

## Resources

### Worm vendors

For a current list of worm vendors, contact  
**Metro Recycling Information**  
at 503-234-3000.  
TDD 503-797-1804

### Books

#### **The Worm Book**

Loren Nancarrow and Janet Hogan Taylor  
Ten Speed Press, Berkeley, Calif., 1998.

#### **The Worm Café: Mid-Scale Vermicomposting of Lunchroom Wastes**

Binet Payne  
Flower Press, Kalamazoo, Mich., 1999.

#### **Teaming with Microbes: A Gardener's Guide to the Soil Food Web**

Jeff Lowenfels, Wayne Lewis  
Timber Press, Portland, Ore., 2006.

#### **Worms Eat My Garbage**

Mary Appelhof  
Flower Press, Kalamazoo, Mich., 1997.

### Websites

- Composting with red wiggler worms  
[cityfarmer.org/wormcomp61.html](http://cityfarmer.org/wormcomp61.html)
- Cornell University worm composting basics  
[compost.css.cornell.edu/worms/basics.html](http://compost.css.cornell.edu/worms/basics.html)
- Klickitat County composting resources  
[klickitatcounty.org/491/Worm-Bins](http://klickitatcounty.org/491/Worm-Bins)
- USDA soil biology primer  
[nrcs.usda.gov/wps/portal/nrcs/main/soils/  
health/biology](http://nrcs.usda.gov/wps/portal/nrcs/main/soils/health/biology)

### About Metro

Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy, and sustainable transportation and living choices for people and businesses in the region. Voters have asked Metro to help with the challenges and opportunities that affect the 25 cities and three counties in the Portland metropolitan area.

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# Worm bin basics

## How to start and keep your worm bin healthy and productive



 **Metro** | *Healthy homes. Healthy families.*

**Problem: Fruit flies**

**Too much food or not enough bedding covering food.**

**Solution:** Stop feeding the bin for a week or two, and add more bedding. Bedding should always be about 2 to 3 inches thick above food and worms.

**Solution:** Make a fruitfly trap. Cut the corner off a plastic bag, and place the cut corner into a glass jar with a half cup of vinegar. Rubber band the rest of the bag around the top of the jar, creating a funnel of plastic. Place the trap in or near the bin. The flies are attracted to the vinegar, fall in the liquid and drown.

**Solution:** Be sure your kitchen collection container has a sealed lid, or empty it more often. Do not let food sit in a kitchen container more than a week, to discourage flies from laying eggs in the food.

**Problem: The worms are dying**

**The bin is too wet.** Water that has been sitting at the bottom of a worm bin doesn't allow enough oxygen flow for the worms, causing them to suffocate.

**Solution:** Soak up or drain the water. Place fluffed, dry bedding under and atop food and worms. Don't add any water or food until moisture balance is restored.

**The bin is too dry.** Dry conditions will actually pull moisture out of the worms, killing them.

**Solution:** Add damp bedding or keep a spray bottle handy to wet the dry bedding.

**The worms are starving.** After worms eat all their food and bedding, and after they eat their own waste several times, the bin material becomes toxic to them.

**Solution:** Harvest your bin and feed the worms.

**The bin is too hot or cold.**

**Solution:** If temperatures rise above 80 degrees Fahrenheit inside the bin, move it to a cooler location. If the worms are too cold (below 55 degrees Fahrenheit), insulate the bin with solid foam insulation or straw bales, or move the bin to a warmer environment. A garage or basement can work well.

**Problem: My worms are leaving**

**Solution:** Check to ensure your worms have actually left the bin – often they hide in masses underneath material. It's rare for worms to leave the bin in large numbers after initial setup. Leaving a light on above the bin for the first few nights can prevent this. Don't worry if a couple worms find their way out of the bin occasionally.

**Problem: There are fly larvae in my bin**

Inappropriate foods such as meat and dairy, and smelly, anaerobic conditions caused by overfeeding can attract flies, which lay their eggs and hatch into larvae. The larvae won't damage your worms or bin, but the conditions that attract them can.

**Solution:** Remove inappropriate foods, stop feeding the bin for a week or two and drain or absorb excess moisture. To absorb moisture, place fluffed, dry bedding under and atop the food and worms.

**Problem: Something's eating my worms**

Usually rodents are not attracted to worm bins. However, sometimes rats can be attracted to the worms as a food source.

**Solution:** Be sure your bin is rodent resistant (with a solid floor, a lid and no holes larger than a quarter inch).

## Problems, solutions and helpful hints

### Problem: My worm bin smells bad!

**The worm bin is being overfed.** The worms have too much food to eat, and the extra food is decomposing anaerobically (without air).

**Solution:** Stop feeding them for a few days, and break up food chunks to allow air in. Add fluffed, dry bedding below and above the worms and food to absorb excess moisture.

### Your bin isn't getting enough air.

**Solution:** Gently fluff the bin with a gardening fork to allow air to break up pockets of anaerobic bacteria (the smelly type). Add loose, dry bedding. Make sure air holes aren't blocked.



**The bin is too wet.** Blocked air or drainage holes can lead to a rise in moisture and decreased oxygen, promoting anaerobic bacteria growth.

**Solution:** Unblock drainage or air holes. If there is actual standing water in your bin, absorb it by placing fluffed, dry bedding under and on top of the worms and food.

### Improper, smelly foods were accidentally fed to the worms.

**Solution:** Remove meat, dairy and oily foods, which can cause bad odors.

**Tip:** Certain vegetables (onions, broccoli, etc.) have a stronger odor. Experience will allow you to distinguish between smells that are "rich" and those that actually indicate a bin imbalance.



**Y**ou can start your own compost system to reduce waste and make nutrient-rich compost. This manual is set up in a question-and-answer format to allow you to find information quickly. If you still have questions, see the back page for a list of resources, or call Metro Recycling Information at 503-234-3000.

### What is worm composting?

Composting is the process by which organisms such as bacteria, worms and insects help turn fruit and vegetable waste into a nutrient-rich soil amendment. Worm composting uses red worms in an enclosed container to create worm castings, or vermicompost. Vermicompost is more nutrient-rich than standard compost.

## Bin habitat: worms and food

### What kind of worms should I use in my worm bin?

Red worms or “red wigglers” are best. Red worms are surface dwellers that typically live in the top layer of soil under the organic debris that is their food. The scientific name for red wiggler is “*Eisenia fetida*” (i-SEE-nee-a FET-ida). These worms can process large amounts of organic matter about half their weight in food in a day), reproduce quickly and tolerate fluctuations in temperature, moisture and acidity that other species cannot.

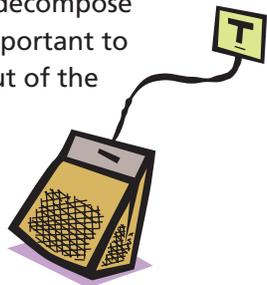


### What do they need to live?

Worms need a home (such as a worm bin), food, bedding, air, water and moderate temperatures.

### What do they eat?

Worms eat mostly fruit and vegetable scraps, coffee grounds, filters, tea bags and eggshells. They also eat their own carbohydrate-rich bedding, usually made of newspaper, leaves or straw. Worms and other organisms within the bin can decompose most organic items, but it's important to keep certain types of waste out of the bin to avoid odor and pest problems.



### When do I add the bedding?

When you start your worm bin, and at each harvest time, fill or top off the bin to about three-fourths full with dampened bedding. Add a few handfuls of garden soil to provide bacteria and grit to help worm digestion. Maintain a 2- to 3-inch layer of dampened bedding at all times. This also will help keep down odors and flies.

### When do I harvest my bin?

You can start harvesting three to six-months after initial setup. Be sure to harvest your bin at least once per year to ensure your worms have a healthy environment.

### How do I harvest my bin?

The easiest way to harvest small amounts is to simply scoop out handfuls of brown crumbly compost, worms and all. For larger-scale harvests, here are two basic techniques:

### Migration method (takes about a month).

Push all the contents of the bin to one side and add fresh, damp bedding to the empty side of the bin. Continue to operate your bin but place food only on the freshly bedded side. The worms will migrate to the new food and bedding, leaving finished vermicompost behind. Remove compost and fill the space with bedding to continue normal bin operations.

### Dump, divide and sort (takes 30 to 60 minutes).

Remove the layer of finished compost and worms from the bin, placing it on a tarp in a number of small cone-shaped piles. The worms will move away from the light, down into each pile. Scrape off the finished compost from the top of each mound as the worms continue to burrow deeper. Keep scraping off the compost until you have mostly worms in each pile. Add fresh, damp bedding to your bin, and place the worms in the new bedding.

**Note:** If you remove all the vermicompost, you will need to place a source of grit in the bin to aid worm digestion. Add handfuls of soil, rock dust or crushed eggshells to help the worms.

## Bedding and harvest time

### What is bedding, and why do I need to use it?

Bedding is one of the most fundamental components of your bin – it helps maintain the balance of air and water that worms need to survive and is a source of food. Improper bedding maintenance is the main reason bins fail. The worms' primary food source isn't the food or bedding you're putting in the bin – it's the bacteria that grows on that food, and the bedding supports the bacteria.

Bedding should provide a loose, moisture-retaining environment with lots of air pockets that allow for drainage. Following are suggestions for bedding options. Keep in mind that a mixture of bedding materials may work better than any one type.

#### Shredded newspaper

Tear newspaper into long thin strips, fluff it up and dampen with water. To prevent compaction, mix with leaves or straw. Keep the strips less than an inch



wide, and remember to moisten the newspaper each time you add it to the bin if your bin is dry.

#### Coir (coconut fiber)

Coir is shredded coconut husk fiber. It retains moisture well, doesn't compact, is odorless and is clean to use. Worms seem to LOVE it. One block of coir costs about \$4. It can be purchased in bulk for half the cost but will need to be cut into smaller pieces, which can be messy and time consuming. It also has to be soaked in water 15 to 20 minutes before use.

#### Dry leaves or straw

Dry leaves that are moistened and added to the bin provide worms their natural habitat. Using fresh leaves that have been sitting outside for a week is fine, but know that you may introduce unwanted organisms into your bin. Gather them fresh in the fall, or rake them into a sack. Straw can also be used as bedding. It is best used in combination with finer-textured bedding materials.



#### Keep these items out of worm bin:

- Dairy products (milk, cheese, yogurt)
- Meats (including fish)
- Oily foods (such as potato chips or french fries)
- Grains (crackers, breads, rice)



#### Where can I buy worms?

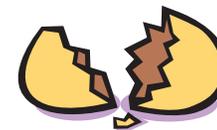
Contact Metro Recycling Information at 503-234-3000 for a list of local resources.

#### How many worms do I need?

One pound of worms is usually enough to start a bin for a small household. For larger systems, it is best to start with 1 pound of worms for every one-half pound of food waste generated per day. For example, if you generate 1 pound of food waste per day, you will need 2 pounds of worms.

#### How often should I feed the worms?

Generally, worm bins should be fed at least once per week. This is not because the worms need to be fed that often, but rather because food standing around for more than a week becomes stinky and attractive to flies. An established worm bin can go for weeks or even months without new food.



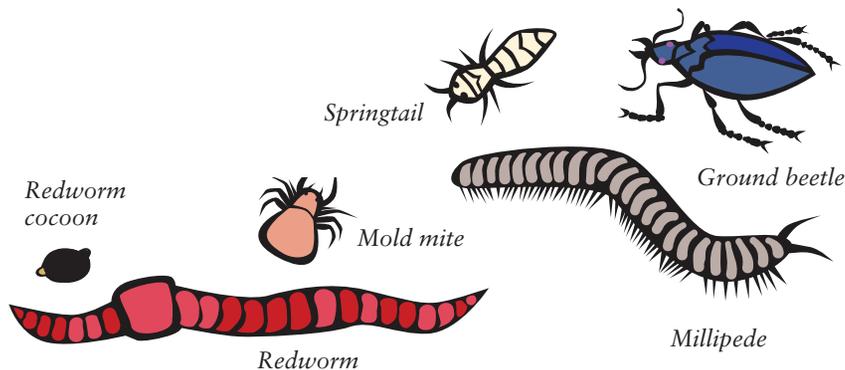
## How do I feed the worms?

1. Collect fruit and vegetable scraps in a container. A tight-fitting lid keeps fruit flies out. Just be sure to empty the container at least weekly so it does not become smelly.
2. Chop the food scraps into smaller pieces to increase the surface area, if you want to speed the decomposition process.
3. Bury your food in a different area of the bin at each feeding.
4. Always keep the worms and food covered with 2 to 3 inches of damp bedding.



## There are other creatures in my bin. Will they hurt my worms?

Your worm bin works efficiently when there is a diverse web of organisms working together to decompose the organic material. You may notice potato bugs (sow bugs), mites, millipedes, small white worms, or "pot worms," and tiny white insects called "springtails." These creatures are an important part of the composting process. The only creatures that may be present and pose a threat are centipedes, which eat worms. You can tell centipedes and millipedes apart by looking at how their legs attach to their bodies. Centipedes have only one pair of legs per segment; millipedes have two pairs. If you notice a decline in your worm numbers, remove the centipedes. If you'd like to learn more about beneficial creatures, consult the resource list at the back of this manual.



## Bin habitat: shelter and space

### How do those other creatures get in my bin?

Eggs and larvae are imported on the surface of fruits and vegetables as well as in the soil or leaves you add to your bin.

### What size worm bin do I need?

The size of your container depends on the weekly amount of food waste to be composted. **The bin should provide a surface area of 1 square foot for each pound of waste per week.** This large surface area helps prevent overfeeding and promotes air flow in the bin. For example, if your family produces 4 pounds of food waste each week, you will need a worm bin with 4 feet of surface area. This could be a bin whose floor is 2 feet by 2 feet, or two bins, each with floors that are 1 foot by 2 feet. The bins should be shallow (no more than 1.5 feet deep). Call Metro Recycling Information at 503-234-3000 for design plans and suggestions on where to purchase bins.



### Where should I put my bin?

The range of temperatures that support worms is between 55 and 80 degrees Fahrenheit. If you have your bin outside, place it in the shade in the summer and insulate it during the winter. Winterizing can include filling the bin with straw, covering it with a tarp and using solid foam insulation beneath the lid and along the sides.

