Home Composting

"…because rinds, limbs, manure, leaves, garden cleanout, etc...are Terrible Things to Waste!!"

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Composting to Reduce the Waste Stream and…. Make a Great Soil Amendment

REDUCE

REUSE

RECYCLE

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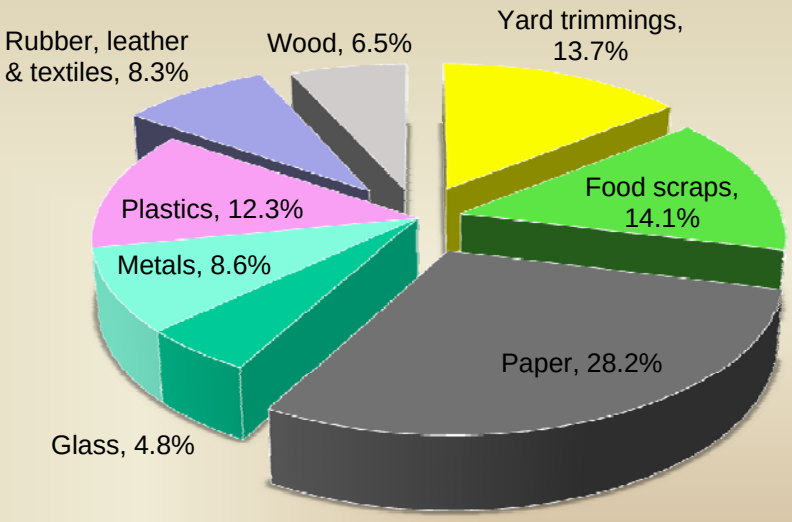
US Waste Stream



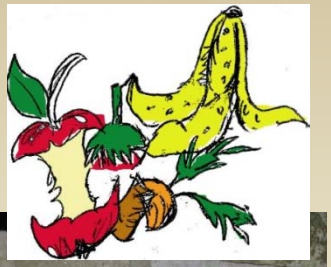
Composting can also help solve our society's solid waste disposal problem. *Organic residuals can comprise over 60% of our solid wastes nationwide.

*USEPA Municipal Solid Waste in the US: Facts and Figures 2009.

The Process of Composting

Composting converts organic waste such as leaves, kitchen scraps and garden wastes…, into a valuable product which, when used in the garden, results in healthier plant growth when added to garden soil.

Think About Residuals Available to Compost



- Food waste
- Food processing
- Leaf and yard waste
- Garden residuals
- Manure
- Weeds

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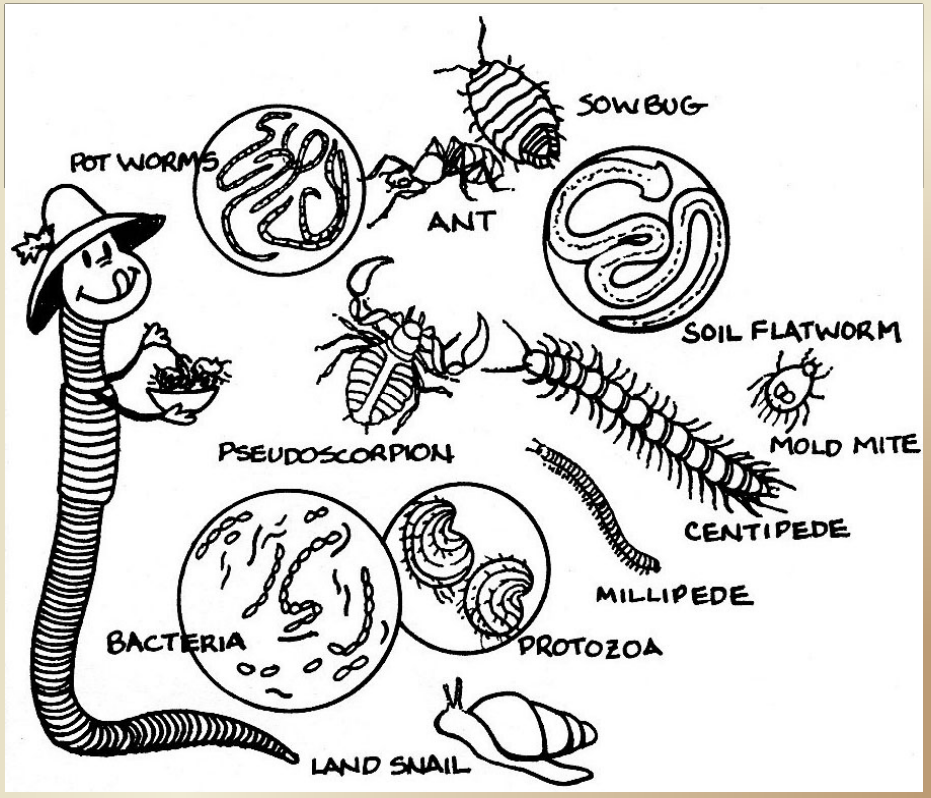
How the Composting Process Works

1. Organisms involved in the composting process
2. Variable components in the composting process
3. Types of materials (feedstocks) that can be composted
4. Home composting systems
5. Uses of compost

I. Organisms Involved in the Compost Process



What Makes the Compost Process Work?

Micro and macro organisms are key….

- to keep volunteers happy, what do we have to do?

Volunteers require:

1. Food
2. Shelter
3. Moisture

Decomposition is a natural part of the nutrient cycle of living things. Composting is simply human intervention to enhance and accelerate the decay process.

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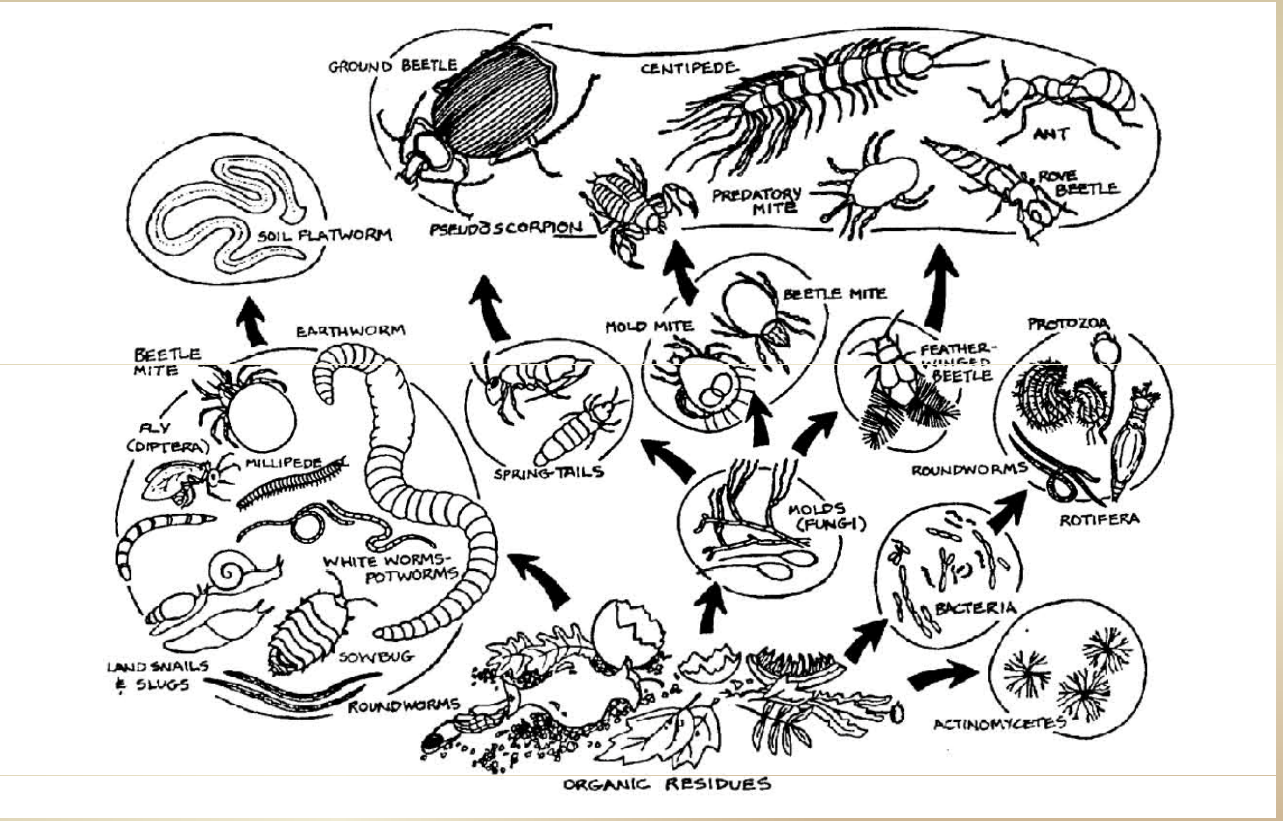
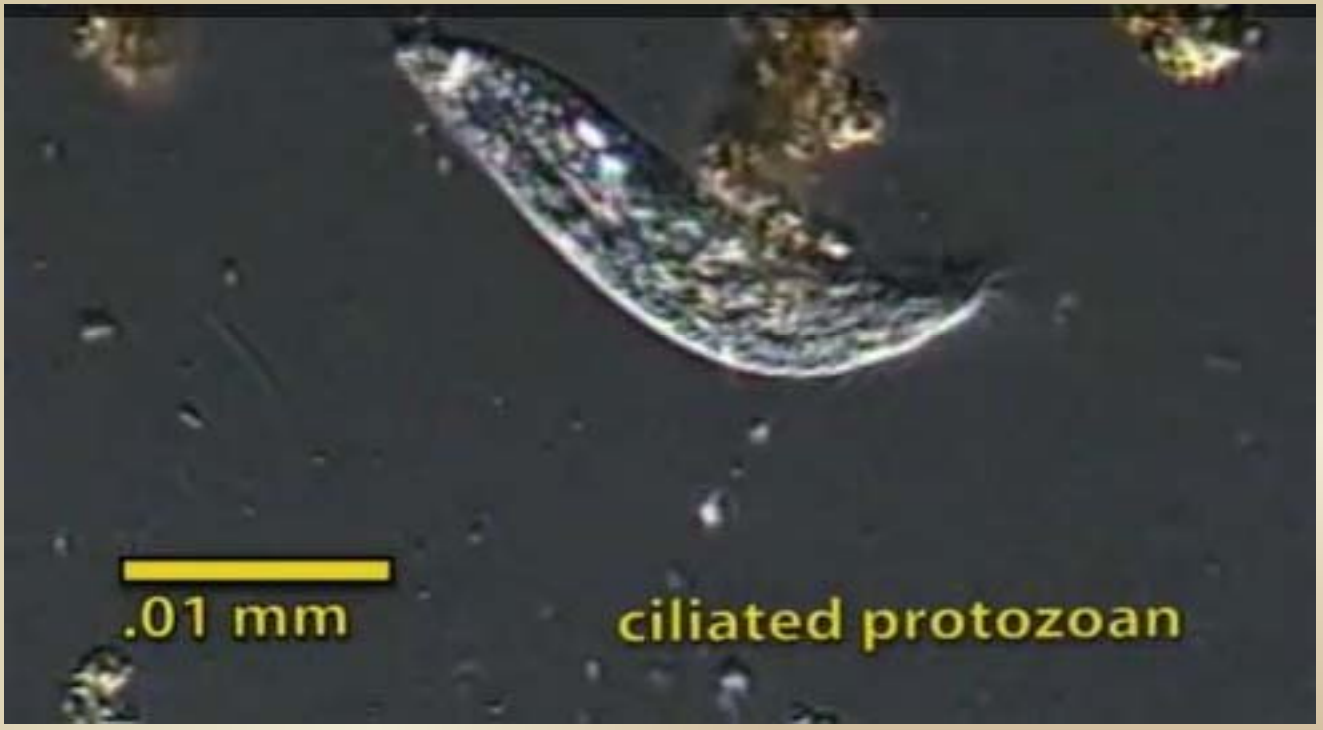


Composting is a microbiological process. Organisms use decaying matter as their food source. Bacteria are among the simplest and most common organisms. Single-celled and microscopic, they are found almost everywhere in the environment.



Source: Vermicompost: A Living Soil Amendment video by Allison Jack

Organisms have evolved to use decaying matter as food source.

Fungi and molds are also important. This *Meripilus giganteus* (giant polypore fungi) appears on stumps and at the base of some living broad-leaved trees.

Q. Are bacterial inoculants required for composting?

A. No. Bacteria and other decomposers occur everywhere in the environment.

Bacteria reproduce very quickly and are naturally present in air and soil, so there is usually no need to add them to the compost pile. Of the many inoculants, or compost starters available, the best is freshly made compost.

Mites and other soil invertebrates feed on bacteria and fungi, helping to keep their populations in check. Competition among the different organisms insures that only the most efficient decomposers multiply.

Earthworms are perhaps the most familiar decomposer. By blending soil and organic matter in their digestive track, they produce stable, nutrient-rich aggregates (worm castings) that improve the structure of soil.

Springtails

Mites

All decomposers are bound together in a complex feeding web. They turn organic wastes into a beneficial soil conditioner.

Spiders

Earthworms

Nematodes

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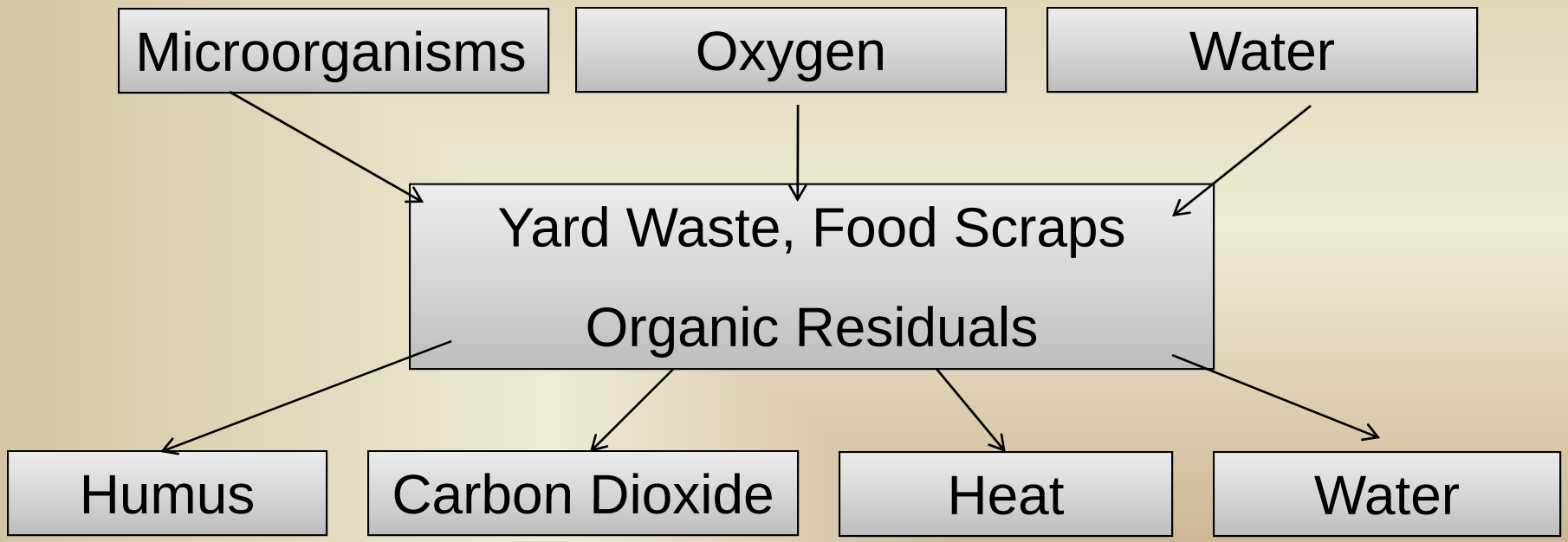
II. Variable Components in the Composting Process

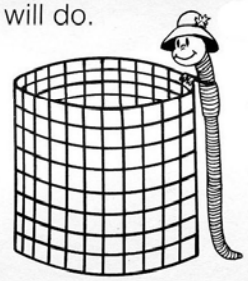
The Composting Process



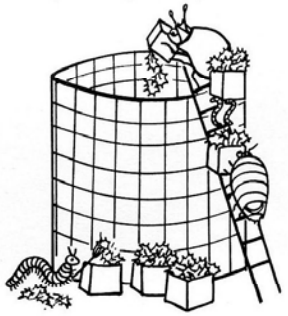
While the natural process of decomposition will occur without any assistance from us, several factors can be managed to accelerate the compost process.

BEST EVER Compost Recipe

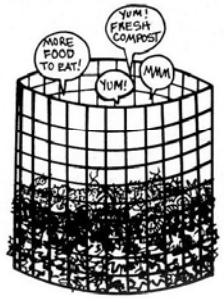
1. Choose a "pot" for baking your compost. Any type of composting bin will do.



2. Place kitchen or yard wastes into the composting bin. Chop or shred the organic materials if you want them to compost quickly.



3. Spread soil or "already done" compost over the compost pile. This layer contains the microorganisms and soil animals that do the work of making the compost. It also helps keep the surface from drying out.



4. Adjust the moisture in your compost pile. Add dry straw or sawdust to soggy materials, or add water to a pile that is too dry. The materials should be damp to the touch, but not so wet that drops come out when you squeeze.

5. Allow the pile to "bake." It should heat up quickly and reach the desired temperature (90° to 140°F, or 32° to 60°C) in four to five days.

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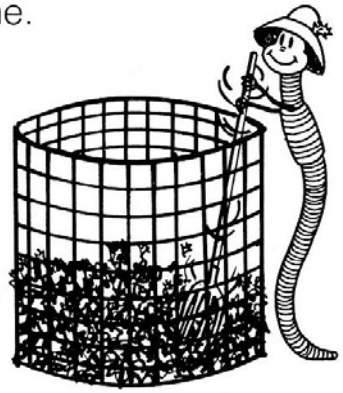
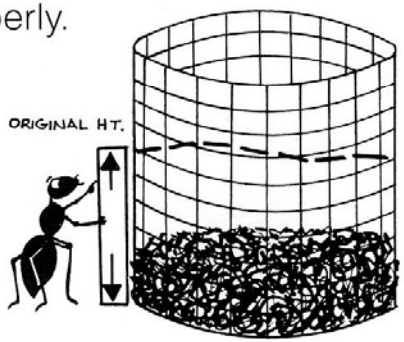
BEST EVER Compost Recipe

6. Stir your compost as it bakes if you want to speed up the baking time.



7. The pile will settle down from its original height. This is a good sign that the compost is baking properly.



8. If you mix or turn your compost pile every week, it should be "done," or ready to use, in one to two months. If you don't turn it, the compost should be ready in about six to twelve months.

9. Your "best ever compost" should look like dark crumbly soil with small pieces of organic material. It should have a sweet, earthy smell.

10. Feed compost to hungry plants by mixing it with the soil.

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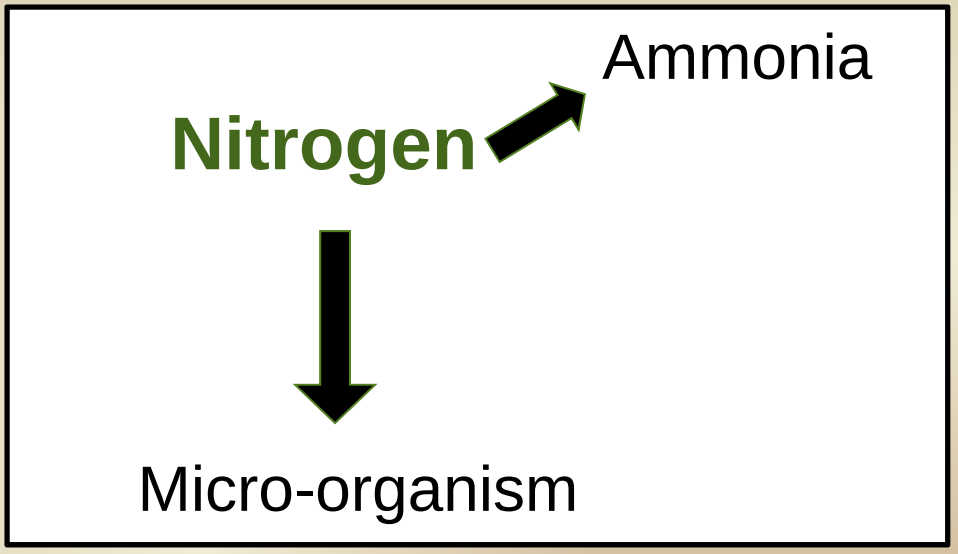
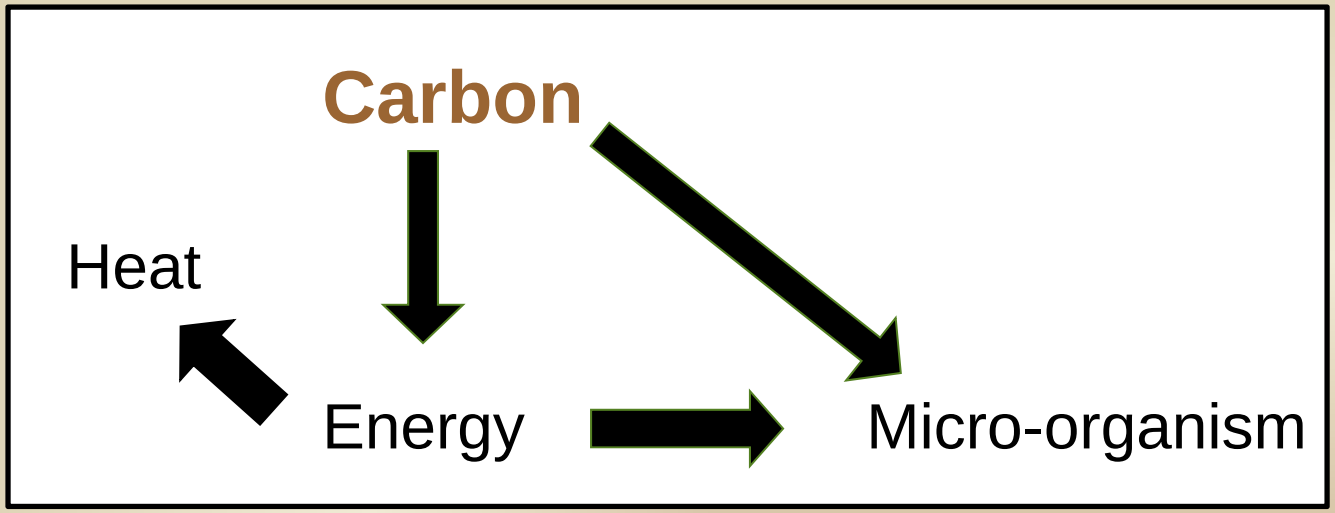
Nitrogen Cycle



Organisms use nitrogen to grow and reproduce.

Low nitrogen = slow decomposition
Excess nitrogen = ammonia will volatilize, creating odor

Carbon Cycle



Organisms utilize carbon as a source of energy.

Low carbon = wet pile, dense conditions
Excess carbon = dry pile, slow decomposition

Materials With High Nitrogen Value

Material	C:N
Humus	10:1
Food Wastes	15:1
Grass Clippings	20:1
Cow Manure	20:1
Horse Manure	25:1

The optimum C:N ratio is about 30 to 1. This ratio will make fast, hot compost. Grass, animal manures and fresh green plants are high in nitrogen.

Materials With High Carbon Value

Material	C:N
Fruit Wastes	35:1
Foliage	40-80:1
Corn Stalks	60:1
Straw	80:1
Bark	100-130:1
Paper	170:1
Sawdust	500:1
Wood	700:1

Leaves, brush, sawdust and wood chips are good sources of carbon. Blending carbon sources with nitrogen-rich materials can balance C:N ratio.

Surface area is another key factor to consider; decomposition occurs in thin films on the surface of particles. A large particle has less total surface area than the same particle chopped up.

*Large particles (woodchips) = better aeration and less labor but take longer to breakdown.

*Small particles (sawdust) = more surface area, less pore space to circulate air and more labor to aerate.

Organisms need moisture. Decomposition will slow with too much or too little moisture. The optimum moisture content for compost is 40-60%, damp enough so that a handful feels moist to the touch, but dry enough that a hard squeeze produces no more than a drop or two of liquid.

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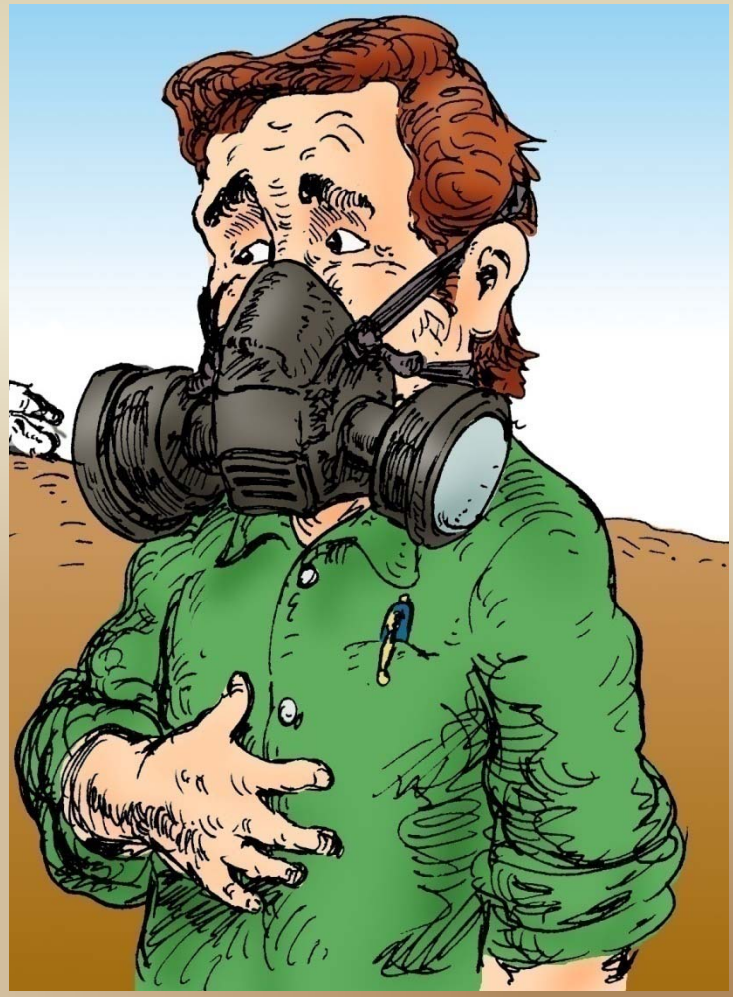
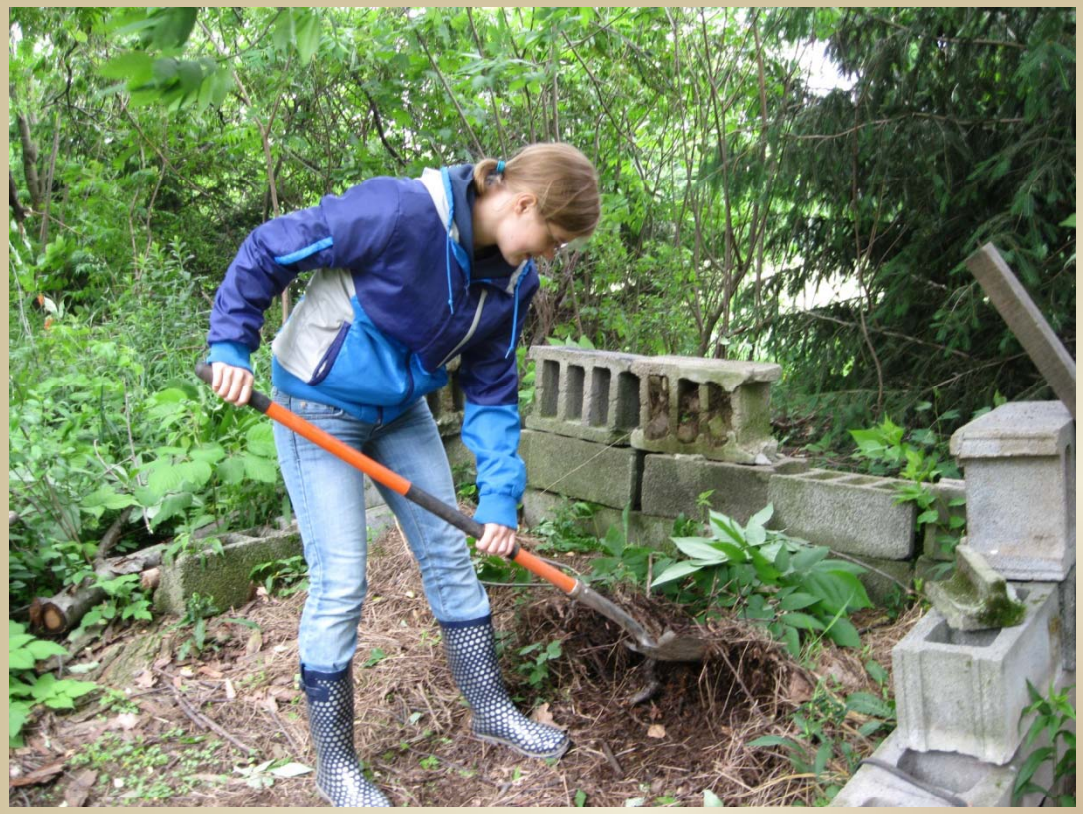
Aerobic organisms require oxygen to live. Their "aerobic" activity forms carbon dioxide and heat as by-products. If oxygen starved, the process can become "anaerobic."
IT STINKS!
The by-products of anaerobic decomposition include methane and hydrogen sulfide gas. Hydrogen sulfide smells like rotten eggs.



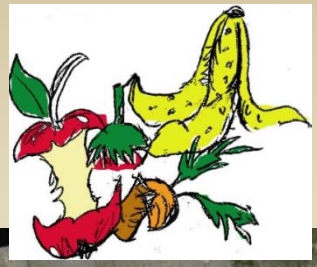


Oxygen will move into the pile if it is loose and there is plenty of space between particles, as when straw is mixed in the pile. Finer material may need to be aerated by turning the pile with a pitch fork or shovel. With the rapid decomposition that occurs with high nitrogen materials, turning becomes necessary to prevent anaerobic conditions from developing.

Heat will be given off as organisms feed on wastes and break them down into less complex molecules. Ideal temperatures for composting are between 90º - 150ºF. High temperatures can help kill weed seeds and disease organisms, but temperatures above 150ºF will also kill the decomposers and slow the process.

Compost piles should be a minimum of one cubic yard in size. Smaller piles may not have enough mass to hold the heat of decomposition.

Feedstock



Food waste

Food processing

Manure

Weeds

Garden residuals

Leaves

Yard waste

Pond weeds

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Q. What Creates the Heat in a Compost Pile?

- Sun?
- Fire?
- Heat source?
- Bacteria?
- Microbes?
- Worms?

A. What Creates the Heat in a Compost Pile?

Sun

Fire

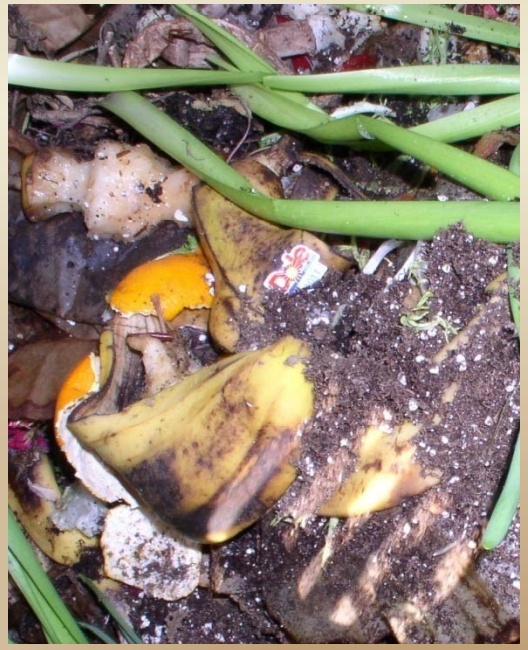
Heat source

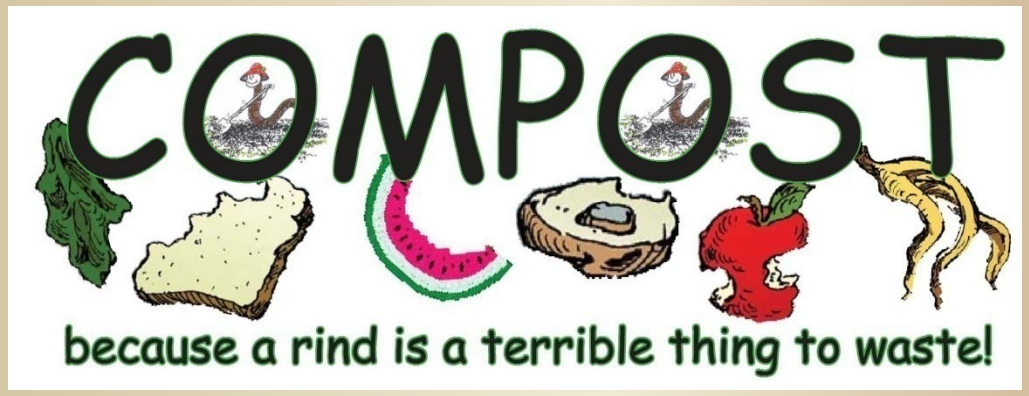
Bacteria

Microbes

Worms

III. Materials (feedstocks) that can be Composted





Almost any type of organic material can be composted; some decompose more easily than others.

Maple leaves have a C:N ratio near the optimum level of 30:1. With the right moisture and frequent turning, maple leaves can break down in just a few weeks time.

Oak leaves have a C:N ratio of about 60:1 and have high levels of tannins which are resistant to decay. Mixing leaves with high nitrogen material will accelerate their decomposition.

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Wood Chips

1. Have a high C:N ratio, large particle size, and break down relatively slowly.
2. Are used in landscaping composting process.
3. Are often available free from tree services and utility companies for use as mulch.
4. Using chip or chunky material in any pile will help airflow and require less turning.

Leave’em on the lawn! They decompose and return nutrients and organic matter to the soil. Clippings will not contribute to thatch buildup.

Fresh grass clippings are high in nitrogen, about 20:1. They are too wet and will mat, creating unpleasant anaerobic odors. They will compost well when mixed with a carbon source such as leaves or brush.

Clippings from home lawns treated with pesticides may contain chemical residues. With few exceptions, these residues will not persist from one growing season to the next. If the type and level of pesticide used is unknown, those materials should not be added to the compost pile.

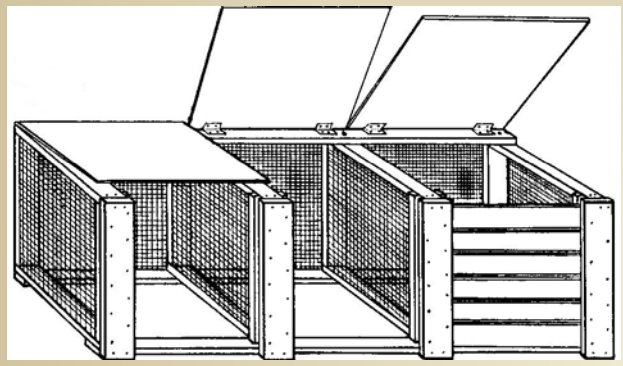
Food scraps can be composted at home. Dairy and meat products should not be composted in small piles, they attract your pets, rodents and other pests.

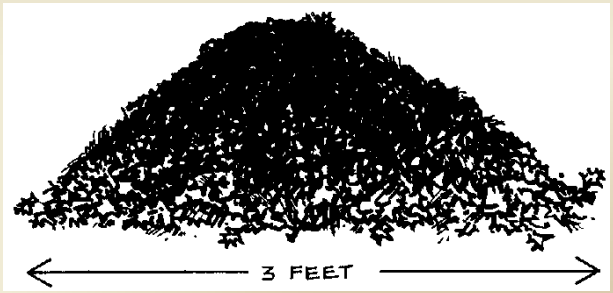
Wood ash is not recommended as a compost feedstock. Ash contains potassium but also contains other contaminants that may not be good in vegetable gardens.

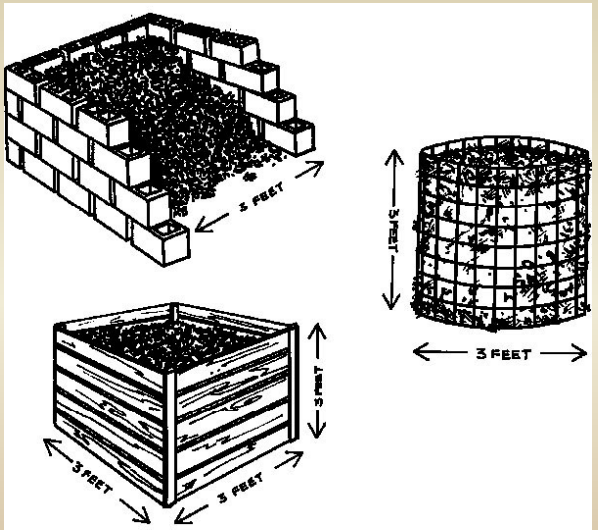
Manures are high in nitrogen and contain many organisms helpful to the compost process. While livestock manure is a great feedstock, dog and cat feces may contain parasites which can spread disease.

Coarse material, such as corn stalks, small tree and shrub limbs, can also be composted. Shredding increases the surface area that organisms can work, decreasing the time required for composting.

IV. Composting Systems

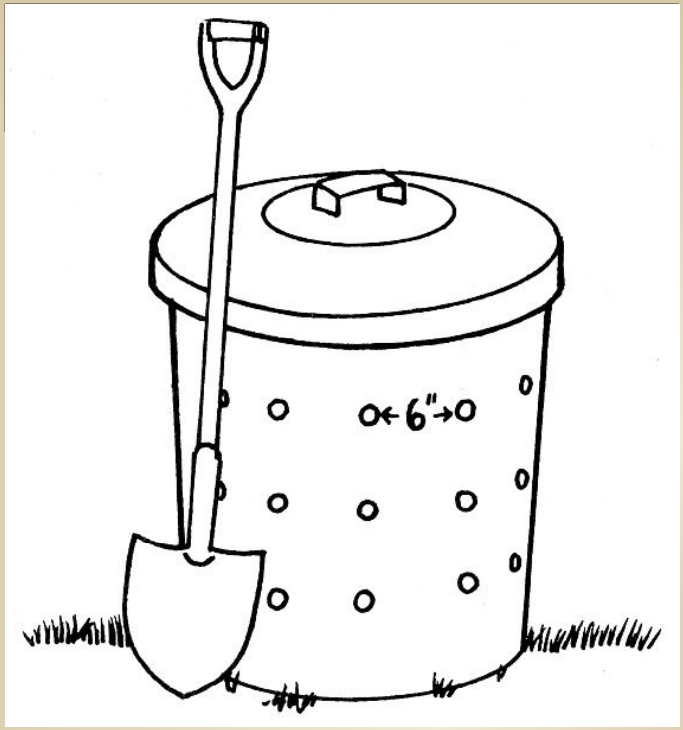




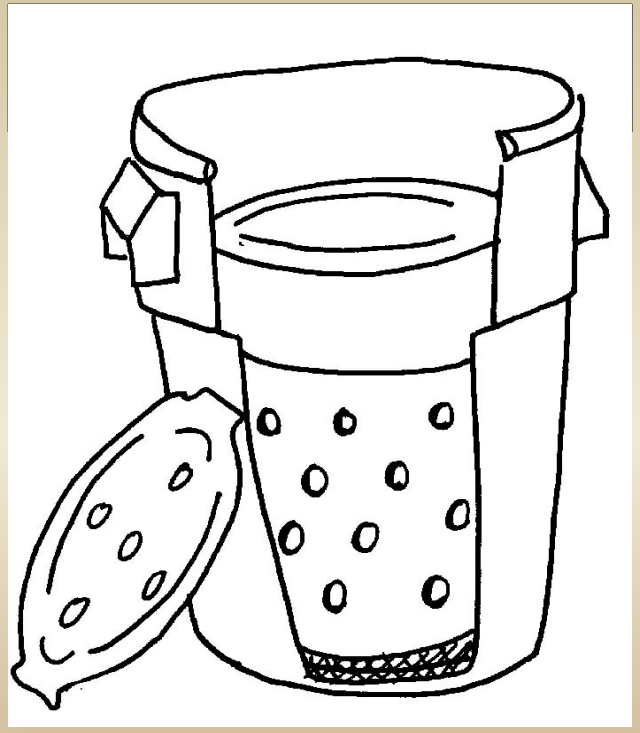


Many options are available for producing compost:

- Holding units
- Tuning units
- Direct incorporation of feedstock
- Rotating drums
- Vermicompost units



Single can composter used outside.



Two-can composter used inside.

Can composter units can be used for food or garden wastes.

A **wire holding unit** made from fencing or chicken wire. This bin works well for light materials like leaves.

Used **pallets** are often available for free from manufacturers. Tied or nailed together, they effectively contain compost in a stable structure.

Moving compost from bin-to-bin on a weekly basis makes rapid compost and provides considerable, strenuous exercise! The **turning unit** method is used to make compost quickly and is more suitable for food wastes. Compost is turned frequently to provide aeration.

Three bin **turning unit** with removable front boards.

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Homemade **rotating drum.**

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Rotating drums take some of the work out of turning, and are available from garden supply stores. Some units can represent considerable investment for the volume of material composted.

Direct incorporation, may be the easiest way to dispose of small amounts of organic waste by burying it in the garden or yard. Bury food waste at least 6-8” deep to keep animals from digging it up. Care should be taken not to damage the roots of nearby plants.

V. Compost Uses

Recycling food and yard waste provides many benefits for soil and plant response. Compost supplies small amounts of nutrients but the organic matter significantly improves soil structure, allowing better drainage in heavy clay soils and improved water retention in light sandy soils.

Screened compost can be blended with soil and peat and used as a growing media for containerized plants. A simple screen can be made with hardware cloth and a wood frame.

Coarse, partially decomposed compost can also be used as a mulch. Mulches are useful for water retention and weed control, but have a cooling effect on soil and will delay maturity of warm weather crops.

Home composting provides households to convert waste material into a valuable soil amendment. The result is a healthier, more productive and easier to maintain garden. Composting at home reduces our carbon footprint because organics do not require trucking and it keeps a resource out of the landfill!

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Benefits of Using Compost

1. Adds organic material.
2. Builds healthy soils where a diverse group of beneficial organism thrive.
3. Helps suppress disease.
4. Increases moisture holding capacity in soils.

Note: Immature compost should not be used for germinating seedlings and can affect the health of mature plants.

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Recycling Organics Makes Good Sense!

Healthy Soils =
Healthy Food!

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Resources

- It's Gotten Rotten (video)
  http://hdl.handle.net/1813/11656
- Composting at Home: the Green and Brown Alternative
  http://cwmi.css.cornell.edu/compostingathome.pdf
- Composting at Home slide show
  http://compost.css.cornell.edu/homecompostingslides.pdf
- Composting: Wastes to Resources
  http://cwmi.css.cornell.edu/compostingwastestoresources.pdf
- Composting to Reduce the Waste Stream
  http://cwmi.css.cornell.edu/compostingtoreduce.pdf
- Cornell Cooperative Extension (county offices)
  http://cce.cornell.edu/learnAbout/Pages/Local_Offices.aspx
- Vermicompost: A Living Soil Amendment
  http://cwmi.css.cornell.edu/vermicompost.htm

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