Composting 101

OREGON STATE UNIVERSITY
EXTENSION SERVICE
Master Gardener™ Program

What is composting?

- Composting is a ***controlled*** biological process in which microorganisms convert organic materials into a nutrient-rich soil amendment called compost.

Composting is important!

- It reduces the amount of organic material entering the waste stream
- It is the most ***cost effective*** method of processing organic waste
- It creates a valuable soil amendment

Composting Methods

- Hot composting
- Cold composting
- Vermicomposting (Worms)

Hot Composting

- Advantages:
  - Speed
  - Weed & disease suppression
- Disadvantages:
  - Effort
  - Requires careful control of moisture and content
  - The whole pile usually built at once

Cold Composting

- Advantages:

  It takes less effort than hot composting

  It can be done right in the field or garden

  It can be done with worms—vermicomposting

- Disadvantages:

  It is slower than hot composting

  It may not kill weed seeds and pathogens (unless you're using worms)

Composition of Materials to Start a Compost Pile

- All organic materials contain substantial amounts of carbon

- These materials also have nitrogen and can be divided into two groups:
  - High-N (nitrogen) materials
  - Low-N (nitrogen) materials

High Nitrogen Materials "The Greens"

- Manures
- Fresh vegetation (grass, garden scraps, alfalfa, clover, etc.)
- Fruit & vegetable kitchen scraps
- Coffee grounds & tea bags
- Wood ash
- Seaweed

Low-N Materials
"The Browns"

- Leaves (dry)
- Cornstalks
- Shredded paper products
- Pine needles
- Straw (not hay!)
- Sawdust (very high carbon)
- Dryer lint

Starting Materials: do compost with...

- Disease-free, weed-free yard and garden waste
- Kitchen scraps
- Shredded paper
- Manure
- Leaves

Starting Materials:
Avoid...

Diseased or toxic plants
Weeds with seeds
Pest/herbicide residues
Meat, dairy, bones, fats, oils, grease
Pet or human waste
Wood ash, BBQ ash

The 7-Factor Method of Composting

1. The Carbon-Nitrogen ratio
2. Moisture content
3. Surface Area
4. Volume
5. Aeration
6. Temperature
7. Time

1. The Carbon-Nitrogen Ratio

- A C:N ratio of 15:1 to 25:1 is optimal for rapid decomposition
- Mix greens & browns in approx. equal proportions by ***weight***
- This *usually* ensures that content is in the correct range for both C:N *and* moisture

Carbon-to-Nitrogen Ratios for Common Materials

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

2. Moisture content

- The pile should always be about as damp as a wrung out sponge
- Water should be added as needed to keep the right consistency.
- A pile should usually be covered with clear plastic sheeting!

About as Damp as a Wrung-Out Sponge!

3. Surface Area

- Maximize surface area for faster decomposition
- Smaller particles work better!
- Use your mower to chop up big pieces – run over them several times!

4. Volume (pile size)

For hot composting…

- A pile should be *at least* 3 ‘x 3’ x 3’
- No larger than 6 ‘x 6’ x 6 ‘
- Finished volume will reduce by 1/2 to 2/3

5. Aeration

- A *hot* compost pile *should* be turned at least once a week or more!
  - Once per week is recommended unless it needs it more often due to temp!
- Temperature is the best indicator of the need for aeration.
- A pile should have air from all sides, if possible - some people use a perforated pipe stuck in the middle for air

6. Temperature

- A long thermometer stuck into the pile is the best way to gauge the temp, but you can use your arm.
- The average temperature range to be expected from a backyard compost pile is about 130-150°F
- Try not to let your pile go over 160°F
- 150°F will kill pathogens and weed seeds.

7. Time

- Your compost will finish sooner if you take the time to :
  - assure the correct C/N ratio
  - get the moisture content right
  - turn the pile as needed
- Hot Composting takes 6-8 weeks or less
- Cold Composting takes 3-6 months or more

Signs that the Composting Process is Finished

- **All** of these signs should be observed:
  - No discernible signs of starting materials remain
  - The pile just won't heat up any more, even after turning
  - Worms have invaded your compost pile
  - It has an "earthy" smell
  - If your pile does not heat up enough, look at the seven steps and see what's wrong.

"Augmented" Composting

- A pile can be added to periodically
- Fresh greens (like grass clippings) added to the pile weekly
- Pile is rebuilt by layering in the greens
- Ensures complete composting
- Takes longer
- Is something to do over the winter

Composting Containers

- Closed bins
- Open bins
- Piles (no bins!)
- Tumblers

Cold or Hot?
(Depends on effort and time!)

- Hot compost following the "7-Factor Method" in piles, containers or bins.
- Cold compost by just leaving a pile sit undisturbed in a corner of your garden or in a container or bin.
    - Layering greens/browns helps them decompose naturally in 6 – 18 months with little or no effort!

Three-Bin Cedar System

Bins can be used for "Cold" or "Hot" Composting

Multi-Bin System Using Pallets

Two-Bin System Using Blocks and Straw Bales

Various Commercial Bins

Straw-Bale Composting System

Tumblers

There are many different styles of tumblers available

Simple Wire Compost Surround

Use Leaves, Don't Bag Them!

There are dozens of uses for dry leaves around the garden!

Trouble-shooting

- Odors
- A pile won't heat up
- Pests are invading the pile

Odors

- Problem: materials are too wet
  - Solution: add dry, brown materials- layer materials for better results

- Problem: compaction (lacks oxygen)
  - Solution: aerate (turn) the pile more frequently

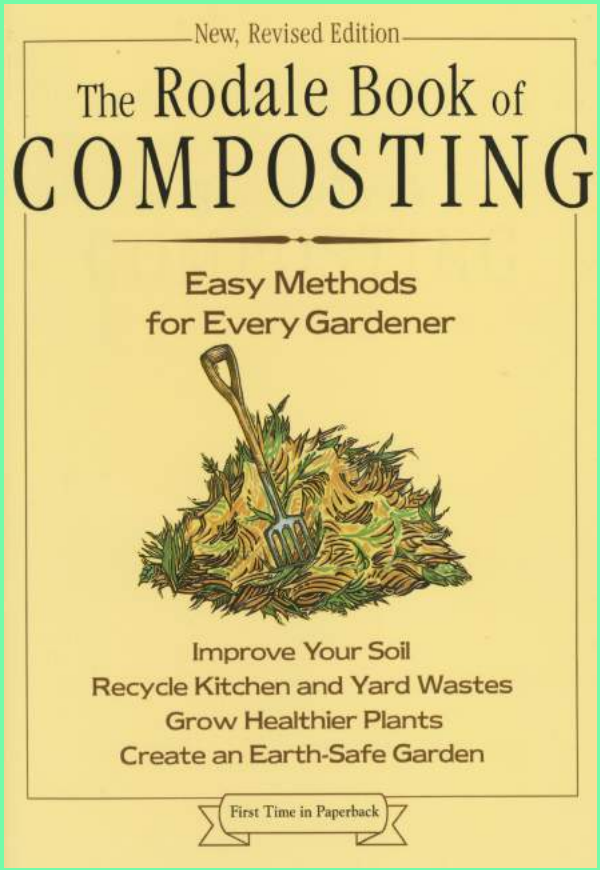
Pile Won't Heat Up

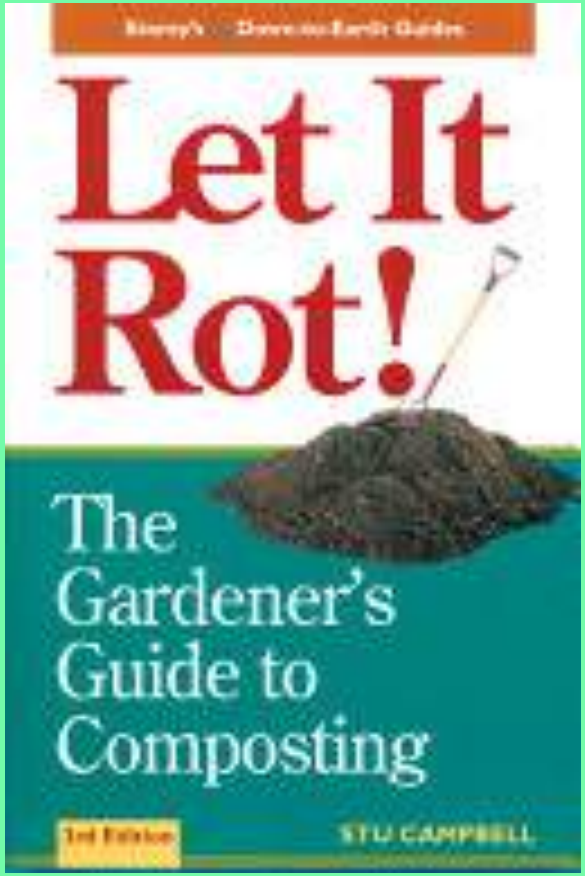
- Problem: not enough Nitrogen
  - Solution: add green materials
- Problem: not enough Oxygen
  - Solution: aerate, and add brown materials if the pile is too wet
- Problem: too dry, too wet.
  - Solutions: Water it as you turn it! Cover the pile!

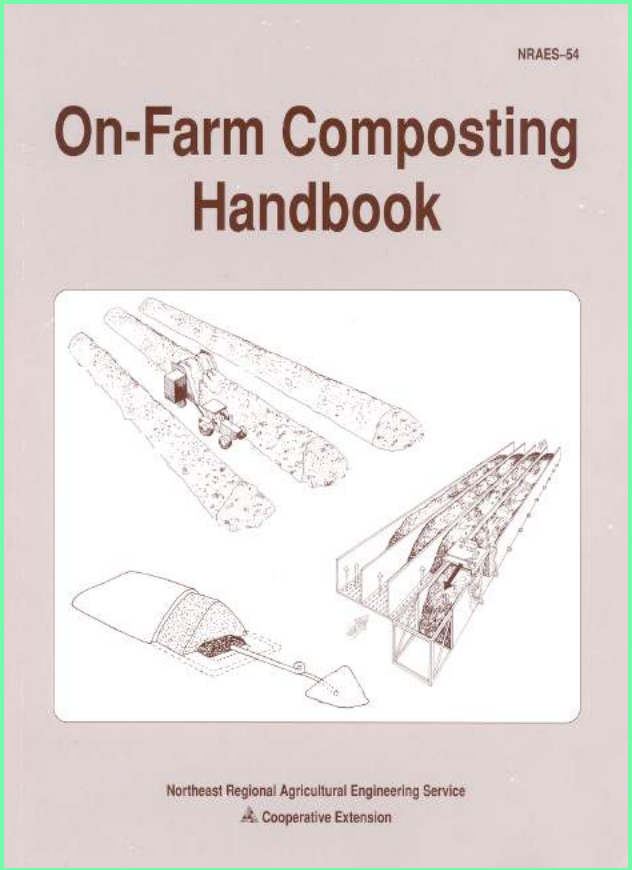
Pests are Invading the Pile

- Problem: vertebrate pests
  - Solution: don't add proteins like bones, meats, or oils. Covering the pile with a thick layer of brown materials (straw, leaves, etc.) often helps, too. Live with the animals (they help aerate).
- Problem: maggots
  - Solutions: the pile may be too wet/too cool or have proteins. Add brown materials, cover with clear plastic to heat it up & kill maggots.
- Problem: insects, spiders, armadillo bugs, etc.
  - Solutions: Turn pile, ignore them

Books for the Serious Composter







Websites for Composting, Vermicomposting, etc.

- Just "Google" for thousands of sites!
- http://www.youtube.com/watch?v=huWOOOZY6RY (video of baby worms being born!)
- http:/www.wormwoman.com
- http:/www.eugenerecycles.org
- http://www.journeytoforever.org/compost.html
- http://tinyurl.com/lsnzceo - (video of invertebrates in the soil web)
- http:/whatcom.wsu.edu/ag/compost/Easywormbin.htm

This last site has plans for an easy-to-make, two-bin, plastic tub worm bin!




Questions?

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