

# ***BACKYARD COMPOSTING:***

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# HOW DOES COMPOSTING HELP THE ENVIRONMENT?

- Yard waste uses up valuable space in our landfills
- Organic materials made up 65% of the trash going to landfills in 2006 (US EPA).
- By using a natural method, composting, we are helping the environment as well as generating something we can use in our gardens.
- Since 1994, yard waste has been banned from Indiana landfills. Some places now offer a yard waste recycling program.
  
- What could we do with the yard waste?
- We could burn it, but because of the high moisture content of yard waste, burning was impractical, plus open burning of leaves and trash is also illegal in Indiana.



# Materials for Composting

- Any plant material may be composted.
- Yard wastes such as leaves, weeds, and the remains of garden plants make excellent compost. ( disease issues? )
- Woody plant materials decompose slowly and are better ground or chipped and used for mulch.
- Grass clippings may be composted but are best left on the lawn; return nutrients to the soil.
- Sawdust, raw fruit and vegetable scraps, coffee grounds, & eggshells may be included.

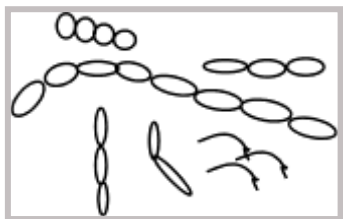


# BASIC COMPOSTING

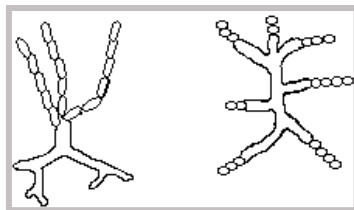
- The compost pile is really a smorgasbord of decomposers.
- Bacteria, the most abundant and effective microbial decomposers, are the first to feed on the plant materials.
- As they begin to break down, they produce heat as other active organisms do.
- Fungi and other one-celled organisms soon join in followed by insects, worms, and others.



# The Compost Food Web



bacteria



fungi




mites & springtails



Beetles &  
centipedes

- **Level 1** decomposers eat organic materials
- **Level 2** decomposers eat **Level 1's**
- **Level 3** decomposers eat **Level 2's**

# What's Happening in the Pile?



**Complex  
Carbohydrates >  
Simple Sugars &  
Organic acids >  
Humus**

- Organic matter is decomposed by living creatures
- Starting materials converted to 'less complex' forms
- It becomes "unrecognizable" humus



# **BIOLOGY LESSON**

- All plant materials contain Carbon and Nitrogen along with other basic elements.
- When feeding, the microbes convert Carbon into energy and Nitrogen into protein, the building blocks of all life on Earth.
- A good balance of Carbon (Browns) and Nitrogen (Greens) is necessary for good composting. The ideal balance or ratio is 30:1, in other words 30 parts of Carbon to 1 part of Nitrogen.
- Another way to look at it: 2 to 1 bulk ratio



# 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

# EXAMPLES OF COMPOSTABLE MATERIALS

MATERIALS	CARBON TO NITROGEN RATIO
Hog Manure	6 : 1
Poultry Manure (fresh)	10 : 1
Vegetable Wastes	12-20 : 1
Grass Clippings	12-25 : 1
Poultry Manure w/ litter	13-18 : 1
Coffee Grounds	20 : 1
Cow Manure	20 : 1
Horse Manure	25 : 1
Leaves	30-80 : 1
Straw	40-100 : 1
Corn Stalks	60 : 1
Tree Bark	100-130 : 1
Wood Chips	100 - 150 : 1
Paper	150 - 200 : 1

# *What Not to Compost*

## WHAT NOT TO COMPOST:

- (1) Any part of a Black Walnut tree. It contains a substance that can impede growth**
- (2) Foods, such as fish, meats, bones, dairy products, breads, fatty or greasy foods, or cooking oils. These items will attract all sorts of insects, rodents, and other unwanted pests. Some bacteria can't break them down.**
- (3) Wood ash – alkaline – also lime not needed**
- (4) Diseased plant material**
- (5) Pet waste**



# ***SURFACE AREA***

- The smaller an item is ground or chopped, the greater its surface area.
- The greater the surface area, the more space for microbes to feed.
- The more microbes that feed, the faster the composting takes place.
- grinding or chopping materials speeds up the composting operation. 2 inches is good
- A variety of sizes are needed for good composting to take place. Needs oxygen too.



# ***HOW TO START A COMPOST PILE***

- **First remove the grass or sod from the area where the pile will be placed. Direct contact with the soil insures that the plant material will be exposed to the decomposing microbes in the soil.**
- **Cover the area with coarsely chopped woody materials so excess water will drain from the pile.**
- **Start layering your compost materials until you have a pile about 10 inches high.**
- **Wet the mixture and then sprinkle a cup of commercial dry fertilizer (10-10-10 or 12-12-12).**
- **Then cover with either old compost material or soil. Repeat the process until you have the compost pile the size you desire.**

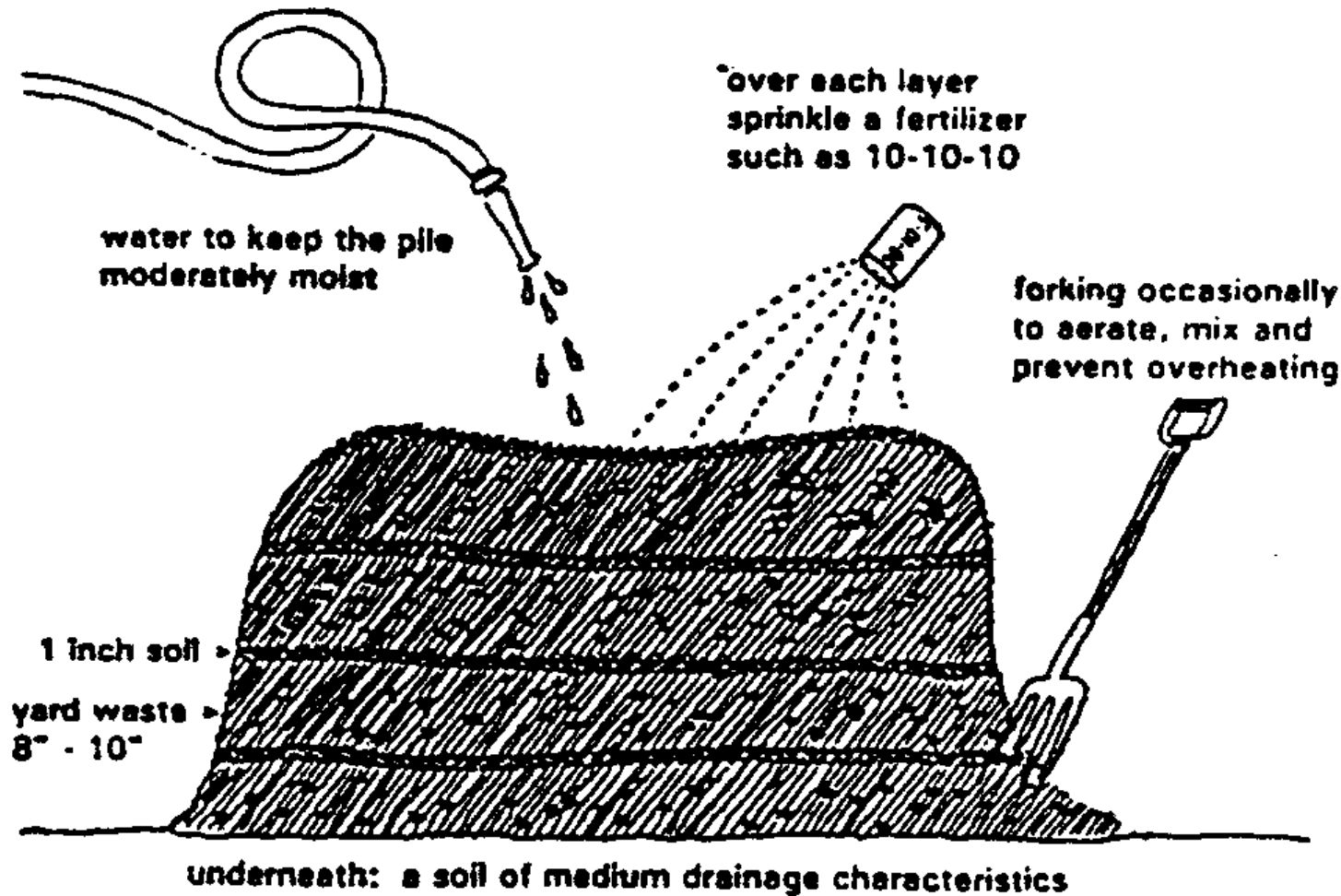


# ***HOW BIG SHOULD MY COMPOST PILE BE?***

- A good sized or respectable compost pile should be at least 27 cubic feet, or a pile of 3 ft. x 3 ft. x 3 ft.
- This size will insulate the pile's heat and insure that the microbial activity will continue, even on cooler or cold days.
- Smaller piles usually will quit when the outside temperatures drop in the fall since they cannot insulate the microbes from the cooler temperatures.
- Larger piles, say 100 cubic feet plus, will smother out the microbial action from the lack of oxygen. It is a delicate balancing act on getting the right materials in the pile and getting the right size pile.



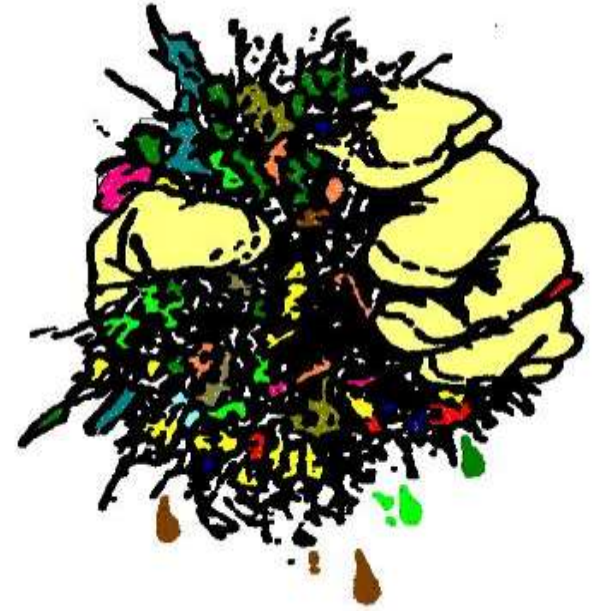
# Example Pile





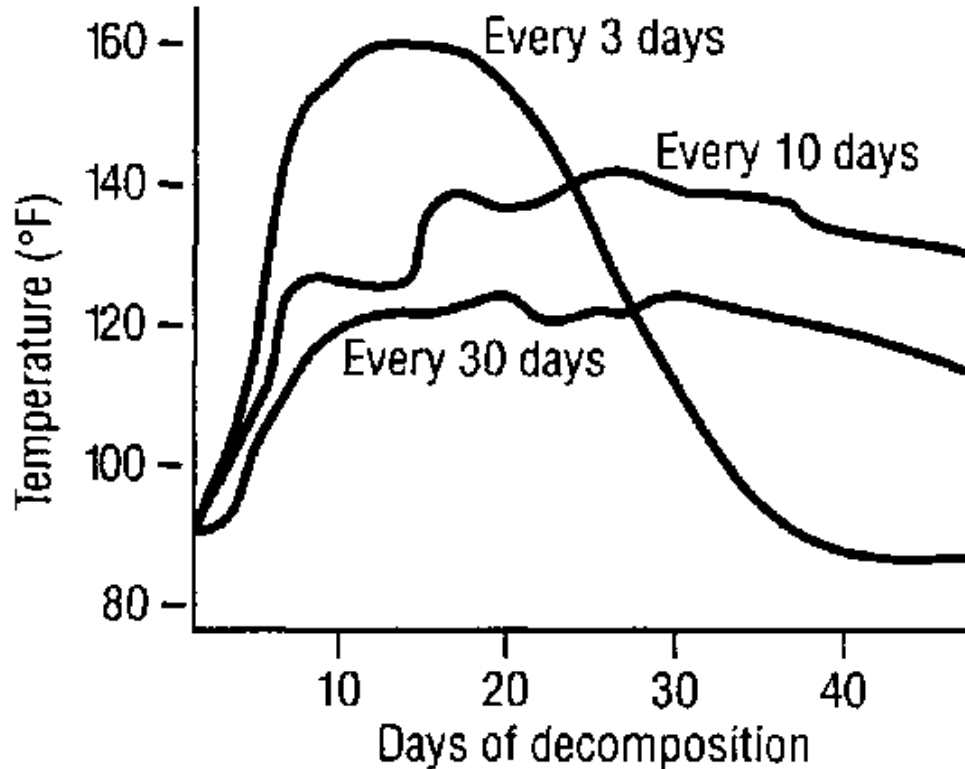
# WATER AND AIR

- Compost piles need to be checked periodically to see that they haven't dried out.
- If a sample of compost is squeezed, and water runs out of it...it is obviously too wet. If it is squeezed, and it is "dusty," then it needs water.
- It should have the consistency of a damp sponge. Turning or aerating the piles will help eliminate excess water and insure that oxygen gets into the core of the compost pile.



# Achieving Aeration

## Turning Frequency Effects on Composting



### ■ **Turning** piles

- *Introduces oxygen* to pile organisms
- *Hastens decomposition*
- *Set a schedule* that works for you



# Required: Oxygen (Aeration)

- Home composting should be ***'Aerobic'***
- Aerobic composting is ***up to 90% faster*** than Anaerobic composting
- Anaerobic ***odor emissions are avoided***



# Goal: Achieve High Temps



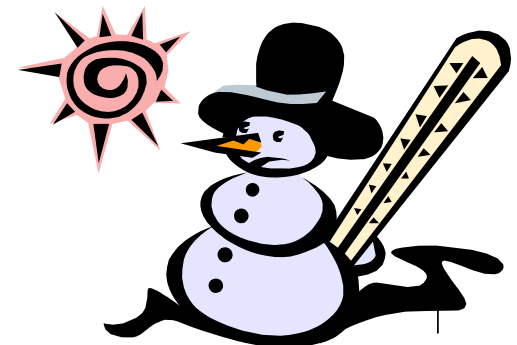
Checking temp with a compost thermometer

## ■ Importance of High Temperature

- Pathogen kill
- (Harmful bacteria, etc.)
- Weed seed kill
- Pest control
- (Flies, plant parasitic Nematodes)

# ..... *AND TEMPERATURE*

- By placing your hand in the center of the pile, you will be able to tell if the compost pile is working.
- It should be very warm to almost hot.
- If it is cool or cold, then the pile is not working.
- If it is too hot for your hand, again the pile is not working to potential.
- The internal compost pile's temperature should be between 130 and 160 degrees F.
- This will usually be hot enough to kill most diseases, insects, insect eggs, and weed seeds.



# *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

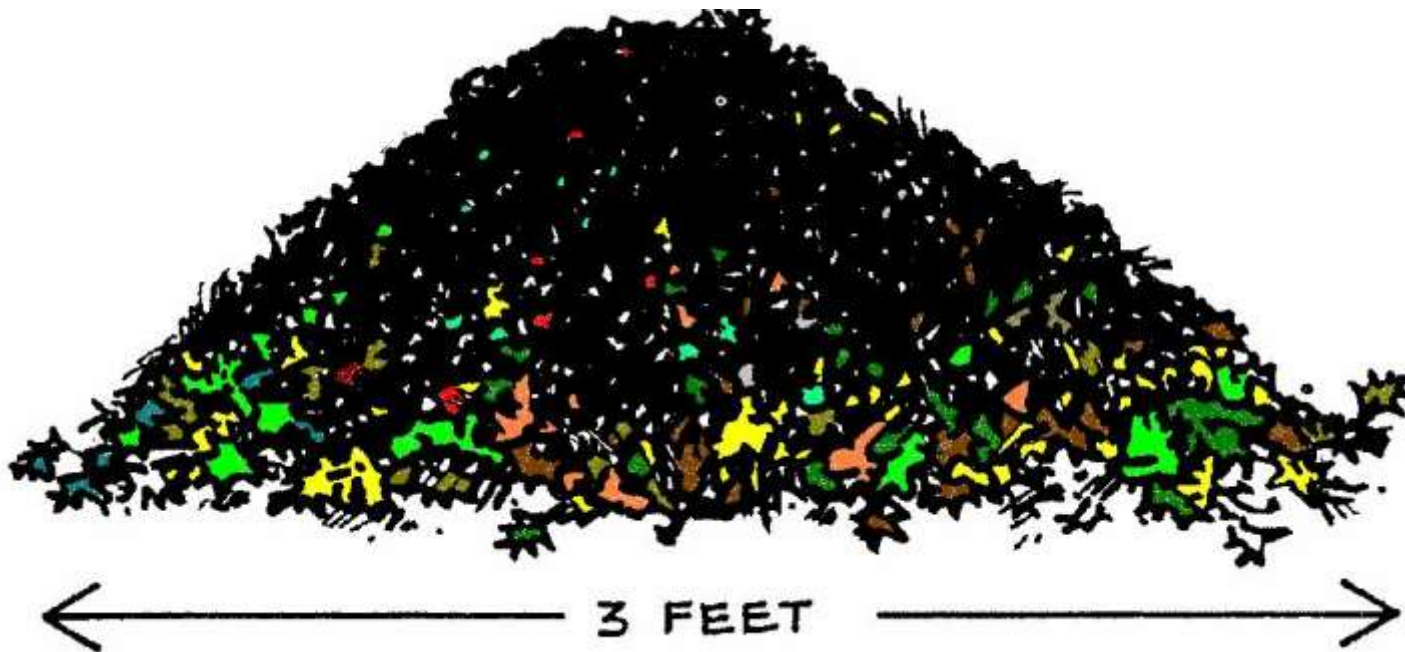


# *Considerations for location*

- **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



# *Compost Mound*

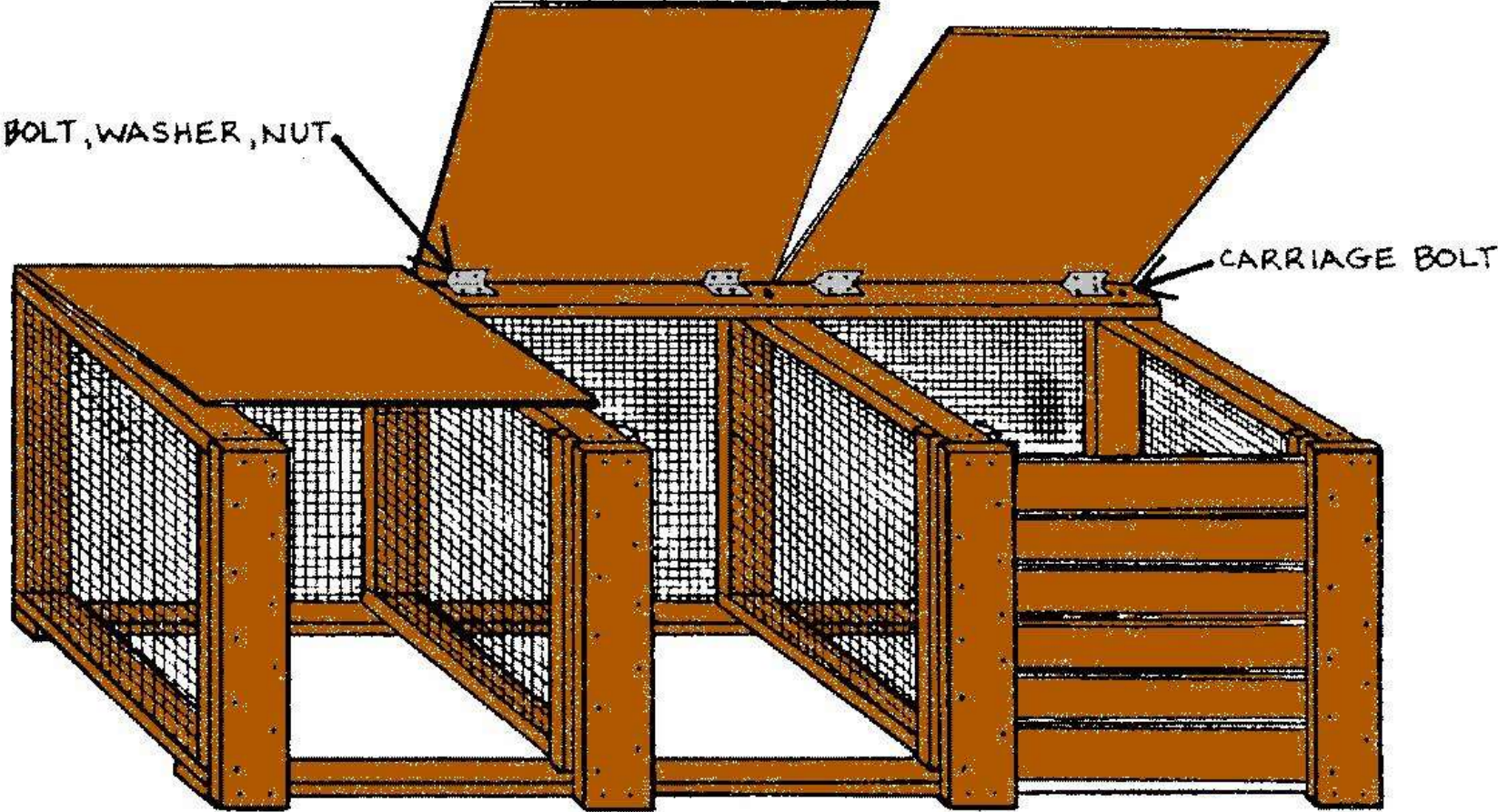


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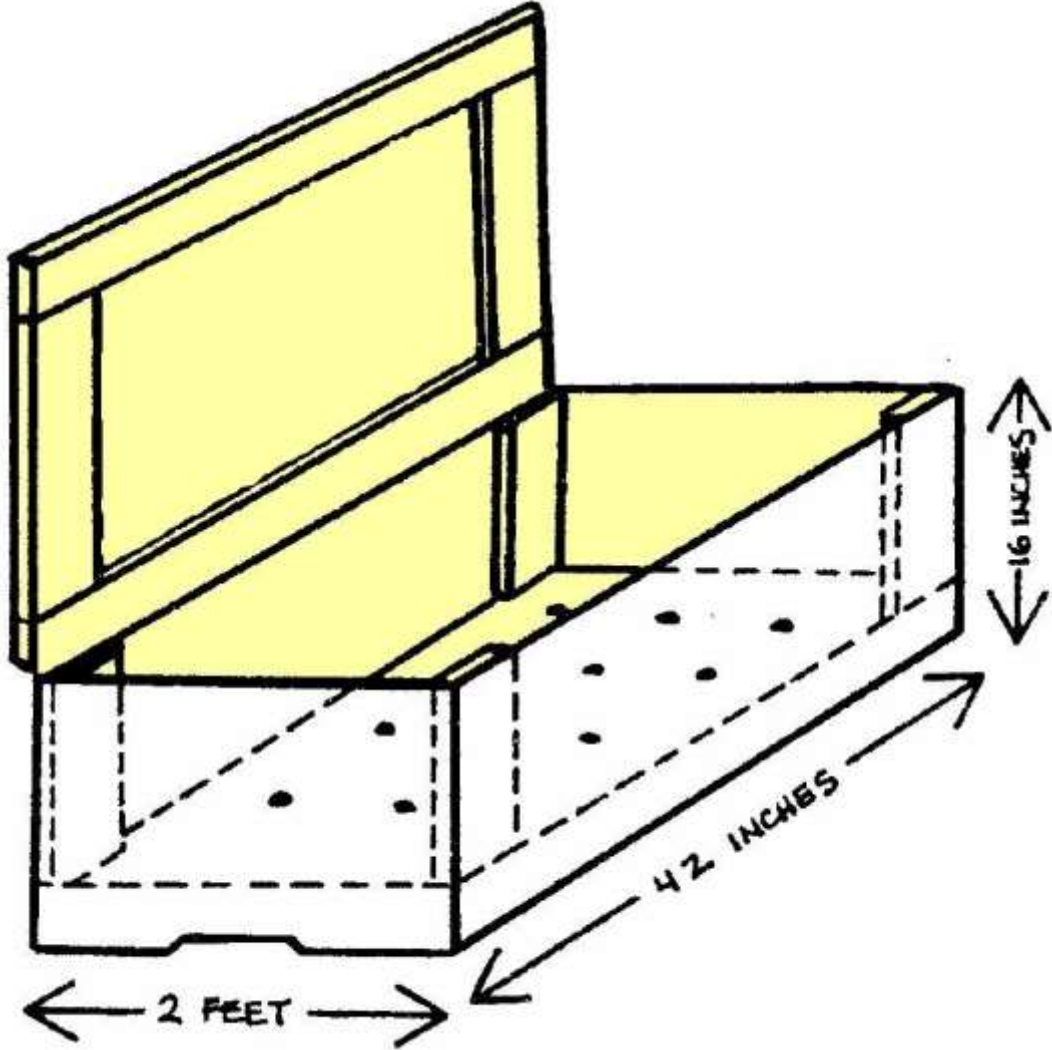
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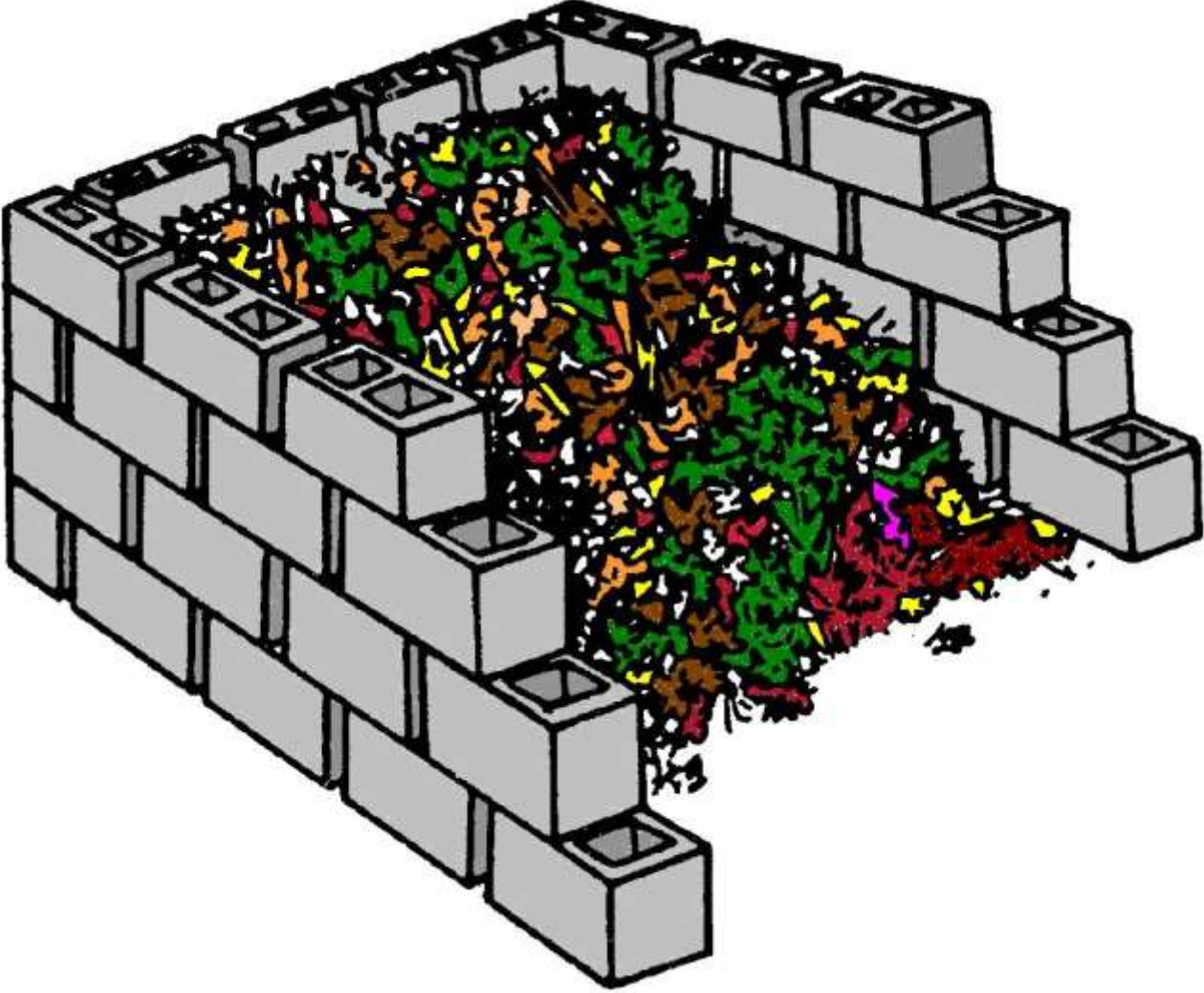
# Wood and Wire Three-Bin Turning Unit



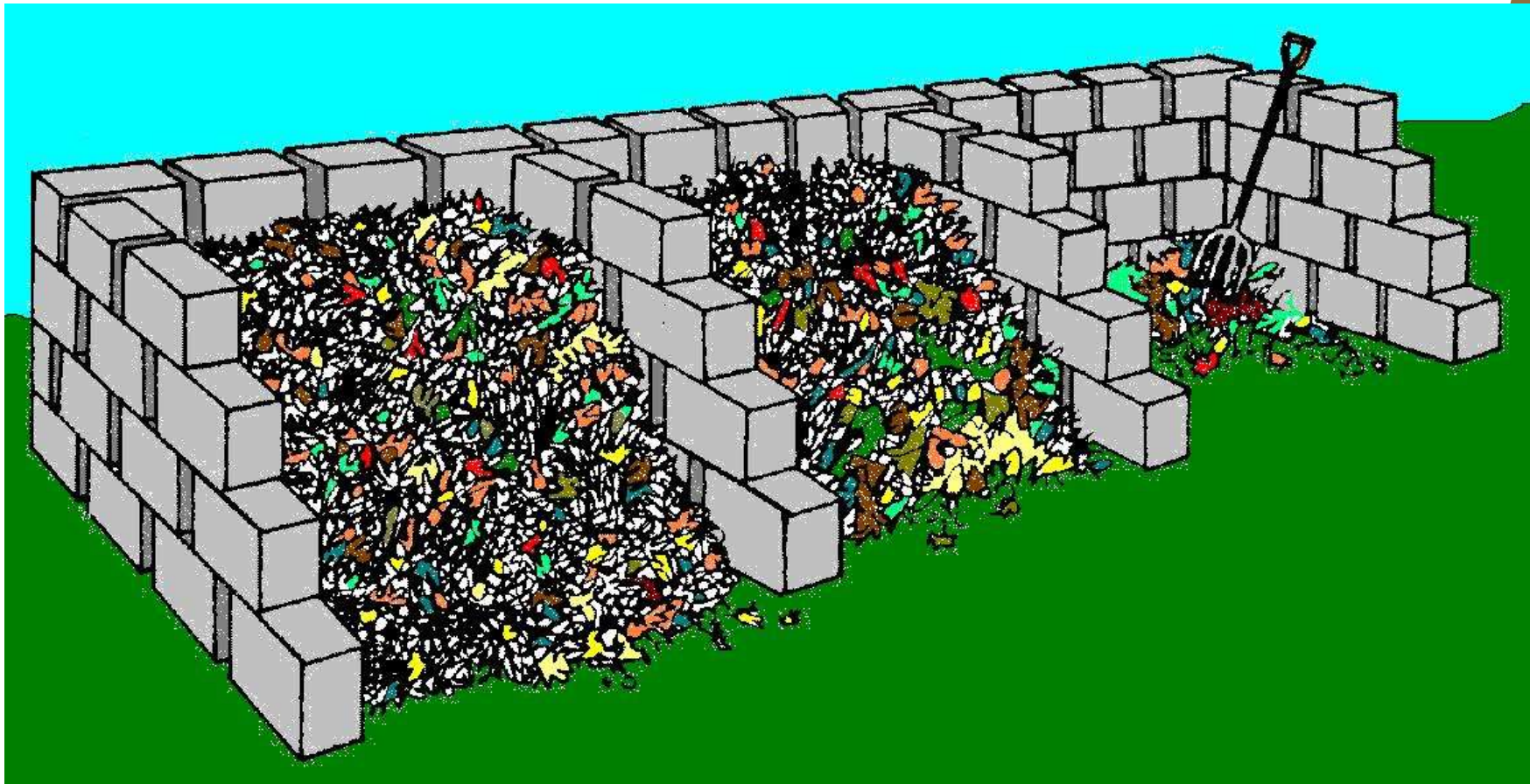
# Worm Composting Bin



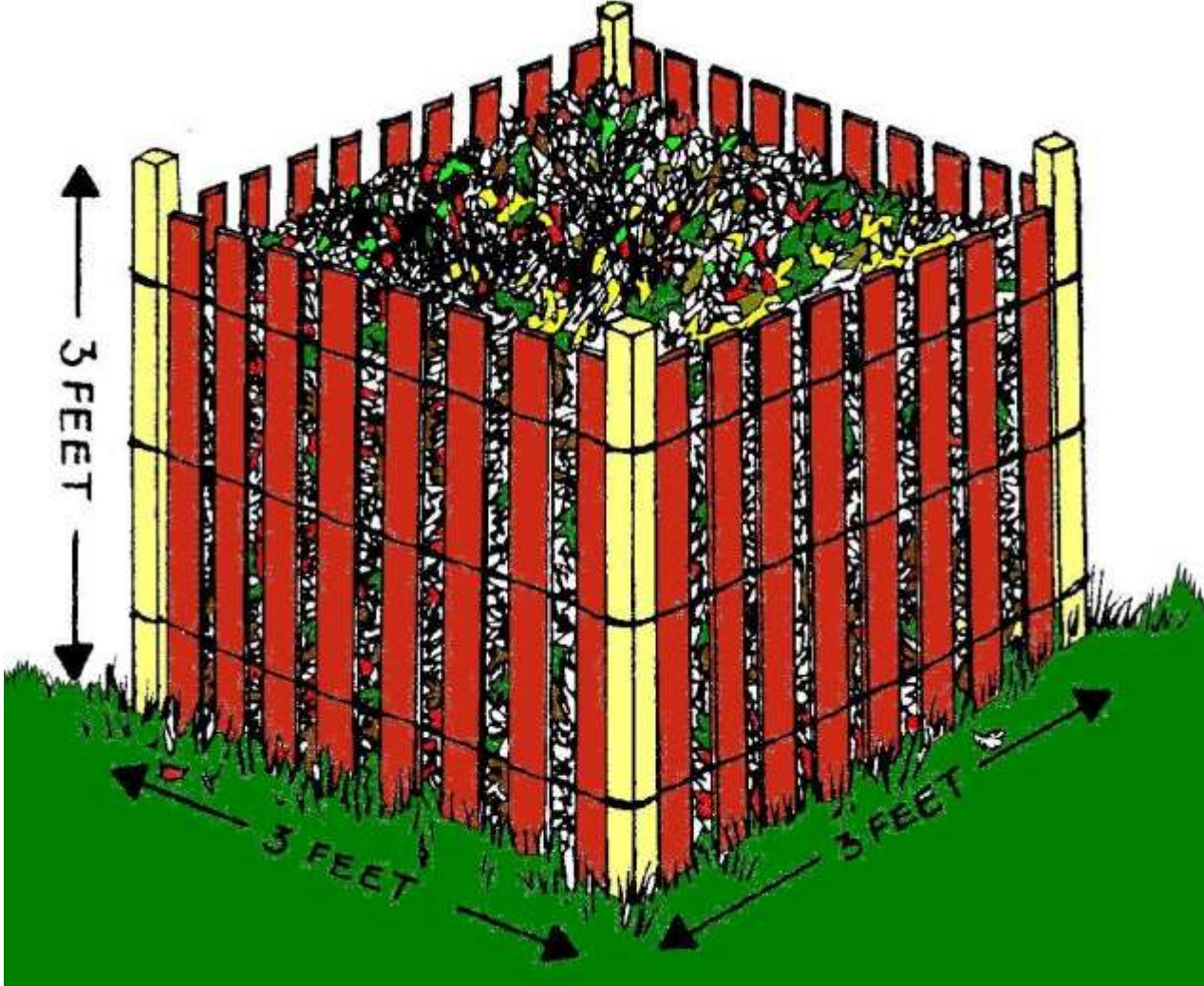
*Cinder Block Bin*



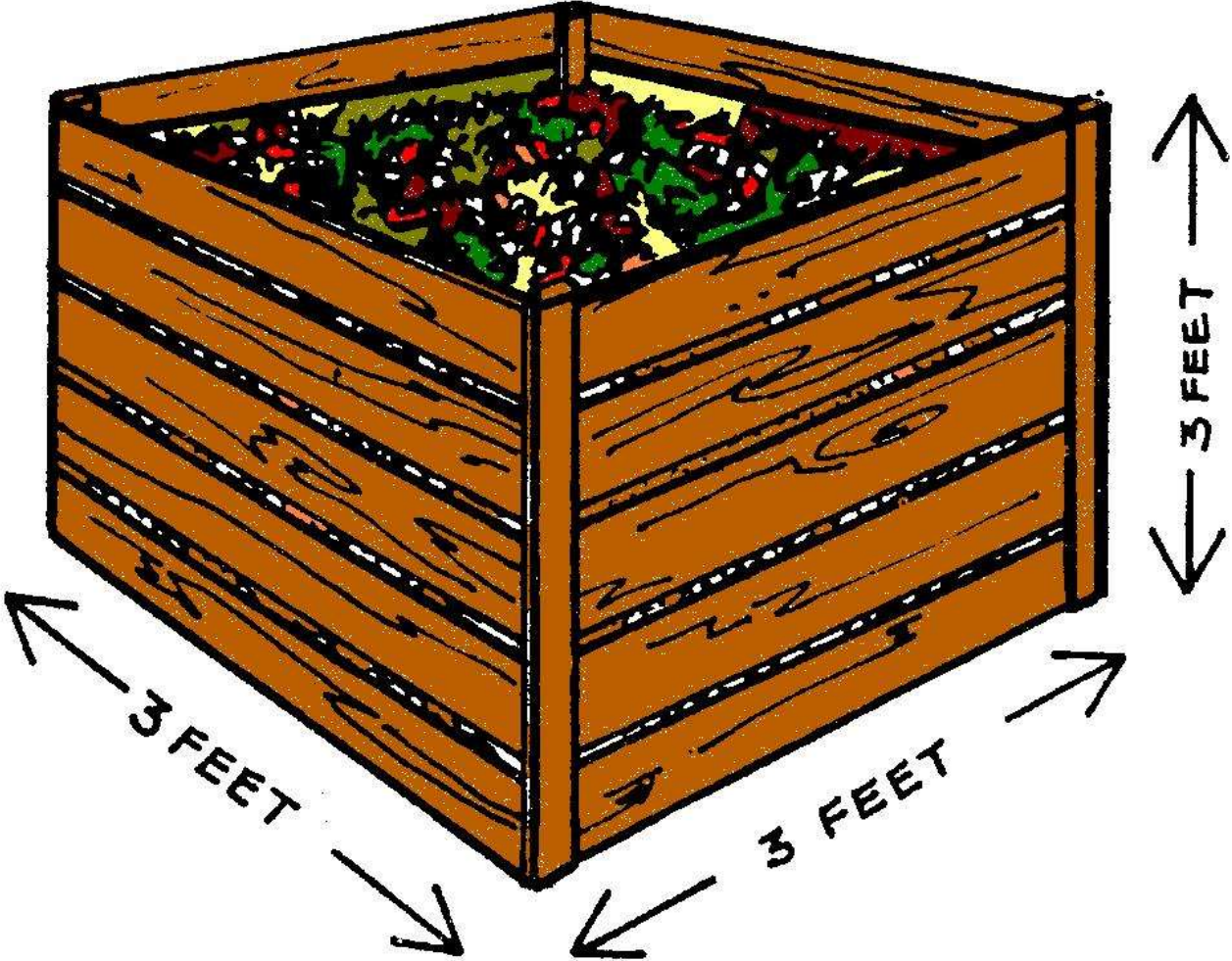
# *Cinder Block Turning Unit*



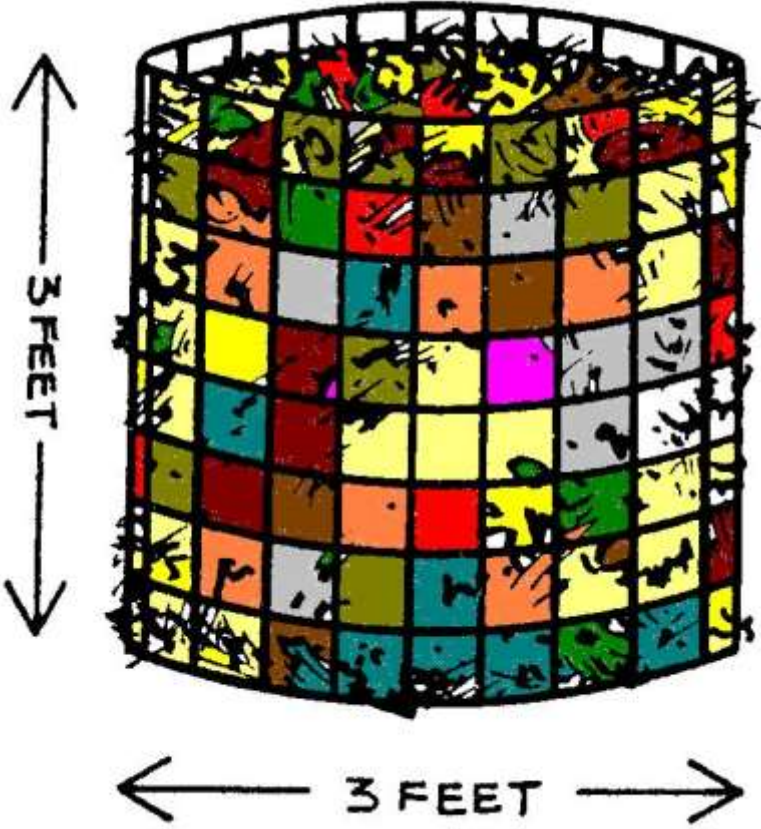
# Snow Fence Bin



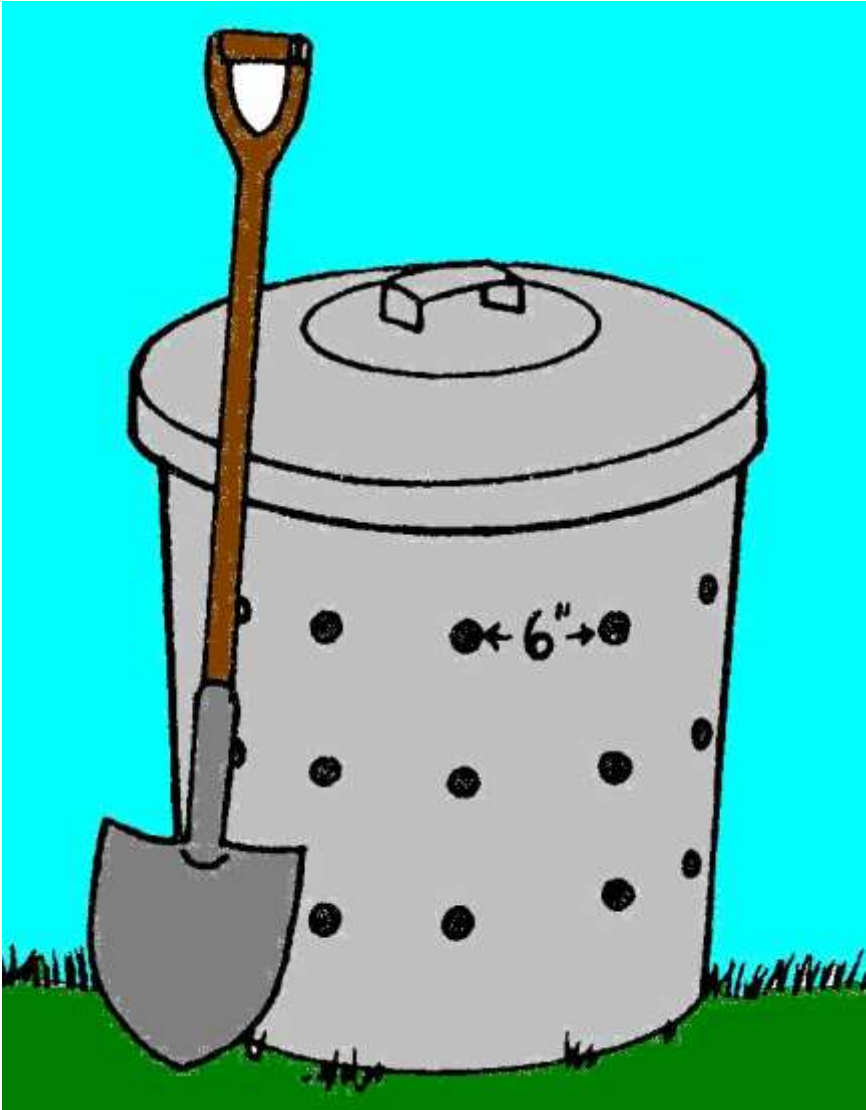
# Wooden Box Bin



# Wire Mesh Bin



*Garbage  
Can  
Composter*





# TIME.....

- If you have balanced the Carbon and Nitrogen ratio,
- have a healthy sized pile,
- have insured that the pile is moist
- and has been turned at least once a month, more hopefully
- then your compost materials should be decomposing and becoming compost.
- This will take as little as two months or as long as one year.



# *IS IT Done YET?*



- A compost pile will continue work until there is nothing left. Kind of defeats the purpose of a compost pile if you wait too long.
- So, when is a compost pile finished, or ready for me to use on my garden?
- Composted materials are ready when you cannot distinguish what went into the original compost mixture. It should have the consistency and color of potting soil.
- Let cure for a few weeks after temp cools. “Curing”



# 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)

# COMMON COMPOST PROBLEMS:

Problem	Possible Cause	Possible Solution
Rotten Odor	Excessive Moisture	Add materials such as sawdust, wood chips, or straw
	Compaction	Turn pile or make smaller pile
Ammonia Odor	Too much Nitrogen	Add high carbon materials such as sawdust, straw, etc.
Low Pile Temperature	Pile too small	Make pile bigger or insulate sides
	Insufficient moisture	Add water while turning pile
	Poor Aeration	Turn pile
	Lack of Nitrogen	Add fertilizer or green matter
	Cold weather	Increase pile size
High Temperature (160 degrees F+)	Pile too large	Reduce pile size
	Insufficient ventilation	Turn pile
Pests	Presence of meat scraps or grease	Remove from pile

# Compost Uses

- Compost improves soil structure, is a food source for earthworms, and adds nutrients to soil. It can be used as a mulch, soil additive, or lawn top-dressing.
- 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



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# Using finished compost

- Lawn topdressing
  - Be sure compost is very mature to avoid harming the lawn
  - Use fine (screened) compost, ¼” 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



# *What if this doesn't work for me?*

- Large volume piles – do you create enough material?
- Lasagna gardening
- Trench composting
- Rouge composting
- Wood mulch as compost



# Compost in a Bag?

Yes!

- Good for people with very limited space but who still want to recycle their organic waste.
- “Recipe”
  - 1 cup of shredded green material
    - ½ cup soil
  - 1 tablespoon of dry brown materials
    - 1 oz of water
- Ingredients can be doubled as space allows
- Want a strong bag! Mix bag often
- Check water
- Compost in 4-6 weeks



# Compost Tea

- Extract nutrients into water for application
- Apply every two weeks
- “Brewing”
  - Put finished compost into a burlap bag, pillowcase, cloth and place in 5 gallon bucket for one to three days
  - Agitate bag every day a few times
  - Reuse compost this way



# Vermicomposting

## Composting With Worms

Process is using earthworms and microorganisms to convert organic waste into black-earthy smelling, nutrient-rich humus.



# *Worm Facts*

- Worms have mouths but no teeth
- Worms do not have eyes but they are sensitive to light
- Worms can regenerate a new tail, but not a new head
- The end nearest the band around the midsection is its head.



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# *Worm Needs*

- **Bin with lid**
- **Bedding**
- **Moisture**
- **Proper temperatures**
- **Ventilation**
- **Food**
- **Worms don't like light, vibrations and extreme temps. Keep in quiet spot between 59 and 77 degrees**



# Bin Size



- Size of bin will depend on how much organic matter you plan to compost
- Plan on one square foot of surface for each pound of garbage
- No deeper than 15 inches
- Plastic bins do stay more moist than wooden



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# Worm Bin - Specs



## Quick and Easy Worm Bin for under \$10

Supplies: 18 Gal. *Rubbermaid* bin with lid  
24" piece of 1/2" ID PVC pipe  
Drill with 3/4" and 3/16" bits

1. Drill a series of 3/16" holes along the middle 18" of PVC pipe.
2. Drill a 3/4" hole, centered at one end of bin, 3" up from the bottom.
3. Drill a 3/4" hole, centered on the opposite end of the bin, 5" up from the bottom.
4. Feed PVC Pipe through the two 1" holes, so that a small section protrudes from either end.
5. Drill a series of 3/16" holes randomly into the sides of the bin, about 2"- 3" from the top.
6. Drill a series of 3/16" holes into the lid.
7. Viola!...Vermicomposting bin! Just add bedding, water, worms and food!

# *Worm Amounts*

- The recommended worm to daily garbage ratio is 2:1
- OR
- 1 pound of worms for a 2 ft by 2 ft bin receiving about 4 lbs a week
- Keep in mind worms will reproduce rapidly and will need to be divided every few months.
- Red worms only!





# *Worm Bedding*

- **Must hold moisture, be light and fluffy and non toxic**
- **Shredded newspaper works great, black ink only**
- **Some suggest adding some peat moss 1/3 of the mass to the paper**
- **Use about 3 lbs. per cubic foot of  $\frac{3}{4}$  of the bin**
- **Water to bedding ratio should be 3 to 1 by weight ( damp but not soggy)**
- **Add handful of soil**
- **Eggshells for calcium**



# Worm Monitoring

- Worms prefer to be left alone
- When you see them, assess bin conditions
- Drain off excess moisture, add to houseplants!
- Add more bedding and moisture as needed.
  - Spray bottle works great
- Monitor for flies and control infestations quickly



# *Worm Feeding*

- Any fruit or veggie. Use citrus sparingly
- Plate scrapings can be, but watch syrups, butters and salt!
- Tea bags and coffee grounds
- Avoid dairy, meats, and fats
- Feed when convenient. Daily or weekly doesn't matter.
- Dig hole and cover with bedding. Place in different parts of the bin.



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# *Harvesting Compost*

- **If left alone, eventually all of the worm bedding will be converted to castings and the worms would die.**
- **Plan to harvest every 2-4 weeks.**
- **Simply pull compost to one side and harvest one side of the bin at a time. Add new bedding and bury feed over there until worms are moved to new feeding site.**



# Using Compost

- Can be directly applied to plants
- Place in the seed row and beneath transplants
- Slightly more concentrated than yard compost bins, can be mixed into other soils and composts.



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# Resources

- Purdue Composting with Worms – HENV-104-W
- Ohio State – Composting at Home – HYG-1189-99
- Researched based resources!
  - There are lots of tips and tricks that aren't based in science, but marketing a convenience or product.



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