



SOUTHWESTERN UNIVERSITY

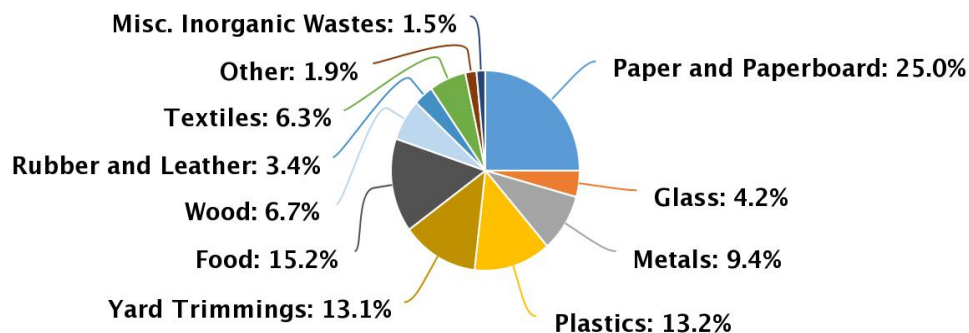
At Home Composting Guide

1. Why Should You Compost?

America has a trash problem. Most of the world does, but for purposes of this guide, I'll be talking about America. As of 2017, the EPA estimates the average person throws away 4.51 lbs. of trash every day. We accumulated 267.8 million tons of solid waste in 2017. The majority of this was made up of paper and paper products, as shown in the figure below taken from the EPA website¹. Of the figure below, total compostable materials (paper and paperboard, yard trimmings, food, and wood) make up 60% of the graph, or just a little under 161 million tons of trash. In other words, if all compostable materials had been composted in 2017, only just about 107 million tons of trash would have been put in landfills instead of 267.8 million. Those are both big numbers so let's talk about why it matters that organic trash doesn't end up in landfills.

Total MSW Generated by Material, 2017

267.8 million tons



So how is composting better than landfills? The simple answer is that compost 'fixes' carbon. Microorganisms break down compost by eating it. The nutrients from the food and paper scraps then become part of their body. The nutrients that don't get eaten get put into the newly formed soil and 'eaten' by plants, thus becoming part of their 'bodies.' Global warming is caused by an excess of CO₂. Compost does not completely prevent the release of CO₂ in the breaking down process. However, due to the presence of oxygen, microorganisms can break down the waste and 'fix' some of the carbon so that it becomes part of them and not a gas. Landfills use mostly a process with no oxygen in them because everything is pressed down to make room for more trash. Thus, only microbes that don't need oxygen (called anaerobic bacteria) can live there and break things down. Another greenhouse gas produced more by landfills is methane. When those no-oxygen-needing bacteria break things down, they make methane which warms the earth. So overall, composting at home does make a difference. A 161 million ton difference.

2. How Does Compost Work?

At its base, compost is taking the nutrients stored in waste and letting them organically break down into a form usable by plants. It's part of the natural cycle of things; it happens every year when the trees lose their leaves, the leaves break down on the forest floor, and the chemicals and nutrients that made up the leaves get reabsorbed by the tree to make new leaves.

Finished compost, known as humus, is essentially highly nutritious soil. Before it can get there, we need to talk about what goes into it. We focus on Nitrogen and Carbon because they are the primary nutrients needed by the insects and microorganisms breaking down your compost. In compost terms, nitrogen-rich materials are the 'greens.' In other words, these are your food scraps, fresh lawn clipping, and fresh leaves. Carbon-rich materials are your 'browns.' These are your old lawn clippings, dead leaves, cardboard, and newspaper. The goal is to have a ratio of 2 parts carbon to 1 part nitrogen, however, it's ok if it's not. 2:1 is the recommended number because that is the ratio that 'thermophilic' bacteria like. Those bacteria move in and eat and live, producing a lot of heat which helps scraps break down. The Carbon ratio is higher because not only does a lot of it escape as CO₂, a lot is combined with the nitrogen of microorganism bodies¹. If you want to keep things simple, it's ok to not keep a super close eye on the exact ratio. Most of the problems people run into are a result of the ratio being off. Later in this guide will be a cheat sheet for how to solve them.

When you first start composting, you should line the bottom of your container with a thick layer of browns to absorb excess moisture. You should then make sure that you have a good ratio of wet (food scraps etc.) vs dry (cardboard etc.) as well as the aforementioned Carbon to Nitrogen ratio. Once you start putting scraps in your bin, the main thing you need to do is regularly turn the compost. This looks different depending on your set up but turning means to 'turn' the compost usually with some kind of instrument like a shovel and stir everything up. The main purpose of this is to make little air pockets so the aerobic (oxygen-needing) bacteria will stay alive. If you don't turn it, it will compact and kill off your 'good' bacteria. Turning also prevents bugs like ants from taking your bin as their home. Stirring your compost breaks up ant hills and keeps them from killing helpful bugs like worms. It additionally helps drain excess moisture. Compost in a pile should be turned every 3-7 days and in a tumbler, it should be turned every 3-4 days².

Aside from putting in scraps, turning, and generally keeping an eye on it, making compost is about waiting for nature to take its course and break things down. It is also important to make sure that it doesn't get too dry, as this will kill off the organisms breaking it down. Additionally, some very large piles can catch fire due to the populations of thermophilic (heat loving) bacteria. Keeping it damp will prevent this.

3. How To Make a Composting Container

Plastic Bin

Difficulty	DIY?	Cost	Time	Size
Easy	DIY	≤ \$10	≤ 10 min	Fully adjustable



■ Pros and Cons

○ Pros

- Compost is very contained and out of the way. Beneficial if you live with a family that isn't too enthusiastic about composting.
- Extremely easy DIY
- Can pick up and move the bin

○ Cons

- You have limited space in the bin
- Can be a bit more difficult to turn the compost because you have to use a small shovel and get in the corners
- Uses plastic

■ Required

- a plastic container with a tight fitting lid (size ultimately up to you); could be a storage bin or even a big plastic trash can
 - *Tip:* A dark container with opaque plastic is recommended. Heat helps the compost break down and having a dark container helps trap heat from the sun. Heat also keeps unhelpful bugs like ants from setting up homes inside your bin.
 - *Tip:* I recommend one that has the handles that snap on and off easily like the one pictured below. You want a container with a lid because it keeps out unhelpful animals like raccoons and possums that will ultimately only make a mess. Snapping handles make it easier to ensure it closed if you're coming out to quickly toss in scraps.



- a power drill

■ Steps

- For a big plastic tub like the one shown above, drill about 8-10 small holes on each side including the lid. The purpose of these holes is to aerate the compost which keeps it from turning into a solid mass of sludge. They also let bugs come and go as they please.
- Leave the container outside in a spot that gets plenty of sun

Wood Fence

Difficulty	DIY?	Cost	Time	Size
DIY skills required Medium-Hard	DIY	≤ \$40	1-3 hours	Large



■ Pros and Cons

- Pros
 - Made of natural materials
 - Completely open to the air and ground
- Cons
 - More labor and cost intensive
 - Messier depending on if you use chicken wire or wood slat sides and how big the gaps are

■ Required

- (4) 2 x 6 pieces of wood (120" long)
- (2) 2 x 2 pieces of wood (96" long)
- Wood Screws (2.5" long)
- Brad Nails
- Chicken Wire (24" high x 160" long)
- Measuring Stick
- Pen or Pencil
- Table Saw or Circular Saw
- Brad Nailer or Nail Gun
- Cordless Drill or Screwdriver

■ Steps

- Found [HERE](#) about halfway down the page (Command F: Measure and Mark Wood)¹
 - *Tip:* I recommend the chicken wire lid to keep rodents and pests out

Purchased Tumbler

Difficulty	DIY?	Cost	Time	Size
N/A	Purchased	Varies but ~\$100-\$300	n/a	Varies



- Pros and Cons
 - Pros
 - More aesthetically pleasing
 - Easier to turn (under a certain weight limit)
 - Tight lid keeps rodents out
 - No smell
 - Cons
 - Harder to turn (over a certain weight limit)
 - Most are plastic
 - Expensive

- Links
 - [This](#) website compares some different styles of compost tumblers
 - [12 cu. ft. Compost Wizard](#) - \$199.95
 - [100 Gal. Dual Bin Compost Tumbler](#) - \$244.99
 - [570 lbs. Compact Composter Tumbler](#) - \$306.60

4. What Can/Cannot Go Into Compost

Things that CAN go in compost

- Cardboard/Paper goods
 - Napkins, paper towels, old homework (take out the staples), newspapers, toilet paper and paper towel rolls, boxes, etc.
 - Make sure you tear these into small (roughly dollar bill) sized pieces first so they break down quickly. Tear them as small as you have patience for.
- Dryer lint
 - Once it breaks down, you might see shiny fibers left over. That's plastic fiber from clothing. You can take it out if you want but it won't be harmful to leave it there. It just won't break down.
- Food scraps
 - This should make up about half your compost
 - Exceptions to this are things listed in the next sections
- Hair
 - Hair contains a lot of nitrogen and is excellent for soil. You can throw in hair from your brush or swept up pet hair.
- Lawn clippings
- Wood (small pieces)
 - Burnt matches, wood chips, tooth picks (preferably ones that haven't been in your mouth)

Things that CANNOT go in compost

- Anything with bodily germs (Nose tissues, animal waste, etc.)
 - The germs could sit in the compost and eventually get into whatever plants you fertilize with it. Think about how people got sick at Chipotle because their lettuce was fertilized with cow manure that was contaminated with *e. coli*.
- Breads/crackers/cookies/cake
 - You'll attract ants and maybe critters.
 - This is acceptable in some compost systems. For example, the composter at Southwestern can handle bread. However, at home it's better to leave it in the trash.
- Chemicals
 - Not only will these affect the life in your compost that is helping break it down, remember that if you use the compost in an edible garden, the chemicals may get into what you eat

- Clothing/cloth
 - The dyes might be toxic. Plus it would take a very, very long time to break down.
- Fats and oils/Anything that's oily (like pizza boxes)
 - These attract pests and smell.
 - *Tip!* Tear off the parts of the pizza box that don't have oil stains and toss those into your compost.
- Meats, eggs, and cheese
 - These attract pests and smell.
- Rice
 - Cooked rice attracts harmful bacteria and raw rice attracts pests.
- Sawdust
 - Treated wood can't go into compost (chemicals), you should avoid putting in sawdust unless you're completely sure the wood hasn't been treated.
 - *Tip!* If you mix pure sawdust into your soil, nothing will grow there until it decomposes. This is because the sawdust is very high in carbon which absorbs the nitrogen necessary for things to grow. It's a great nutrient boost once it has decomposed though, so just make sure it has before using your compost.
- Walnuts
 - They contain a chemical called juglone that's toxic to some plants and vegetables like tomatoes.
- Weeds
 - This is more up to you than the other items in this section. Adding weeds to your compost means that they will likely sprout wherever you end up using the compost. It's recommended that you don't put weeds in for that reason but if you don't mind some weeding, then it's fine.

Things to be used in moderation

Compost should be a neutral pH and these make it more acidic:

- Citrus Peels
- Coffee grounds
- Fireplace ash
- Onion scraps
- Tea leaves

Other items to use moderately:

- Compostable Cleaning Wipes
 - Follow the instructions on the package. They usually say something like "should not make up more than x% of household compost."
- Egg shells (NOT eggs)
 - These are compostable with the caveat that any leftover liquid in them might attract pests. Let them dry out first and crunch them into small pieces or they'll take a long time to break down.
 - *Tip!* I prefer saving eggshells until I have a lot, grinding them into a powder (usually with a food processor), and spreading them directly onto the soil under a plant for a nutrient boost. This can also help acidic soil.
- Sticks
 - Unlike the rest of the things on this part of the list, you can't technically have too much woody material but be prepared that it's going to take a very, very long time to break down
- Waxy paper
 - Think shiny magazines. The amount doesn't matter so much here, however, you should rip it up into small (maybe half of a dollar bill sized) pieces before putting it in. The soy wax used takes a while to break down.

5. Taking Care of Compost

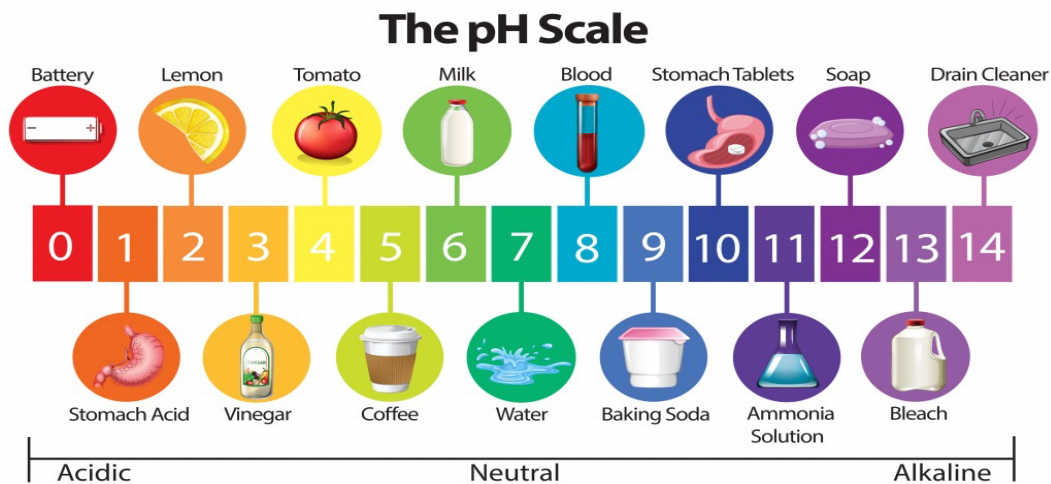
The goal of composting is essentially making dirt, as mentioned before. Thus, you want it to resemble the kind of dirt you'd get in a bag of potting soil: dark; moist but not wet; neutral pH; and crumbly. Moisture level should be that of a wrung-out sponge. A common pitfall of new composters is that they think compost should stink. When done correctly, compost smells like soil. A little earthy, but definitely not like rotting garbage. Luckily, this is easily remedied.

pH Testing

First, how to test the pH if you aren't willing or able to purchase a kit. Think back to elementary school science volcanoes¹.

1. Take 4 big spoonfuls of compost. Put two in one cup and two in another.
2. Add ½ cup of white vinegar into one of the cups. If it fizzes, your soil is basic and probably between 7 and 8.
3. If nothing happens, add two spoons of distilled water to the cup that has only soil. Mix it up and let it become mud.
4. Add ½ a cup of baking soda to the cup with mud in it. If it fizzed, your soil is acidic and is probably between 5 and 6.
5. If nothing happens in either cup, congrats! You have neutral soil.

Generally, most plants prefer somewhere between 5.5 and 7. You'll probably experience fungal issues if you get below 4.5.







Troubleshooting

Too wet?	Add dry, papery goods. Newspaper and cardboard works the best.
Too dry?	Add water. Maybe water you cooked pasta or vegetables in for that extra nutrient boost.
Too acidic?	You can refer to the list above of what not to put in compost. In this case, add things like eggshells. If you have access, oyster shells work.
Too basic?	Add things like citrus and onion peels.
Ants?	Give the compost a good stir and break up their nest. They should be gone tomorrow. These will also be killed off if your compost gets hot enough.
It smells bad?	You have too many food scraps and your ratio is thrown off. Throw in some brown lawn clippings (not green), cardboard, or paper and give it a day or two.
Flies swarm when you open the lid?	This isn't a problem but it is annoying. You've got food scraps too close to the surface. Just put some brown material (paper, cardboard, brown lawn clippings) as your top layer.

6. Bugs and Other Friends

Bugs are one of the most helpful parts of nature when breaking down your compost. Most people aren't used to thinking of them as a good thing so let's get acquainted. Remember that this isn't an exhaustive list and you will have different bugs depending on where you live.

Bug	Picture	Information
Slugs		These guys are generally helpful! If too many move in, add a little coffee grounds. They'll leave.
Isopods (woodlice, pill bugs, etc.)		These are some of the most common bugs. Luckily they're helpful.
Fruit Flies		These guys are going to be seen along with their larva. They're helpful for breaking down food, even if seeing their larvae is unnerving.
Black Soldier Flies		These look a little more like a wasp but they're flies! They don't bite. The adults don't even have mouths. Only the larvae do.
Maggots		We usually think of maggots as gross but they're the most efficient at breaking down waste. You want them!
Grubs		Grubs can turn into a variety of different beetles. No need to get rid of them!

Worms		<p>These are perhaps the ultimate composter. Those who compost inside will often buy worms online to include in their compost.</p>
Ants		<p>While ants bring in beneficial fungus and break down food, they are a common pest. You can easily get rid of them by stirring your pile. Fire ants can kill worms so it is encouraged that you get rid of them.</p>
Roaches		<p>While roaches aren't a problem, it is understandable if you want to discourage a nest. Stirring compost regularly and keeping it a bit more wet than usual will get rid of them. Just let it dry out when they leave.</p>

7. References and Further Reading

Why Should You Compost?

1. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>

Additional Reading: <https://anrcatalog.ucanr.edu/pdf/8367.pdf>

How Does Compost Work?

1. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_040876.pdf
2. <https://www.gardeningknowhow.com/composting/basics/turning-compost-pile.htm>

How to Make a Composting Container

Credit to <https://sawshub.com/how-to-make-diy-compost-bin/>

Taking Care of Compost

Credit to <https://preparednessmama.com/testing-your-soil-ph-without-a-kit/>