The Art of Small-scale Vermicomposting:

A Bin to Call Home
A simple box or bin is all you’ll need to get started. A worm bin is any shallow (12"-15" tall) wood, metal or plastic bin with a lid and plenty of holes for aeration and drainage. The size of the bin will depend on your eating habits — or, rather, what you don’t eat. Worm wisdom says you’ll need roughly one square foot of surface area per pound of weekly food waste. Either weigh your scraps or estimate. Typically, a household of two will use a bin with about four square feet of surface area. Rubbermaid tubs come in many sizes and work well, but wash plastic residues out before using them. If you’re a do-it-yourself type, you can construct a box with exterior-grade plywood. Next, drill lots of aeration holes, 1/4"-1/2" in diameter, in rows 2" from the bottom and 2" from the upper edge of the bin. This will promote air flow throughout the bin, keeping your microorganisms, compost critters and redworms happy.

If you don’t want to create your own bin, there are many commercially-available ones. We reviewed plenty of homeseal worm bins in our issue #23 and larger bins in issue #24. These reviews are available in their entirety in the articles section on our website at www.wormdigest.org.

Your bin can be kept indoors near the source of food waste or in the garage or outdoors. The bedding temperature should be kept between 40°-85°F, and the system will process waste fastest when bedding stays between 60°-75°F.

Turning Garbage into Gold

Beds for Their Little Heads
Bed your redworms down in any carbon-rich bedding, which, in combination with nitrogen-rich food waste, will provide a balanced diet for the bin ecosystem. Newspaper is a good, widely available bedding material, as is office paper — just shred paper into strips 1" wide or thinner. Coir (shredded coconut husk fiber) is becoming popular and chopped straw or brown leaves will work well. Water your bedding until it’s the dampness of a wrung-out sponge and fill your bin almost full with bedding, without compacting it. Now set your worms on top and watch them wiggle downward, moving away from light.

Finding Your Little Waste Managers
Giving your bin a good start requires a pound or more of redworms (for a small bin of two square feet in area), Eisenia fetida — the species name for the common redworm sold by your local worm farmer or fishing supply store. A pound is roughly a thousand worms and costs about $15 plus postage. Thus, to pick them yourself from the (cool) compost heap or manure pile might take all day! Do not confuse these epigeic (surface-dwelling) earthworms with those that burrow in the soil (anecic and endogeic). Nightrawlers and other soil-dwelling worms require a soil environment to survive and are definitely not adaptable to your worm bin’s environment. Conversely, redworms will only live in garden beds that have mulched with a good layer of decaying organic matter.

Bon Appetit, Friends!
It’s best to feed your new pets lightly for the first couple of weeks. An ecosystem needs to form within the bedding and food waste. As the populations of bacteria, fungi, microorganisms and other critters increases, the bin will be able to process more. (You can jump-start the process by mixing a bucketful of material from another worm bin or compost pile into your bedding when you set up your worm bin.)
After this period, you can feed your new pets after each meal or once a day, even just once a week. They’ll eat most foods, though you’ll want to leave out the meat or dairy, which have a tendency to putrefy. See how easy it is to care for these new pets? As a rough guide, your worms may eat half their weight in food waste (and bedding!) each day, and increase in population to about a pound per square foot area.

Because worms have no teeth, they rely on bacteria and fungi (primary decomposers) to begin growing on and consuming the organic waste before they can dine. The smaller the pieces of food waste, the more quickly it will be available to bacteria and fungi — so chop it as finely as you like. Don’t blanderize their food, though, as it can lock out oxygen and cause a stink. Burying your food waste under several inches of bedding reduces the numbers of fruit flies, a very common worm bin nuisance. When you feed, you can spread out the food waste or feed in a pattern — one spot for each day of the week. Very little else ever needs to be done for your worms.

**What are Those?**

As you continue to operate your worm bin, you’ll begin to notice many other inhabitants. Among the most commonly seen ones are Colembola. These are tiny, white crawling insects that eat decaying matter. Some of them are called “springtails” because the tiny spring-like organ, (“fercula”) at the back of their abdomens allows them to jump quickly. You’ll likely also see hoards of tiny round red, brown or white mites, especially where there’s fruit scraps. There may be sow bugs or “roly polys” and short, skinny white worms called potworms (these are a different species than redworms). Another possible visitor is the soldier fly maggot, which appears dirty white/gray, is segmented and about 1/2” long. While ugly, they’re also a voracious consumer in your worm bin system. All these critters work to decompose what you feed your bin ecosystem. They live and work there because conditions are good for them and their only interest is in decaying organic matter — they won’t bother your house or garden plants.

**Troubleshooting Your Bin**

Your worm bin ecosystem is pretty easy to maintain and keep on track. It will likely smell good, like finished compost. Now and then it helps to check for and remove excess moisture that may collect in the bottom of your bin (particularly common in plastic bins). Standing liquid may promote the growth of anaerobes, whose by-products stink and are not good for plants. Wooden bins “breathe” and will tend to experience more drying than plastic bins, particularly in dryer climates, and so may require occasional rewetting.

“Stink” in a worm bin is a sign that too little oxygen is reaching part or all of the worm bin system. If you find an area that stinks, where food waste and/or bedding are very wet or compacted, you’ll want to mix in more dry bedding and reduce your feeding in the future.

**Harvesting the Gold**

After operating your bin for three to five months (or even more if you prefer dark, very finished-looking vermicompost), it’s time to harvest your bin. Dump out the contents onto a plastic-covered table in daylight or under a bright lamp and form many small piles of material. The worms will dive down, and in a few minutes you can remove a small amount of vermicompost free of worms. Ten minutes later, the worms in each pile will have gone down again and you can continue to remove the vermicompost. When you’re finished, rebed the worms and you’re done!

The vermicompost you harvest can be used directly in your garden or on your houseplants. It’s an excellent fertilizer that you can use sparingly. Because it comes from an earthworm, however, it will not burn plants if you use more. Mixing it with coir (coconut husk fiber), topsoil, compost and vermiculite or perlite in equal amounts creates a good potting soil.

The following are a few of our educational resources. Visit our website’s Corner Market for a complete listing. You may order on-line, or directly from our office. All prices U.S. postpaid.

**Worms Eat My Garbage**, by Mary Appelhof (176 pgs.), is the foremost practical guide to small-scale vermicomposting. $13.

**Commercial Vermiculture: How to Build a Thriving Business in Redworms**, by Peter Bogdanov, contains plenty of practical, detailed information. $28.

**The Worm Cafe: Mid-Scale Vermicomposting of Lunchroom Wastes** by Binet Payne (180 pgs.), explains the operation of a school-wide cafeteria waste vermicomposting project. $34.

**Worm Bin Creatures Alive Through a Microscope**, a 31-minute video by Warren Hatch, shows us springtails, mites, bacteria, fungi & more. $28.

We offer two videos on large-scale vermiculture operations: The Continuous Flow Reactor (37 min) and American Resource Recovery (15 min.), a 70-acre winrow operation. $28 ea.

Subscriptions to *Worm Digest* newspaper are $12 per year (four issues) and bring you the best current information about worms and worm composting. Back issues are $3.50 each. A copy of our current issue is $3. Send cash or check.

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Composting With Worms

Ecology Fact Sheet

What do you do with your food scraps?
- Throwing food scraps in the garbage quickly fills the garbage can.
- Mixing food scraps with an open compost pile of yard waste may cause odors and attract pests.

Instead, turn your food scraps into nutrient-rich compost by letting worms do the work!

Vermicomposting, or composting with worms, can be done in the basement, garage or in a protected area outside your home. All you need is a worm bin, bedding material, a sheet of plastic, food scraps and, of course, worms!

Within 3 to 6 months, you can have rich compost for your garden or outdoor potted plants.

First, the Bin
You can purchase a worm bin ready-made or make your own from an old cupboard, packing crate, or plywood and 2x4’s.
- The box should be shallow, 12”-16” deep; red worms are surface eaters and need oxygen to breathe.
- Drill a few small holes in the bottom and sides for drainage and ventilation.
- Attach a secure lid to provide a dark environment for the worms. (The lid also keeps varmints out and worms in.)

The size of bin depends on the amount of food waste generated. Generally, a household of 4 produces between 7 to 10 pounds of food waste a week and requires a worm bin with dimensions of 24”x48”x16”.

Call the Department of Ecology’s recycling hotline at 1-800-RECYCLE or your county solid waste department for information on building or purchasing worm bins.

Next, the Bedding
- Corrugated cardboard, newspaper, shredded office paper, straw or leaves can be used for bedding. Tear the cardboard or newspaper into strips 1 to 3 inches wide.
- Soak the bedding in water for a few minutes and squeeze out excess water.
- Fill the bin loosely with the bedding mixture. Do not pack down. It should be fluffy so air can circulate.

Last, the Worms
Worms are the most important part of your vermicomposting operation. Red worms, also known as red wigglers, manure worms, or striped worms, are used for this process because they thrive on organic wastes. (The earthworm, in contrast, needs mineral soils to survive.) Red worms typically have red and grey stripes and can be found in yard waste compost piles or manure.

About a pound of worms are enough to start your worm bin. You can get worms from a friend with an operating worm bin or search through compost piles. Bait shops sell red worms, or they can be purchased through catalogues or gardening clubs. For help locating worms, call 1-800-RECYCLE or your county solid waste department.

Let the Composting Begin!
- Once your bin is filled with a mixture of bedding, place the worms on top. They will burrow down below the surface.
Now you’re ready to feed them your food scraps. Put food scraps in the bin and cover lightly with bedding so food does not show.
Place a sheet of plastic on top to help retain moisture.

**Food Waste Dos and Don’ts**

- **Do feed them:**
  - vegetable scraps
  - fruit rinds and peels
  - breads, cereals
  - coffee grounds w/filters
  - tea leaves, bags
  - egg shells

- **Don’t feed them:**
  - meats, bones
  - fish
  - dairy products
  - vegetable oil
  - pet wastes

**Meats, fish and oily foods should be avoided.** They emit odors when rotting. Flies and rats can also be attracted to worm bins containing meats.

**Worm Bin Maintenance**

In about 3-4 months, the compost will be mostly dark and crumbly. Pile the contents of your bin onto one side and put fresh bedding and food scraps onto the other side. The worms will slowly find their way to the fresh supply, leaving behind rich humus. When the first pile is completely composted (it could take another 4 to 6 weeks), remove it and replace with fresh bedding.

Once established, your worm bin will become home to other creatures besides worms. Sowbugs, beetles, millipedes, molds and many other bugs and microscopic organisms create an ecosystem of their own and, along with the worms, break down food wastes.

**How to Use Your Compost**

- Mix into the soil in garden or flower beds any time of the year.
- When planting your garden, add compost to the bottom of your seed row.
- Add compost to the bottom of holes when transplanting plants.

**Harvest Time**

Fully operational worm bins produce a steady supply of worms. These can be harvested and used for fishing bait and as a starter supply for other worm bins.

To harvest the worms, shovel a small pile of compost onto some plastic in the sun. Let stand for a few minutes and scrape away the top portion. The worms should be hiding in a clump at the bottom of the pile.

**Trouble-Shooting Tips**

Fruit flies multiply around your worm bins, especially in summer. Add a layer of fresh bedding and make sure a sheet of plastic has been placed on top to reduce their numbers.

Odors in the worm bin indicate too much food waste and not enough bedding. Add a layer of fresh bedding and make sure you have adequate drainage. You may need to add a few more drainage holes.

**The Benefits of Worm Composting Include:**

- Creating great nutrients for your soil.
- Reducing the amount of garbage in your garbage can and in the landfill.

A great resource for information on worm composting is *Worms Eat My Garbage*, by Mary Appelhof, published by Flower Press, Kalamazoo, Michigan, 1997. It is available through your local libraries and bookstores.

For more information on composting, call 1-800-RECYCLE or your county solid waste office.

If you have special accommodation needs or require this document in alternative format, please contact Michelle Davis at (360) 407-6129 (Voice) or (360) 407-6006 (TDD).
What Is Worm Composting?
Let worms recycle for you. They will quickly turn your kitchen scraps into an exceptionally rich fertilizer for your houseplants or garden. Worm composting is easy. You feed the worms your banana peels, wilted lettuce or stale bread and the worms do the rest. Worm composting, also called vermicomposting, can be done year round, indoors or outdoors. It's ideal for small spaces in the garage or under the kitchen sink.

Worms In The House?
Worms are clean. With proper care, your worm box will have a pleasant odor, like that of fresh earth dug out of the ground.

Why Feed Worms?
The benefits of vermicomposting are many. Composting is recycling. You and your worms help the environment by reducing the amount of garbage you produce. A medium sized worm box can process more than 5 lbs of food waste each week! In return, you get a valuable soil amendment good for growing just about anything.

Getting Started
Red worms, also called red wigglers, are the best worms for worm composting. Red worms are a different species from common garden worms and night crawlers, which need large amounts of soil and cool temperatures to survive. One pound of red worms (about 1000 worms) is enough to start a worm bin. Get your worms from a friend's bin, or buy them from a worm farm or bait shop. Once your worm bin is established, you will have enough worms to help your friends start vermicomposting too.

Where Will My Worms Live?
You may already have what you need to make a worm bin. A plastic storage container, wash basin, or a sturdy wooden box can be easily fashioned into a home for your worms. Or you can buy a bin specially designed for worms. Whatever you use, your worm box should be shallow, since worms like to live near the surface where they can breathe. About one foot deep with two to three square feet of surface area is best. Your bin should also have a tight fitting lid and holes drilled in the bottom for ventilation and drainage.

Eight or ten inches of bedding inside your bin will provide the worms with a damp, aerated place to live. Common bedding materials include strips of newspaper, shredded cardboard, manure, leaves, or peat moss. Moisten the bedding and squeeze out excess water before placing inside your bin.

You may want to add a handful or two of soil to provide grit which will help the worms digest food particles.
What Can My Worms Eat?
Worms will eat fruit and vegetable peelings, coffee grounds, teas bags, crushed egg shells, bread, rice and leftover leftovers. Most people prefer to raise 'Vegetarian' worms to avoid odors from decaying meat scraps. Be sure to bury your food scraps in the bedding to discourage molds and fruit flies. Bury the food in a different corner of the box at each feeding. The next time you look, it should be gone. If not, try feeding your worms a little less for a while.

When Do I Get My Fertilizer?
After a few months, you will notice that the original bedding has disappeared and has been replaced with rich, dark worm compost. It's harvest time. Put your worms on

from the compost by hand, and start anew with fresh bedding, or you can try the following: coax your worms to one side of your box by feeding only on that side for a few weeks. Then harvest the worm-free side of the box, replace it with fresh bedding, and do it again.

For More Information
For more information about worm composting, read Worms Eat My Garbage by Mary Appelhof.
Or call the California Integrated Waste Management Board's Waste Information Service at (800) 553-2962.

Trouble Shooting Guide For Worm Composting

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Problems</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worm bin smells bad</td>
<td>Too much food</td>
<td>Feed less</td>
</tr>
<tr>
<td></td>
<td>Too wet</td>
<td>Check drainage holes/add dry bedding</td>
</tr>
<tr>
<td>Fruit flies</td>
<td>Food isn't buried</td>
<td>Bury food</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cover surface of bedding w/carpet sheet of newspaper</td>
</tr>
<tr>
<td>Worms aren't eating</td>
<td>Too much food</td>
<td>Feed less</td>
</tr>
<tr>
<td></td>
<td>Too acidic</td>
<td>Stop feeding citrus peelings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sprinkle with crushed oyster shells</td>
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</tbody>
</table>
HOW MANY WORMS DO YOU NEED?

Worms typically eat an amount equivalent to approximately half of their body weight per day in good conditions. Once you have decided how much total waste you have to feed your worms in an average week, divide that number by seven to get the average amount of food you have for worms each day.

A simple example using this formula is:

1. A family produces seven pounds of total waste in an average week.
2. Divide the seven pounds of waste by seven days in a week.
3. The answer is one pound of waste produced each day to feed the worms.

So, knowing this, our example family needs two pounds of worms to eat the one pound of waste they produce each day. Of course, this is an average; when conditions in this bin are good, worms will eat more, and when conditions aren't so good, worms will eat less. In chapter 4, "Maintaining A Worm Bin," we will go into a more detailed explanation of conditions and feeding worms in a worm bin.

Now, your next question is: How many worms are there in a pound? Well, it really doesn't matter, because commercial worm growers sell their worms by the pound. However, most worm growers estimate there are approximately 1,000 adult red-worms in a pound.

HARVESTING

Finally, you have the worm bin set up and going. Your worms are eating your organic wastes and now there is little or no original bedding visible in your bin. The original bedding has changed to brown and earthy-looking vermicompost. Vermicompost is a mixture of worm castings and decomposed organic matter. This process can take anywhere from six weeks to four months, depending on the size of the bin and the number of worms in it. The volume of the bedding will decrease over this time, making the environment more and more hostile for the worms. It's time to harvest. What a great day! Now what do you do?
Worm growers who have purchased commercial worm bins usually don't have to worry about harvesting too much. These worm bins come with specific instructions, which work quite well, about when and how to harvest the worms and castings. For those who have made their own box-type bin system from either plastic or wooden boxes, there are several different ways to harvest the castings and the worms.

**NOTE:** When harvesting worms and vermicompost, some harvesting methods involve moving the worms from one bin to another. If you are planning to move your worms, you should always have the new bin bedded and ready to receive the sorted worms before you start harvesting, to reduce the stress on the worms.

- **Sorting method:** Many worm growers who have small bins feel separating the vermicompost and worms in the bin is an easy method. One benefit of this method is that it doesn't disturb the worms too much, and it allows you to remove as little or as much of the vermicompost as you want.

  Begin by carefully separating the vermicompost from the uneaten food and the worms. Use a paintbrush to move the vermicompost to one side. Scoop the compost out. Wait a few minutes for the worms to move deeper into the bin and repeat the process until all the vermicompost is removed. The last layer will be thick with worms. If you need to remove some worms, do so now, or place new bedding on top and start composting again.

- **Screening method:** This method involves separating the worms from the vermicompost using a screen. One way to do this is to dump your worm bin's contents, a bit at a time, on a framed, 1/4- or 1/16-inch screen. The vermicompost will drop through, leaving worms and larger particles of food and bedding behind. Return the worms back to a clean and freshly bedded bin or bins. Keep in mind that this method does stress the worms, and it may take them a few days to recover.

  Another method involves using a screen inside the bin. This method works great for small bins. Place a piece of flexible screen (1/16-inch or so) on top of your worm bin when it is time to harvest. Use a big enough piece of screen so the screen will go up the sides of your bin. You will use this extra screening to
lift the top section out later. Now, rebed the worm bin right on top of the screen. This now becomes the top part of the bin. The worms will now move up through the screen to feed on the new food and bedding. When the worms are established in the top bedding, lift the top part out of the bin by the screen. Dump out the fine vermicompost in the bottom and pour the top part back into the bin. Repeat this process again when the bottom part of the bin is ready to harvest.

- **Light method:** Worms are photophobic, which means they do not like light. To use light to help you, dump your worm bin in a tall pile on a piece of plastic. (Larger bins can be dumped a bit at a time.) Shine a light directly overhead—or do this outside on a sunny day—and the worms will burrow back down into the pile to get away from the light. Now brush off the vermicompost or castings off the top and sides of the pile and place them to one side. When the worms are exposed, wait until they burrow back down into the pile. Do this until the worms are completely separated from the compost. Now you have a pile of worms to separate into new bins or sell. Be sure to have new bins ready to receive the worms right after sorting, because worms exposed to light for too long will die.

- **Moving method:** This method, which works well for larger bins that are too heavy to lift, involves moving the worms in your bin from one area to another. When the bin is ready to be harvested, move the contents of the bin over to one side. Now rebed the empty side with the same kind of bedding you used initially. Start feeding the worms on the new side only. The worms will start moving to the new side for food and clean bedding. This will take several days. When the worms have moved over, harvest the old side. Add new bedding to the old side and repeat when necessary.

- **Water method:** Some worm growers prefer to use their worm castings in liquid form. One way to do this is to harvest the castings by dissolving them in water. Spray your worm bin with water and collect the casting water that comes out, being careful not to waterlog your worms for too long. Rebed the worms as quickly as possible.
RECOMMENDED READING FOR THE HOME GARDNER:

THE WORM BOOK, by Loren Nancarrow and Janet Hogan Taylor

WORMS EAT MY GARBAGE, by Mary Applehoff

ADDITIONAL RESOURCES:

Dort Worm Farm
POBox 1108
Philomath, OR 97370
(541) 929-5603
www.dortworms.com

Territorial Seed Company
20 Palmer Avenue
Cottage Grove, OR 97429
(541) 942-0510
www.TerritorialSeed.com

www.EarthWormDigest.org
1455 East 185th Street
Cleveland, OH 44110
(216) 531-5374