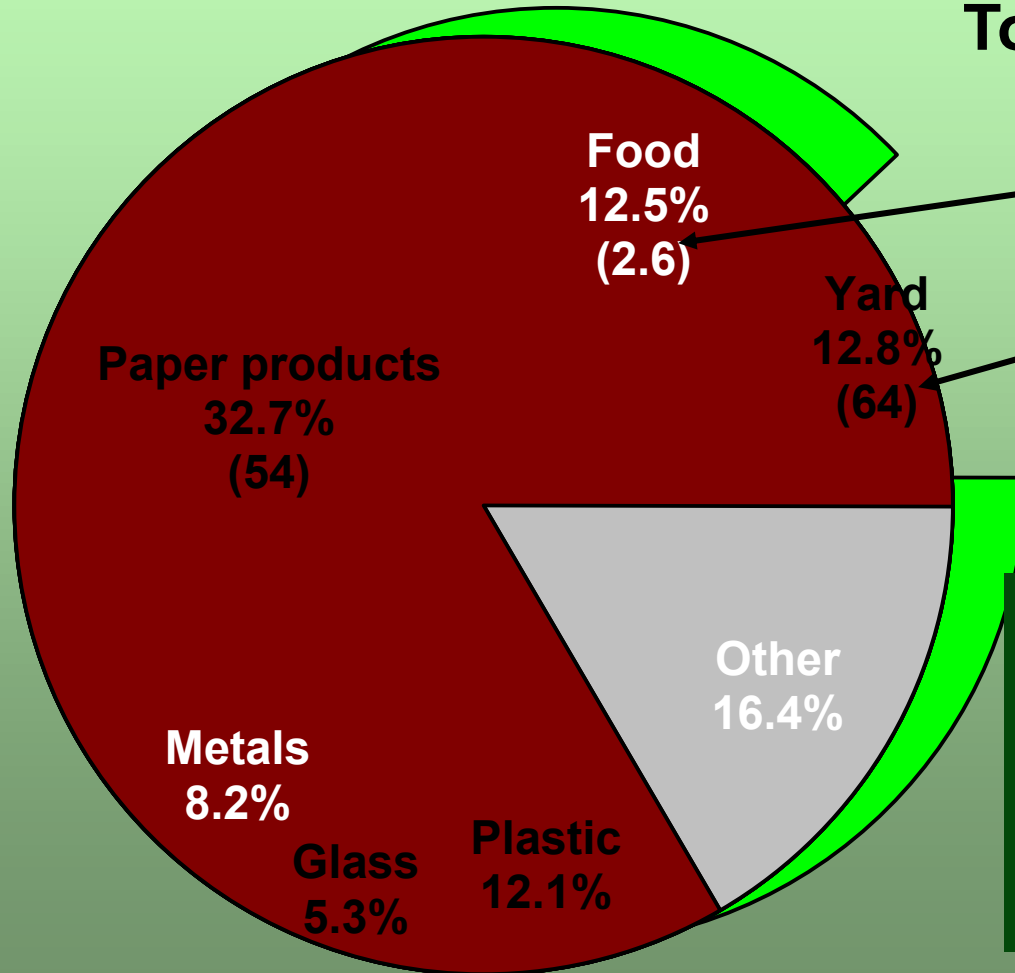


- Limited landfill space should be reserved for materials that cannot be recycled or composted
- Garbage handling is the 4<sup>th</sup> largest expense for many cities. Composting can reduce those costs
- 34% of landfilled waste in PA is food and another 30% is paper.



# 2007 Municipal Solid Waste Production in the U.S.

**Total = 254 million tons/yr  
(4.6 lb/person/day)**



**Percent of category  
that was recycled**

The overall recycling  
rate was 33% in 2007

**Backyard composting  
can increase recycling  
of yard and food  
wastes.**



# 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**





# 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:



**Garden trimmings**



**Grass clippings**



**Leaves**



**Kitchen scraps**

**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)**

# 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**

# 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**

- **Decay very slowly**
- **Coarse browns can keep pile aerated**
- **Tend to accumulate in the fall**
- **Tie up nitrogen in soil if not fully composted**
- **May need to stockpile until can mix with greens**

## **Greens**

- **Decay rapidly**
- **Poor aeration – may have foul odors if composted alone**
- **Tend to accumulate in spring and summer**
- **Supply nitrogen for composting**
- **Best composting if mixed with browns**



# Aerobic composting

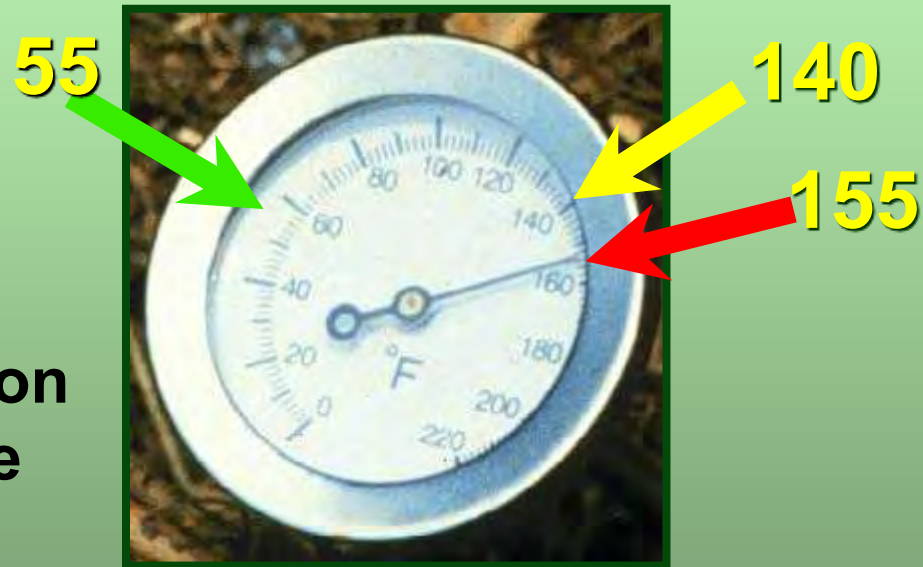
- Composting with decomposers that need air (oxygen)
- The fastest way to make high quality compost
- Produces no foul odors
- Aerobic decomposers produce **heat**



# 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**?

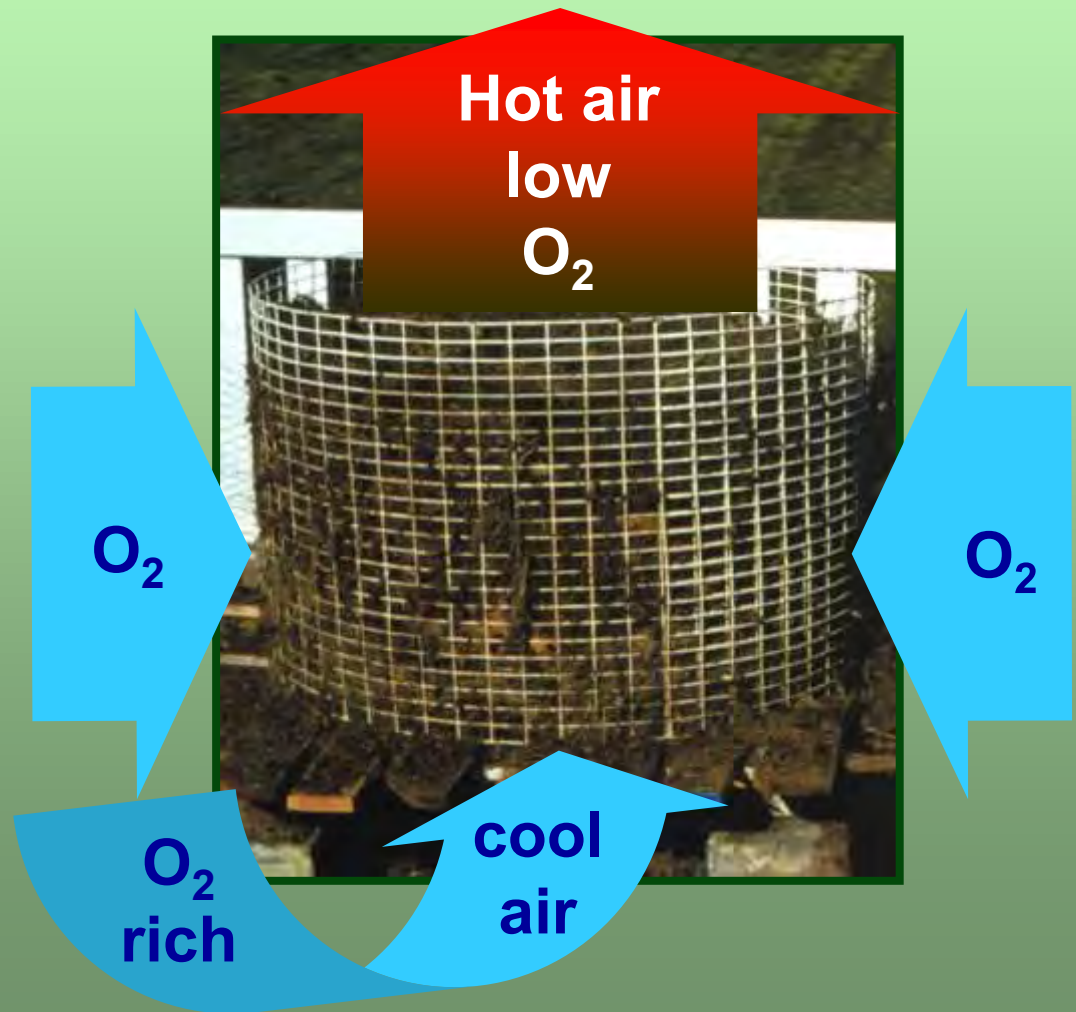
- Good compost can be made in a pile that never gets hot, but...
  - Decay will be slower and it will take longer to make compost
  - Not enough air, too little or too much water, or too many browns in the mix could all keep a pile from heating.
- High pile temperature provides the benefits of
  - The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

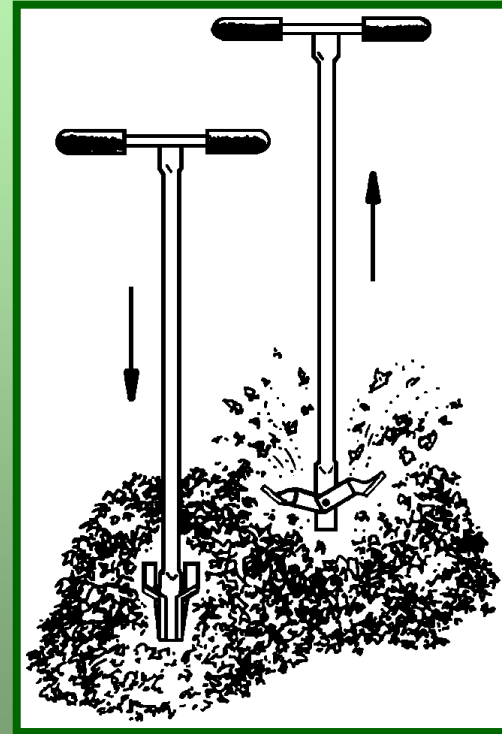


# Pile aeration

## 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 mixed browns + greens
  - 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 the pile every 5 to 7 days,**
  - **move outer material to the pile center**
  - **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)**



# **Making compost the fast way**

## **(Instructions for active composters)**

- **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
- It is crumbly, loose, and humus-like
- It has an earthy smell
- It contains no readily recognizable feedstock
- The 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 a 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

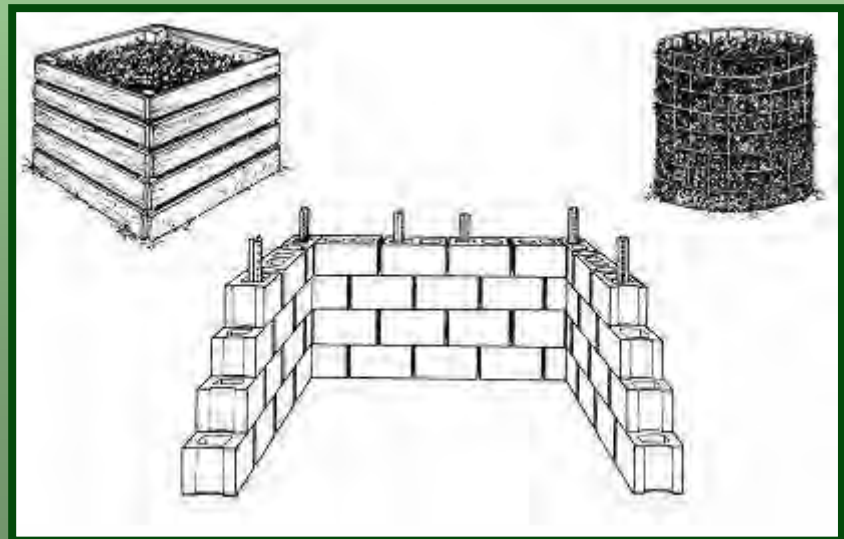


# Considerations for locating the compost pile

- Good drainage
- Away from any wells
- Near where finished compost will be used
- Be a good neighbor
  - Make your composting area attractive, or
  - Keep it out of your neighbors' view

# 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





# Manufactured bins



# 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 ( $\frac{1}{4}$  –  $\frac{1}{2}$  in  
openings)
- Use worm composting (vermicomposting)  
for food scraps



# **Benefits of compost**

## **Promotes soil health**

- **Supplies organic matter to soil**
- **Attracts earthworms**
- **Stimulates beneficial soil microorganisms**
- **Increases soil water holding capacity**
- **Increases soil nutrient retention**



# **Benefits of compost**

## **Promotes soil health**

- **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 – add no more than 2 inches work it into the top 4-6 inches of soil.
- Surface mulch - apply 2-3 inches deep and 3-4 inches from the trunk out to the drip line.
- Top dressing for lawns -  $\frac{1}{4}$  inch overtop after core aeration.
- Potting mix – mix one third volume to regular potting mix.

# Follow-up Survey

- **Program evaluation to learn**
  - What you think of today's workshop
  - If you have made use of what you learned today
  - If you are composting and what you are composting
- **Evaluation will be done about 4 months from now after you have had a chance to**
  - do some composting
  - use your new bin.
- **Look for a survey in the mail this fall. Please fill it out and mail it back to us.**