Worm Composting

Revised

Cowlitz County Master Gardener Program

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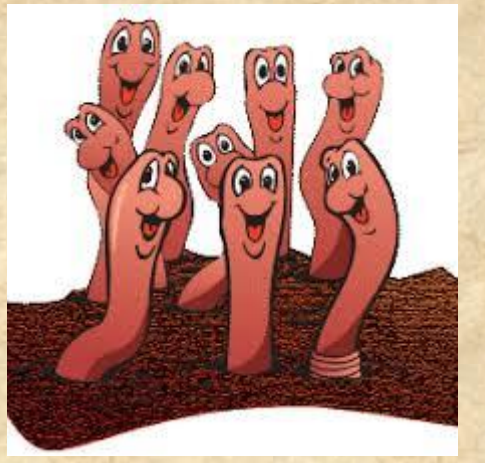
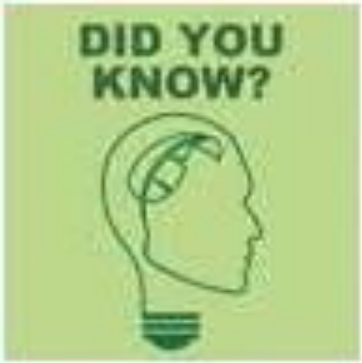
WASHINGTON STATE UNIVERSITY
COWLITZ COUNTY EXTENSION

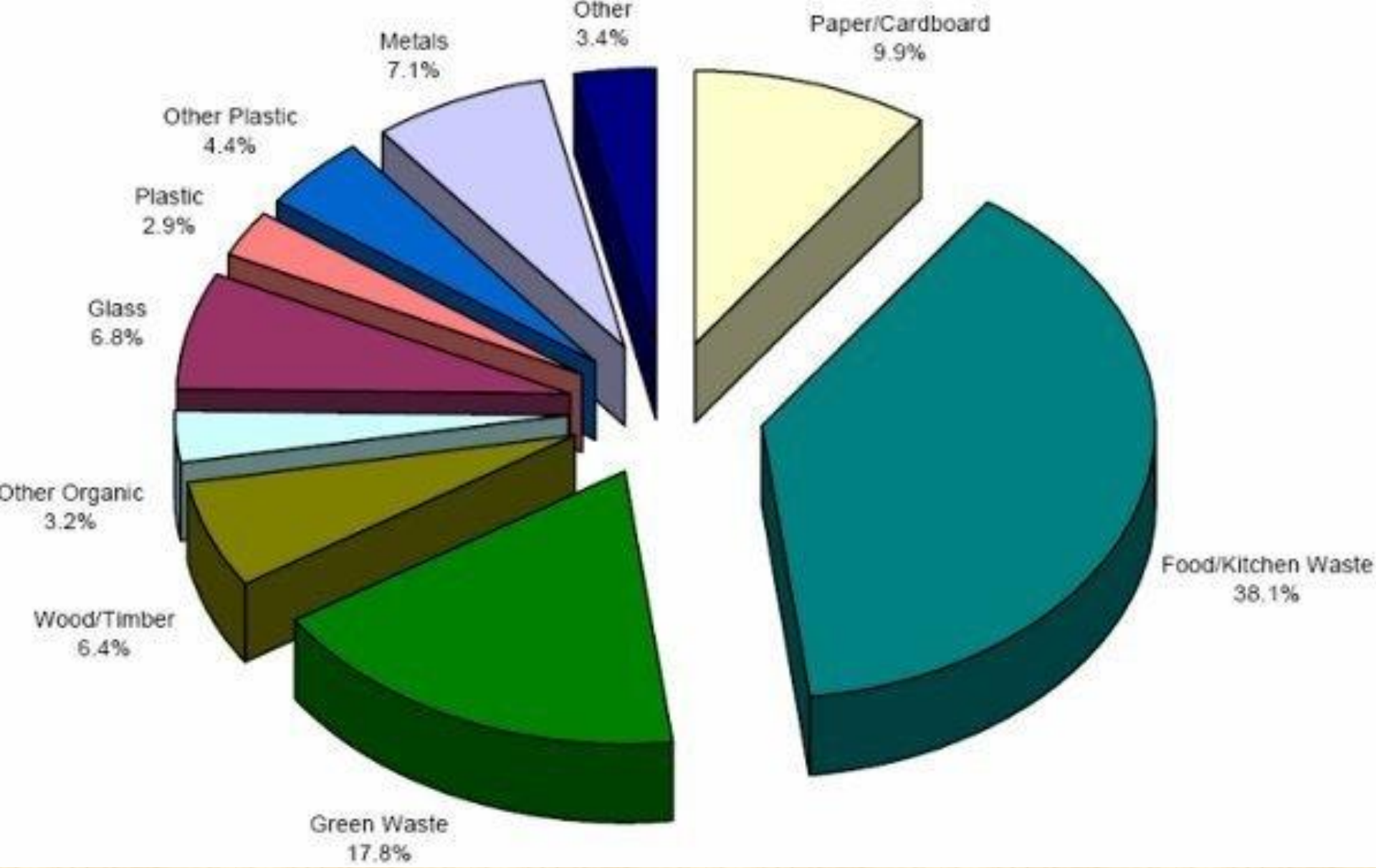
*Why Compost With Worms?

- Removes food scraps and paper from the waste stream.
- Low maintenance and an easy way to make compost.
- Provides valuable nutrients for plants and improves plant health.
- Saves money on garbage fees and purchased fertilizer.





Uneaten food is the single largest component of our nation's municipal solid waste (almost 15% before recycling), and it accounts for 25% of U.S. methane emissions. *(Source: EPA)*



Clark County produced 321,327 tons, Cowlitz County produced 130,308 tons and Lewis County produced 68,958 tons of waste 2016

https://public.tableau.com/profile/solidwastemgmt#!/vizhome/MunicipalSolidWasteFlow2016/Dashboard1

- **Vermicomposting vs Conventional Composting.**
- **Composting with Red Wigglers.**
- **Bin Moisture.**
- **pH.**
- **Ventilation.**
- **Habitat.**
- **Feeding.**
- **Lifespan.**
- **Harvesting Castings.**
- **Use of Castings.**
- **Leachate.**
- **Compost Tea.**
- **Types of Bins.**
- **Building a Worm Bin.**
- **Savings.**
- **Beneficials.**
- **Pests.**
- **Troubleshooting.**

*Vermicomposting vs Composting:

What is the Difference?

Vermicomposting:	**Conventional Composting:**
Cold composting.	Hot/Cold composting.
Food scraps & bedding. Lower green (N) & brown (C) ratios.	Depends on a balance of greens (N) & browns (C), air & moisture.
6 months.	6 - 8 weeks (optimum conditions).
Converts waste by using micro & macro organisms & red wiggler worms.	Converts waste by using a large source of microorganisms (largely bacteria).
Does not destroy weed seeds.	Destroys weed seeds if done correctly.
Completed process has 4% more nitrogen content than conventional composting.	Less nitrogen content than vermicomposting.
Can be done in a compact area with less management.	Needs a larger area and requires more management (turning).

Composting with Red Wiggler Worms:

- *Eisenia fetida* is a surface dweller that scavenges organic waste.
- Dung worm is another common name.
- Red wigglers have no teeth (gizzard), they have no eyes (skin is light sensitive) and skin must be moist to breath through.

Worm Composting Bin Moisture:

- Optimal moisture content is between 43 to 90%. If too wet and water is collecting in your bin the worms can drown. They breathe through their skin.
- Ideal moisture of the worm's environment is like a sponge that is damp but not dripping.

Too Wet

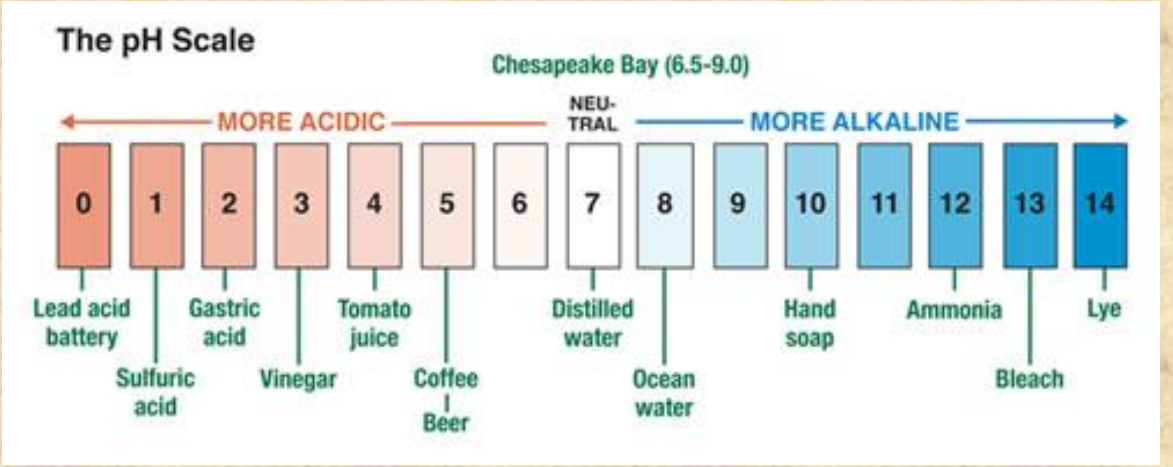
Too Dry

pH Requirements:

- Can tolerate pH from 5 (acidic) to 9 (alkaline).
- A mix of foods will keep the pH closer to the neutral range.
- Low pH can allow pot worms to flourish and red wigglers to struggle to survive.

Red wiggler

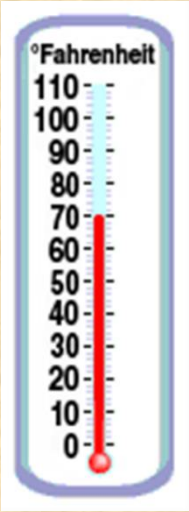
Pot worm



Ventilation:

- Air circulation is a vital element for worms to survive.
- Smothering will occur if there is no air.
- Reduces smells and humidity.

Red Wiggler Worm's Habitat:



- Optimal temperature for growth and reproduction is between 55^{o} F and 77^{o} F degrees.

- Can tolerate higher and lower temperatures between 40^{o} F and 90^{o} F degrees. To overcome temperature extremes they will either huddle together when cold or try to escape when warm.

- Worm bins can be stored anywhere. Ideally, keep in a cool, shady area with the lid on tightly. Ensure the bin can be conveniently checked (out of sight out of mind). Great spots outside the house are the garage, laundry room, pumphouse, garden shed, under an awning or the eave of a house.

Feeding Red Wiggler Worms:

- Worms are living organisms.
- It's better to feed small amounts consistently. Frozen food breaks down faster.
- Smaller pieces are better. Worms have no teeth but they have a gizzard and grind their food.
- Provide a variety of foods.
- Feeding activity depends on temperature.
- Feed worms in a different corner of the bin each time to ensure worms migrate through the bin.

What do worms like to eat?

Fruit peelings or spoiled fruit except for . . .

Oranges or other types of citrus fruits.

Vegetable Parts and Peelings:

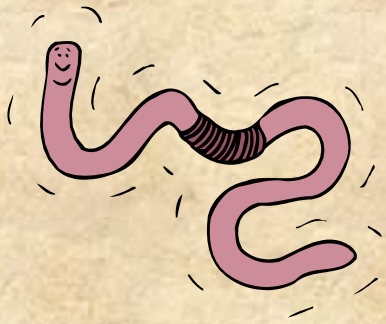
Any part of the vegetable that hasn't been cooked with oil or salt can be fed to the worms.

Coffee Grounds and Tea Bags:

You can even add the filters but it is a good idea to tear coffee filters into smaller pieces.

Moldy Bread or Rolls:

YUMMY!



Bread or rolls that haven't had anything added to them can be used.

Egg Shells as Grit:

- Rinse the membrane (sticky stuff) out of the egg shell.
- Dry, then crush before adding them to the worm bin.
- Worms have no teeth.
- Egg shells help grind food as the food passes through the crop and gizzard.
- Other types of grit: sand, calcium, oyster shells, etc.

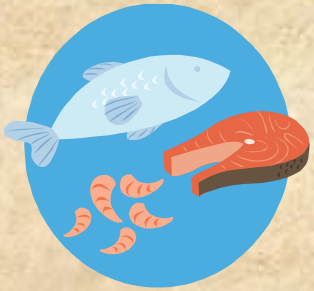
*What NOT to feed your worms!

Chicken or Turkey

Meat or Eggs

Hamburger or Steak

Hot Dogs



Fish

Meat, poultry, or fish (bones, skin, or drippings):
These develop odors and easily attract other pests.

What NOT to feed your worms!

Cheese

Citrus

- **Dairy products:** These products may cause anaerobic conditions and odors.
- **Highly acidic or spicy foods, such as citrus (especially peels) or onions:** These may produce acidic conditions and may be toxic to worms.
- **Oils (such as butter, salad dressing, or mayonnaise):** These smother worms (they breathe through their skin).
- **Pet feces:** Feces can contain large quantities of pests that are not beneficial to worms or to the final compost product.

When in doubt, leave it out!

https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9034.pdf

Reproduction:

- Each red wigglers has both sexes but still must mate with another worm.
- Red wigglers reproduce 30 - 45 days after hatching.
- Red wigglers can create up to 4 cocoons per week.
- Each cocoon contains 2 to 5 worms.
- Population can double within 60 - 90 days.
- Worms can live around 4 to 5 years.

Harvesting Castings:

Faster but more labor intensive.

Harvesting Castings:

Slower but no labor involved.

DIY Worm Harvester (1/4” screen):

Use of Worm Castings:

- Red wiggler worm castings are even richer in nutrients than compost, so they must be used more sparingly.
- Castings are rich in bacteria, calcium, iron, sulphur, magnesium and 60 other trace minerals.
- N-P-K is about 5-5-3 according to the University of California.
- **Annuals and Perennials:**
  - Put a small handful of castings into each hole as you plant.
  - Apply 1 - 3 inches of castings in spring, early summer and fall.
- **Flower beds, shrubs, roses, vegetables:**
  - Top dress with 1 to 3 inches of worm castings and incorporate into the soil with a fork or spade.

Use of Worm Castings:

- **House Plants:**
  - Spread 1/2 to 1 inch of castings around established plants and scratch into the soil, every 2 - 3 months.
- **Lawns:**
  - New Lawns apply 10 lbs. per 100 square feet.
  - Established Lawns apply 4 lbs. per 100 square feet.
- **Potted Plants:**
  - Scratch the top and add 1/2 inch worm castings and water thoroughly.
- **Potting Mixes/Seed Flats:**
  - 1 part worm castings to 3 parts potting mix.

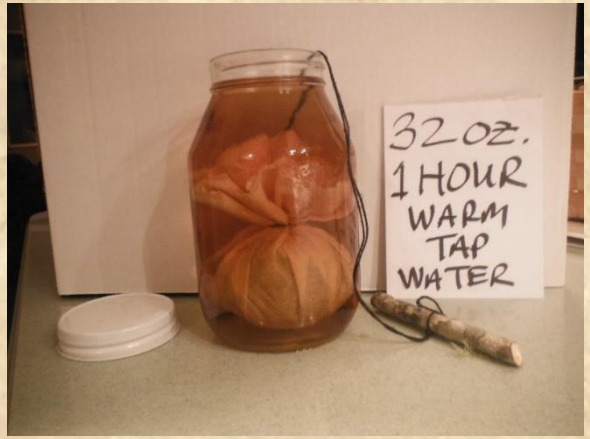
Collecting Leachate:

- Looks like strong coffee with no odor.
- When applied to plants dilute the leachate with water (1 part leachate to 10 parts water) so it looks like tea (amber color).
- The micro-organisms are most active when fresh however, the container can be stored uncapped.

Compost Tea:

- Put castings in a burlap bag, cheese cloth, coffee filter or cotton cloth, secure end and set in water.
- Agitate every once in a while to incorporate oxygen.
- In several hours to a few days (depending on the amount of castings and water) you will have worm tea.
- The tea should be a light amber color. If it is darker than that, simply dilute with water.
- Pour a pint of the worm tea around shrubs, water your lawn with it, soak seeds in it before planting or use it as a foliar spray.
- The castings used to make the tea are still potent. Use it as you would use fresh castings.

Compost Tea:



Worm tea bag & 32 oz jar

Worm tea bag & 104 oz jar

Commercial Type of Bins:

$131.95 Amazon

$209 Northwest Redworms
7 cubic feet

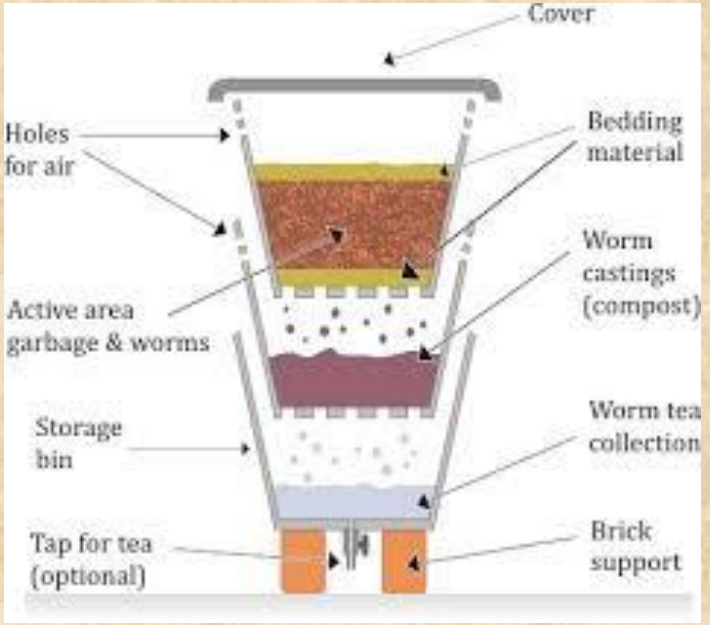
$345 Hungrybin 4.5 lbs
of waste/day

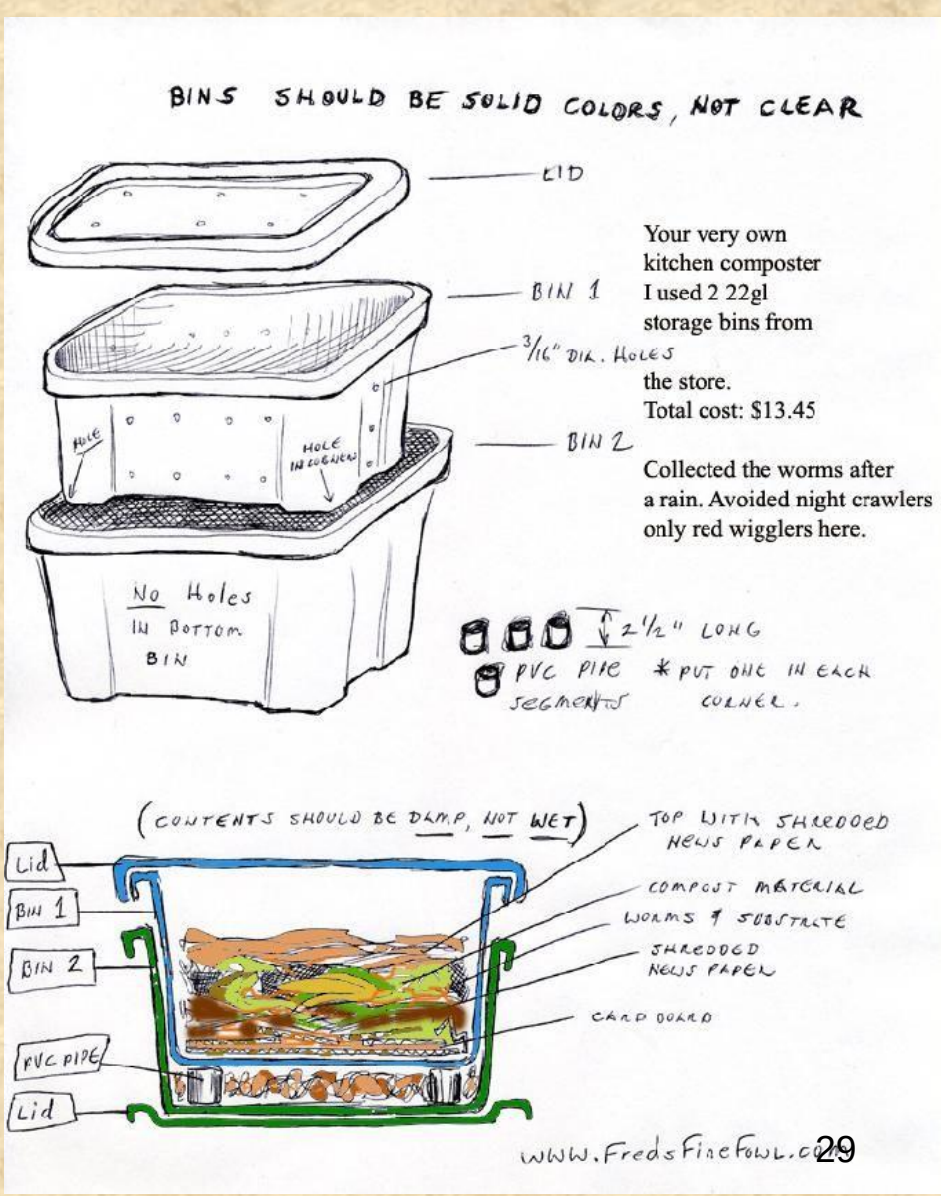
$151.95 Home Depot

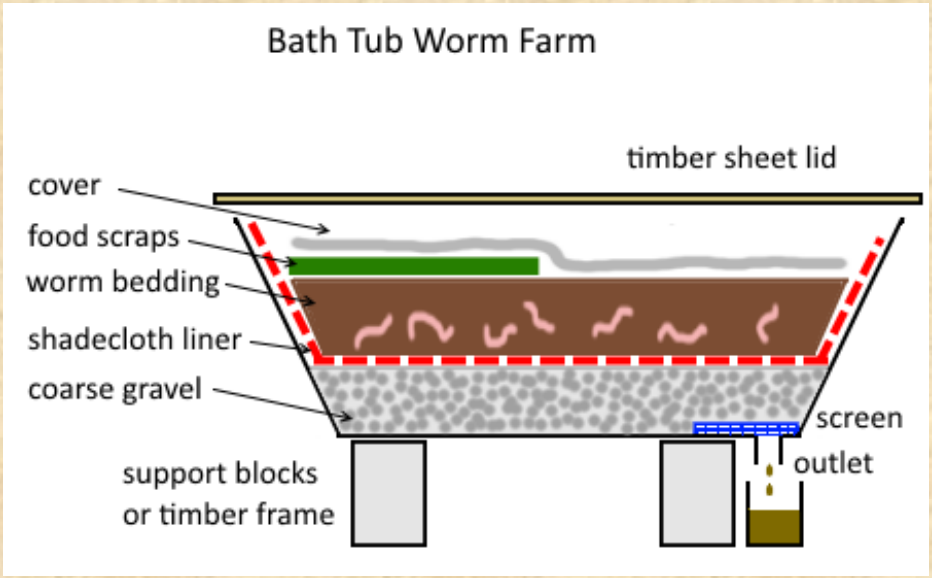
$19.04 Walmart
(9 ¼” x 14 ½” x 7” H)

$149.99 Gardens Alive
(3 tray)

Homemade Worm Bins:







Homemade Worm Bins:

7 Gallon Tote
(Home Depot)

2’ length of 4” PVC Pipe perforate bottom 6” with ½” drill bit put in your garden.

Building a Simple Worm Bin:

1. Select a sturdy opaque container, 7 gallons or more with a lid. Shown here is a 7 gallon plastic tub from Home Depot.

2. Drill several 5/32 inch holes around the perimeter just under the lid of the bin for air circulation.

3. Drill 4 to 6 (13/64 inch) holes close together on one lower end of the bin for easy drainage.

4. If you purchased a kit the holes are already pre-drilled.

Building a Simple Worm Bin:

3. Fill the bin to about 1/4 full with shredded paper. Then spray the shredded paper with water until barely damp (should be the consistency of a wrung-out sponge). The damp shredded paper will act as bedding material.

4. Add a mixture of red wiggler worms, castings/bedding, crushed egg shells (for grit) and food.

Building a Simple Worm Bin:

5. Cover the mixture with several layers of damp, shredded paper. The damp, shredded paper will act as an air filtration and also prevents odors that attract other pests.

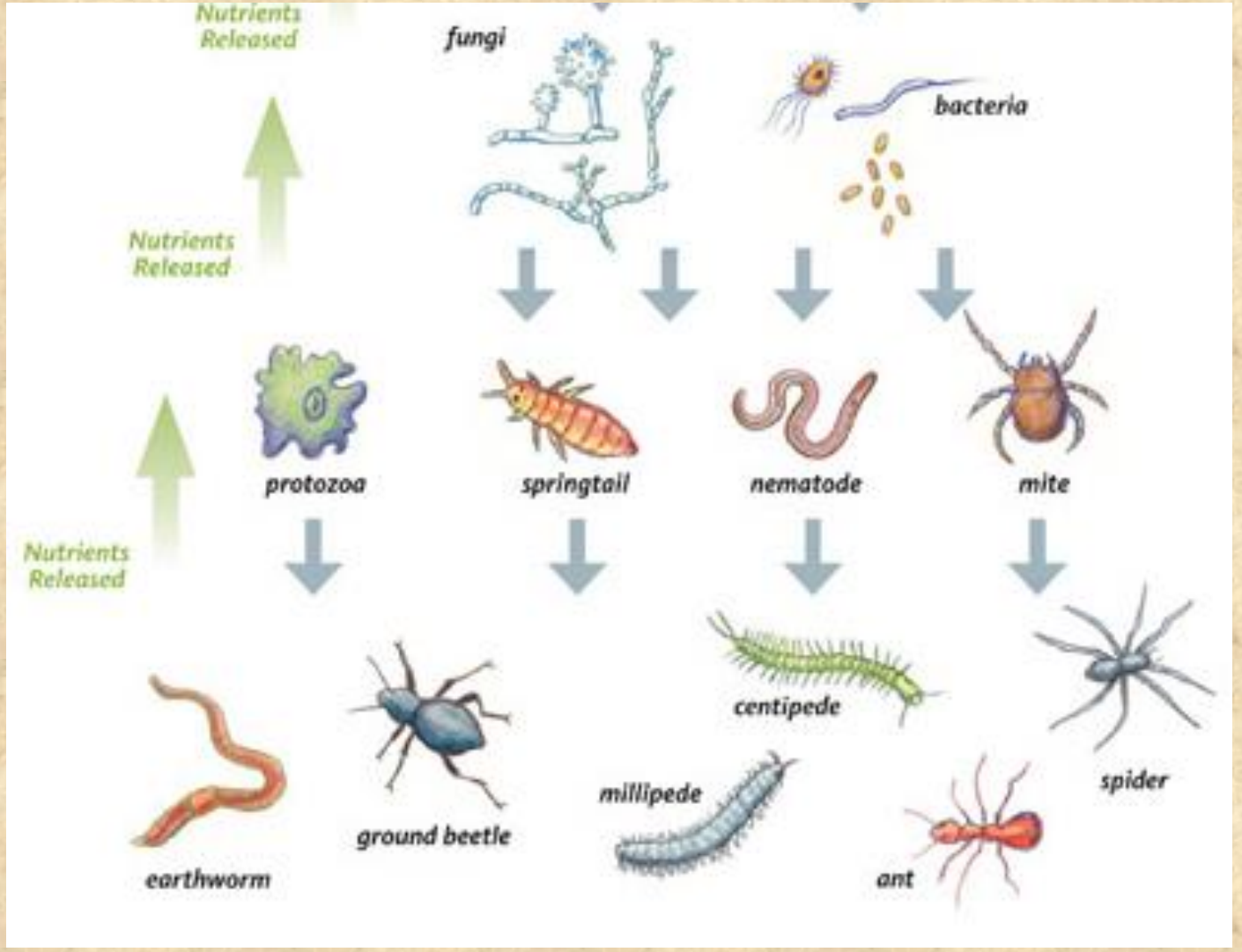
6. Prop the worm bin up on wood, concrete blocks or some other structure and slightly tilt it toward the drain holes. Place a reservoir under the drain holes to catch the leachate “worm tea.”

Savings by DIY:

Items	Commercial	DIY
Cost of purchasing a worm bin.	$19.00 - $345.00	**< $10.00**
Purchasing worms (1 pound).	$28.00 - $37.00	**$28.00 - $37.00 initial cost then $0**
Purchasing worm castings (2.5 gallons).	$33.00	**$0**
Worm compost tea (32 ounces).	$27.00	**$0**
Total	$107.00 - $442.00	**$28.00 - $37.00**

Beneficial Organisms in the Bin:

- Aerobic bacteria.
- Fungi and molds.
- Protozoa.
- Enchytraeids (pot worms).
- Millipedes.
- Spiders and mites.
- Springtails.
- Gnats and their larvae.
- Beneficial nematodes.



Pests in Bins:

- Anerobic bacteria.
- Fruit flies.
- Slugs & snails.
- Centipedes.
- Ants.
- Flatworms.

- Too wet check drain holes (bin smells).
- Too much fruit (freeze prior to adding).
- Remove them.
- Predators remove them.
- Too dry.
- Remove them.





Trouble Shooting:

• Worms dying.	• Too much food, too wet or dry, extreme temperatures.
• Bin attracts ants.	• Bin too dry.
• Bin attracting flies/fruit flies.	• Food is exposed or too much high sugar based food or fruit. Freeze prior to putting into bin.
• Rotten odor.	• Too wet, not enough oxygen, check drain holes, food exposed or too much food.
• Slugs, flatworms, centipedes.	• Just remove them.
• Worms escaping.	• Environment too warm or cold.

In Summary:

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Composting with Red Wigglers.
Bin Moisture.
pH.
Ventilation.
Habitat.
Feeding.
Lifespan.
Harvesting Castings.
Use of Castings.
Leachate.
Compost Tea.
Types of Bins.
Building a Worm Bin.
Savings.
Beneficials.
Pests.
Troubleshooting.

Meltdown!!!!

References:

WSU:

- http://whatcom.wsu.edu/ag/compost/Easywormbin.htm

Oregon State University:

- https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9034.pdf

US Environmental Protection Agency:

- https://www.epa.gov/recycle/how-create-and-maintain-indoor-worm-composting-bin

Organic Agriculture Centre of Canada:

- https://www.researchgate.net/publication/268254767_Manual_of_On-Farm_Vermicomposting_and_Vermiculture

Video:

- https://tinyurl.com/WormBoxVideo

If you have questions please contact Gary Fredricks with your questions at **360-577-3014 ext. 3 in Cowlitz County or via email at garyf@wsu.edu**

Worm Composting:

Presented by the

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