

Week Two

Greens and **Browns**

Aerobic & Anaerobic

Composting

Greens

High nitrogen materials such as

Vegetable scraps (12-20:1)

Coffee grounds (20:1)

Grass clippings (12-25:1)



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)



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
- Usually contain less water

Approximate ratio: 2/3 browns to 1/3 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
- Usually contain more water

Composting Methods

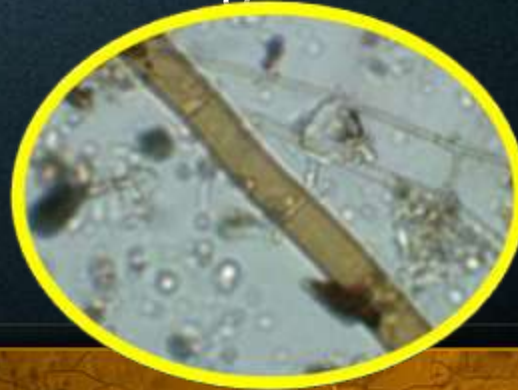
- Passive Pile Method
 - *not approved for certified organic production*
- Windrow Method
- Aerated Static Pile Method
- Aerated static and windrow methods should have:
 - temperature of 120 to 140° F
 - moisture content of 50 to 60 percent.
 - pH of 6.5 to 8.5
 - bulk density of less than 1,100 pounds per cubic yard (40 lb per cubic foot)

Passive Pile Method

- Organic materials placed on a pile and left to decompose over a long time
- Weed seeds and pathogens are not killed
- Manure is an example of passive pile method
- Foul odors usually accompany this method
- Air, water and C:N ratio not balanced and human intervention is usually none at all

Anaerobic Bacteria

- Work when O_2 is limited
- Break down materials slowly but produce undesirable by products
 - Noxious odors
 - Organic acids that may kill plant roots
 - That is how methane or “bio-gas is made





Simple Bio-gas (methane) production

Plastic Bag Method (Fully Closed)

- 30-40 gallon plastic bags filled with plant wastes, fertilizer, and lime
- About 1-3 tablespoons of a garden fertilizer with a high N content should be used per bag.
- Lime (one cup per bag) helps counteract the extra acidity caused by anaerobic digestion.
- Add about 1-2 quarts of water.
- Close tightly.
- Double-bag to keep air tight
- Set the bag in secure site for 6-12 months
- Requires no turning or watering
- Slow due to low oxygen
- Materials should have 30:1, & 50% by volume water



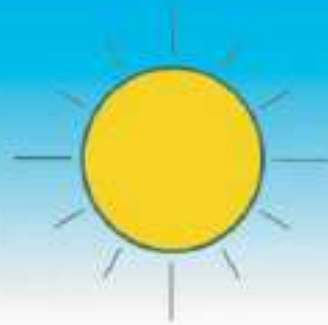
Green Cone Composting



Some materials, such as meat, fish and dairy products may cause problems if composted in a standard compost unit. A Green Cone should be used for these (do not add cheese)

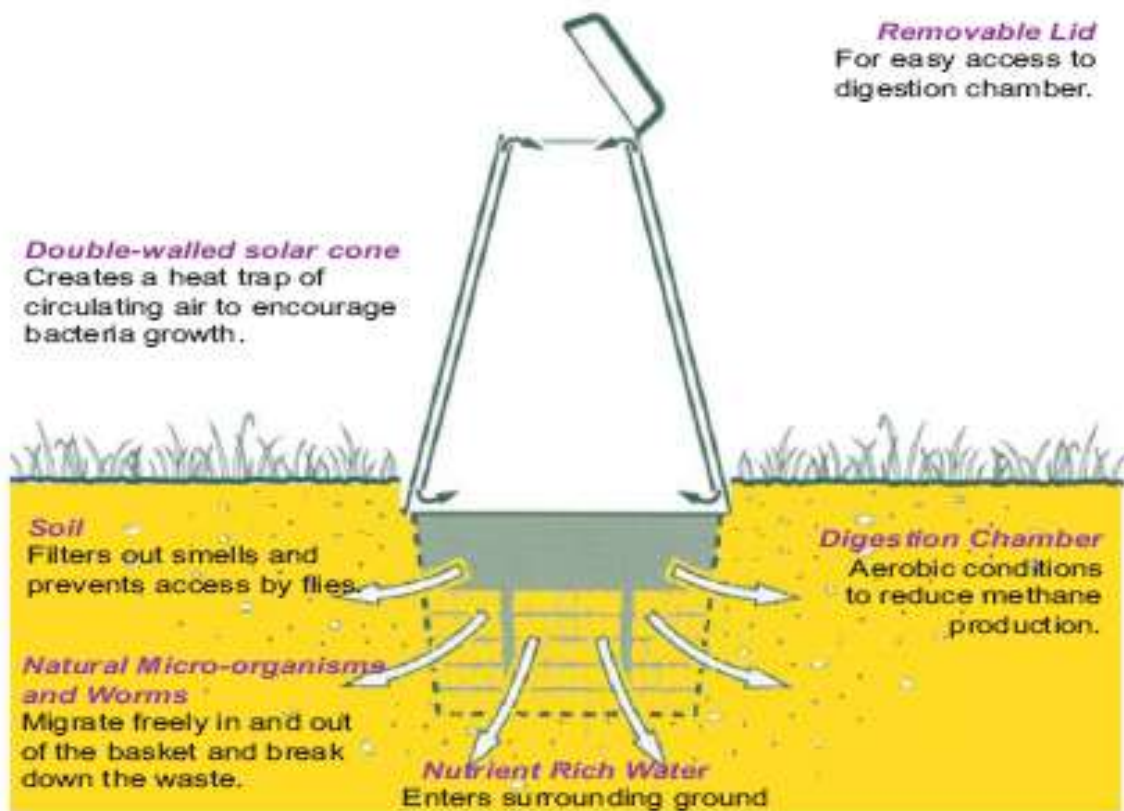
The Green Cone is a digestion unit that converts the waste into a liquid form that seeps into the soil surrounding the unit. The unit is designed to require little maintenance - all you need to do is add food to it, a little at a time.

Sunlight
Provides energy source for the digestion process.



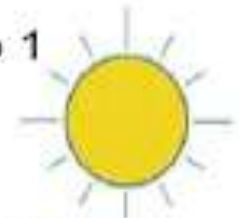
Removable Lid
For easy access to digestion chamber.

Double-walled solar cone
Creates a heat trap of circulating air to encourage bacteria growth.

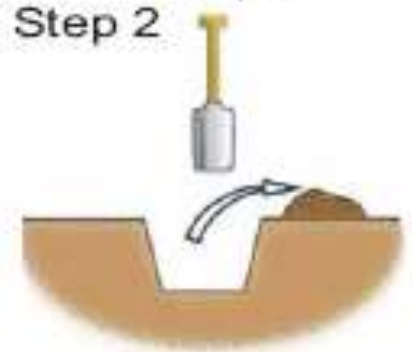


Over 90% of the waste material in your Green Cone will be absorbed as water by the soil.

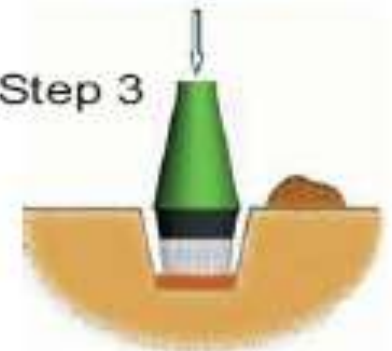
Step 1



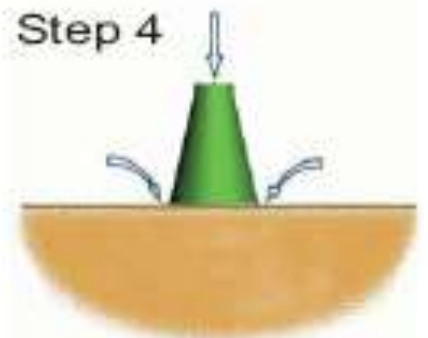
Step 2



Step 3



Step 4



Composting Methods

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- Aerated static and windrow methods should have:
 - temperature of 120 to 140° F
 - moisture content of 40 to 60 percent.
 - pH of 6.5 to 8.5
 - bulk density of less than 1,100 pounds per cubic yard (40 lb per cubic foot)

Windrow Method

- Approved for certified organic production
- Feedstock material is placed in a long narrow pile
- The pile is turned or mixed regularly by front loader or compost turning machines to provide oxygen and maintain particle size distribution
- Pile is turned when temp drops below 120°F
- Water is added each time mixing is done
- Usually about 10 ft wide by 3 ft high

PFRP Requirements

- PFRP stands for “processes to further reduce pathogens” standard
- Stipulates that composting processes must be maintained to reduce levels of organisms harmful to humans
- These organisms are classified as
 - Human Pathogenic Organisms (HPO)
 - Vectors that carry these organisms are included too
- [Watch windrow video from Philomath, OR](#)



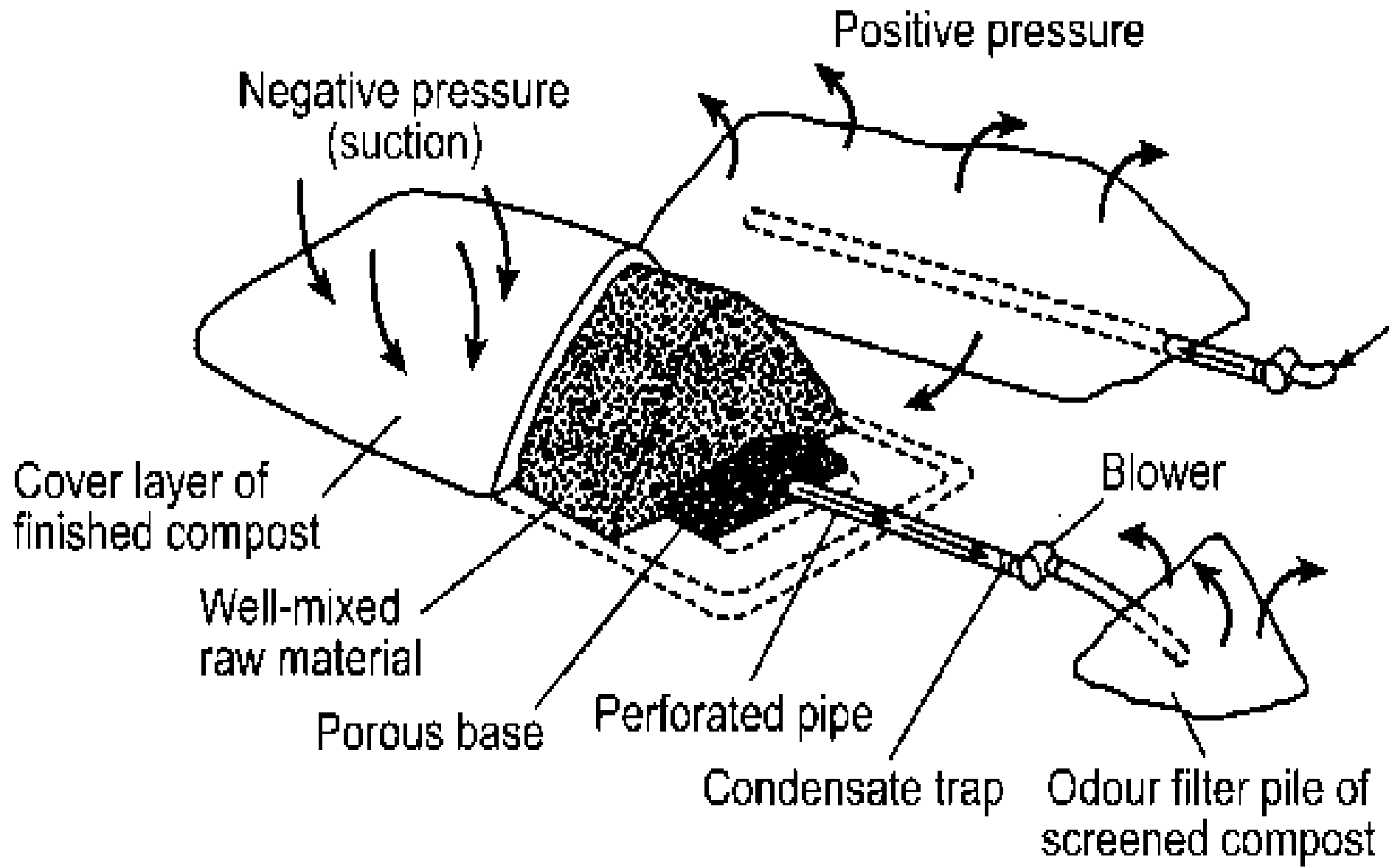


Aerated Static Pile Method

- Approved for organic production
- Pile is not turned
- Instead air is supplied through perforated pipes from a blower for oxygen
- Insulated layer of compost or bulking agent usually covers the pile to:
 - Retain heat
 - Reduce moisture loss
 - Prevent egg-laying flies
 - And acts as a filter against odors
- Composting is fast here about 3-5 weeks

Aerated Static Pile Method

- Feedstock is usually piled on top of a 6-inch base of porous material such as wood chips, chopped straw
- Perforated pipe placed below the base material
- Piles are added 5-8 feet high
- Fans/blowers deliver air to base to flow through the pile
- Suction through pipes can draw air too into the pile
- Pile should extend beyond the porous base to pump air into the pile
- Length of pile should not be more than 90 ft









Laying a base of wood chips on the aeration piping.



Totes of whole fish are added to the pile.



Whole fish and wood chips will make compost!

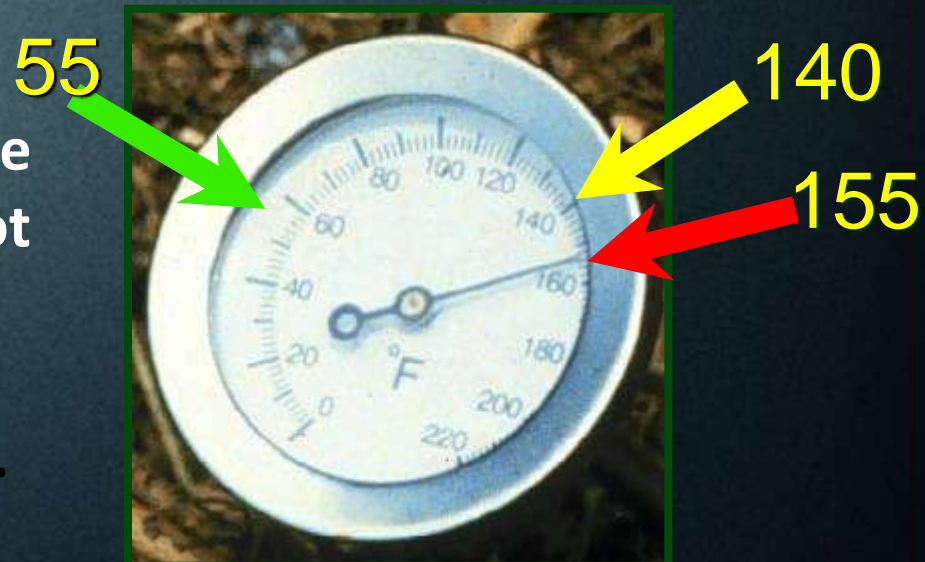


Turning the pile lets off heat and helps homogenize the mixture.



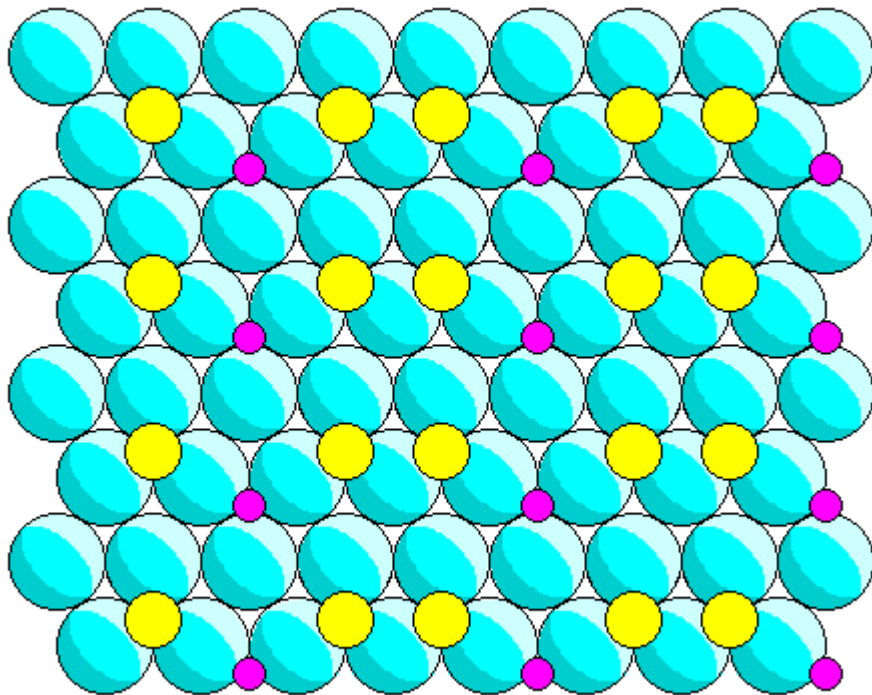
Aerobic Composting and Temperature

- 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**
- **You need 120-150 degrees F for 15 days or longer**

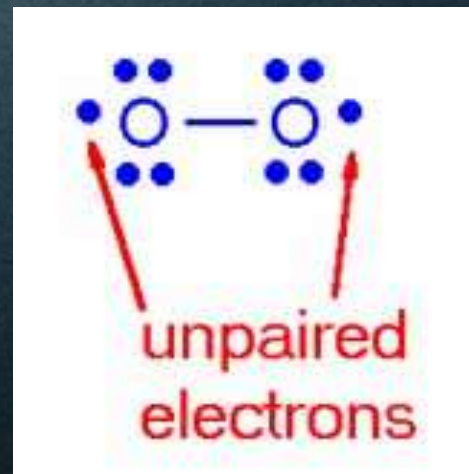
Oxygen Requirement



- Aeration: microbes need oxygen
- Less oxygen leads to odors unless using plastic bag method (fully closed)
- Adequate O_2 you need free air space of 55-65% by volume.

Oxygen Requirement

- Adequate O_2 you need free air space of 55-65% by volume.
- Measure this with a five-gallon bucket and one-gallon milk jug
- Materials needed--→



Oxygen structure

O₂ Requirement Determination

- A five-gallon pail
- A one-gallon plastic milk jug
- Typical mix of materials added to the compost pile (manure, grass clippings, straw, wood chips, shredded bark, etc.)



- 1. Pour 5 full jugs of water to big container -
Mark full line**
- 2. Fill 5 gallon container 1/3 full with compost
pile material**
- 3. Drop bucket onto cement floor 10 times from
height of 6 inches**
- 4. Add compost 2/3 and repeat as above**
- 5. Add compost to full line and repeat**
- 6. Add final compost materials to full line**

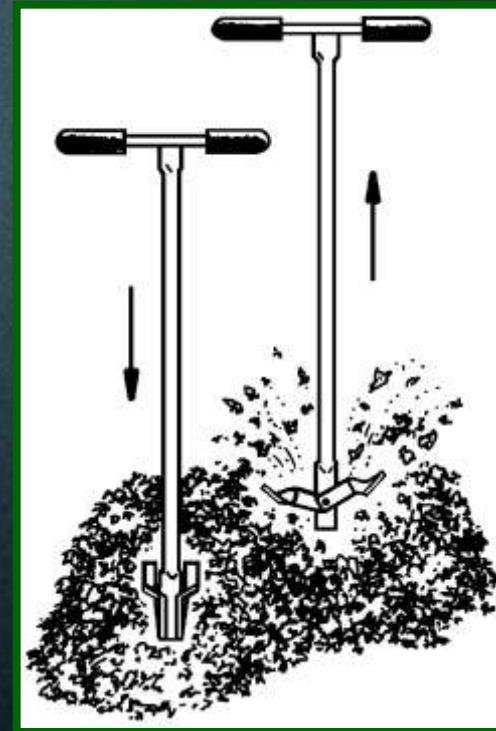
- **Measure and add water till it starts to overflow**
- **If you add 2.75 to 3.25 gallons of water before overflowing = OK**
- **If you cannot add at least 2.75 gallons of water you have inadequate free air space. Add more bulking material like straw, coarse wood chips, or shredded bark.**
- **If you can add more than 3.25 gallons of water without spilling, you have too much free air space - reduce the particle size. Do this by grinding or shredding the materials or by adding finer materials to the mix.**
- **Make the needed corrections and re-test until the test shows the correct initial free air space.**

Pile Aeration

Mix Your Pile Every 5-7 Days



- 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
- Approximately 40% to 65% moisture
- 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



Weight and Moisture Content

- For two materials, the general equation can be simplified and solved for the mass of a second material (Q_2) required in order to balance a given mass of the first material (Q_1)

$$Q_2 = \frac{(Q_1 \times G) - (Q_1 \times M_1)}{M_2 - G}$$

Q_n = mass of material n ("as is", or "wet weight")

G = moisture goal (%)

M_n = moisture content (%) of material n

- For example, suppose you wish to compost 10 lb grass clippings (moisture content = 77%). In order to achieve your moisture goal of 60% for the compost mix, you calculate the mass of leaves needed (moisture content = 35%):
- $Q_2 = ((10 \text{ lb})(60) - (10 \text{ lb})(77)) / (35 - 60)$
= 6.8 lb leaves
- Online calculator <http://compost.css.cornell.edu/calc/1a.html>

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Ingredient	% H2O	Weight	
Grass clippings	77	10	
Sawdust	20	5	
Dry leaves	33	10	
		Solve for % Moisture:	48

Calculate

Reset

End of Week Two