

Backyard Composting of Yard, Garden, and Food Discards

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Instead of disposing of yard trimmings and kitchen scraps, you can compost them in your own backyard. Composting is an easy, fascinating, and natural way to recycle. Compost can be made from most organic materials such as leaves, kitchen scraps, and yard trimmings, and it can improve the health of your soil and plants. You can be as involved as you like with your compost pile: simply stack things up and wait for nature to take its course, or turn, water, and monitor the pile to speed up the process. When mixed with soil, compost increases the organic matter content, improves the physical properties of the soil, and supplies essential nutrients, enhancing the soil's ability to support plant growth. Compost can also be applied to the soil surface to conserve moisture, control weeds, reduce erosion, improve appearance, and keep the soil from gaining or losing heat too rapidly. This publication explains how to build and maintain a compost pile and use the compost in your yard and garden.

Compostable Materials

Organic materials that can be composted are commonly characterized as “browns” and “greens.” Browns are sugar-rich carbon sources (*carbonaceous*) that provide energy to microorganisms, absorb excess moisture, and provide structure to your pile. Browns include dead fallen leaves, newspaper, straw, sawdust, napkins, cardboard, twigs, hay, dryer lint, and bark. Greens are protein-rich nitrogen sources (*nitrogenous*) that provide moisture to microorganisms. Greens include grass clippings, vegetables and fruit, coffee grounds, tea leaves, livestock manures, and alfalfa.

The following list provides examples of organic materials that may be added to your compost bin:

- Autumn leaves, twigs, yard trimmings
- Grass clippings
- Vegetables and their trimmings
- Fruit and their peels
- Coffee grounds and filters
- Tea leaves and bags
- Paper napkins
- Cereal boxes
- Sawdust from deciduous hardwood trees
- Bamboo skewers
- Paper egg cartons
- Pizza boxes
- Twigs
- Paper bags
- Houseplant leaves
- Paper rolls (towel, toilet paper, wrapping paper)
- Cotton balls and swabs
- Paper plates
- Straw and hay (no persistent herbicides; see Extension publication AG-727, *Herbicide Carryover in Hay, Manure, Compost, and Grass Clippings*)
- Nut shells (no walnut shells—they can be toxic to plants)
- Stale herbs and spices
- Wine corks
- Toothpicks
- Paper baking cups
- Hair and fur
- Dryer lint
- Vacuum contents & floor sweepings
- Pencil shavings
- Newspaper
- Loofahs
- Cotton, wool, linen, silk, hemp, burlap, felt
- Office paper, junk mail, envelopes (no plastic)
- Used matches
- Yard trimmings
- Nail clippings
- Freezer-burned vegetables and fruits
- Aquarium water, algae, plants
- Soiled paper
- Dregs from juice, beer, wine
- Spent potting soil
- Dead blossoms
- Eggshells and crustacean shells
- Paper table cloths
- Spoiled tomato sauce, paste
- Dead flowers, blossoms
- Potpourri
- Beer and wine-making leftovers
- Seaweed
- Evergreen garlands and wreaths
- Jack-o-lanterns
- Dry dog, cat, fish food
- Bread, tortillas, pitas
- Cereal and crackers
- Chips (tortilla, potato, etc.)
- Cooked pasta, rice, other grains
- Soy, rice, almond, coconut milk
- Crepe paper streamers
- Yarn, thread, string, rope, twine
- Cork
- Wood chips and bark
- Dryer sheets manufactured by Seventh Generation or Method

You can store food scraps in a container until you are ready to add them to your compost pile. Some people freeze food scraps in a container; others reuse a plastic container with a lid, or use a purchased compost kitchen container, and keep it under their kitchen sink or on the kitchen counter. Food scraps should be buried inside the pile to avoid attracting rodents.

Yard waste suitable for composting includes fallen tree leaves, grass clippings, straw, and non-woody plant trimmings. Although grass clippings can be composted, it is better to leave them on the lawn where they will decay and release nutrients, reducing the need for fertilizer. (See NC State Extension publication AG-69, *Carolina Lawns*.) When adding grass to a compost pile, mix it thoroughly with leaves so it does not compact and restrict airflow.

Newspaper and other types of paper can be composted, but the nitrogen content is low, which decreases the decomposition rate. If paper is composted, it should make up no more than 10% of the total weight of the material in the compost pile. It is better to recycle paper curbside or take it to a community collection site.

Some materials may pose a health hazard or create a nuisance and therefore should not be used to make compost.

Getting Started

Set up your compost pile or bin in a convenient location that is more than six feet away from your home or wooden structures. To help it retain moisture, place it in a shaded area within reach of a garden hose. The location should be a flat, open space that is protected from flooding or runoff to surface waters or wells. Keep the areas in front of and above the pile or bin clear so you can work without difficulty.

You do not need to use a bin to compost. Some choose to use a bin to keep the pile neat, help retain heat and moisture, or because they live in a neighborhood where a bin would be more appropriate than an open pile. Many people make their own compost bins using concrete blocks, wooden pallets, wire mesh, 55-gallon drums, or garbage cans. Others construct a three-compartment wooden bin using plans from the Internet. There are a variety of manufactured composting bins available, including enclosed, spherical, or tumbler styles. Although meat, fish, bones, and dairy should not be added to a compost pile or bin, they can be placed in an in-ground digester such as the Green Cone.

Composting Methods

There are two basic styles of composting: (1) Single batch, where you add materials all at once to form a pile; and (2) Continuous pile, where you add organic materials as they become available. Build

The following types of organic materials should *not* go into compost piles:

- Dog or cat feces and litter, and dirty diapers (may contain parasites and pathogens)
- Meat, fish, bones, fats, grease, lard, oils, eggs, or dairy products, such as butter, milk, yogurt, and sour cream (may create odors, attract rodents and flies)
- Yard trimmings treated with chemical pesticides (residual chemicals may kill beneficial composting organisms or affect plants where compost is placed)
- Diseased or insect-infested plants (diseases and insects may survive and be transferred to other plants)
- Black walnut tree leaves or twigs (release substances that might harm plants)
- Weeds that have gone to seed
- Weeds with invasive roots, such as dock weed, alligatorweed, or bermudagrass
- Used facial or toilet tissue (may contain pathogens)
- Charcoal ash or coal (resists decay and may contain substances harmful to plants)
- Pressure-treated lumber, pressed wood, plywood (contain toxic chemicals)
- Heavily coated paper (e.g., magazines, catalogs, wrapping paper, greeting cards with metallic inks, photographs)
- Wood ash (a handful or two may be added, but too much may harm microbes, slow the composting process, cause smelly ammonia gas releases, and reduce nitrogen)
- Pine needles (waxy coating resists decay)

your pile three to five feet high and at least three feet in diameter so it can become self-insulating to retain heat. Add four or five inches of carbonaceous materials (browns), then two or three inches of nitrogenous materials (greens), and keep alternating the layers. Another method is to thoroughly mix up browns and greens during loading. Be sure to thoroughly water each layer to ensure even moisture distribution. Toss in a handful of soil on each layer to introduce more microorganisms. Top the pile with four or five inches of carbonaceous materials to prevent flies and other pests and provide a filter for odors.

For a simple compost recipe, combine leaves, grass, food scraps, and coffee grounds at a 2-to-1 ratio mixture of browns and greens. To help get your compost pile hot, dust small amounts of one or more of the following (in meal form) on top of your greens: alfalfa, bone, hoof, soybean, canola, cottonseed, or blood. Adding a mixture of water and molasses, sugar, syrups, or flat soft drinks also helps to activate your compost pile.

Carbon-to-Nitrogen Ratios

Leaves are the primary organic waste in most backyard compost piles; however, different types of leaves have varying carbon-to-nitrogen (C:N) ratios, which can affect the decomposition rate in your compost pile. For optimal decomposition, the ideal C:N ratio is from 25:1 to 35:1. Maple leaves have a C:N ratio near 30:1, so with the right moisture and frequent turning, maple leaves can break down in several weeks. Oak leaves have a C:N ratio of about 60:1 and contain high levels of decay-resistant tannins, so they take a lot longer to break down. Mixing oak leaves with high nitrogen materials will

accelerate their decomposition. Table 1 lists C:N ratios for some commonly composted materials to help you determine the appropriate mix of materials for your pile.

The Composting Process

Because decomposition happens on the surface of materials, particle size and shape are crucial to the composting process. Chopping materials into smaller particles creates more surface area and accelerates decomposition. Use a chipper, grinder, or a machete to reduce particle size, or place materials in a bucket and use a square-end shovel to chop them into pieces smaller than two inches. Don't get carried away, because very fine particles will prevent air from flowing into your compost pile. To reduce the size of fallen tree leaves at little cost, run a lawn mower over them before or after raking. The shredded leaves can be collected directly if the lawn mower has an appropriate bag attachment. Rigid particles provide structure and ventilation to your pile, so it is beneficial to layer in small branches.

The decomposition process will slow down if there is too little or too much moisture. Approximately 40% to 60% moisture is needed in the pile. At this moisture level, the pile should feel like a wrung-out sponge. The compost is within the right moisture range if a drop or two of water can be squeezed from a handful of material. If no water can be squeezed out, the materials are too dry. Too much moisture will slow the decomposition process and produce unpleasant odors. If this happens, add dry leaves, paper, or sawdust to absorb excess moisture. Most often, compost piles are too dry, which slows down the composting process. Open piles can be covered with a tarp to hold in moisture.

Table 1. Carbon-to-nitrogen ratios of commonly composted materials:

Materials High in Carbon (Browns)	C:N	Materials High in Nitrogen (Greens)	C:N
Autumn leaves	30–80:1	Vegetable scraps	15–20:1
Straw	40–100:1	Coffee grounds	20:1
Wood chips; sawdust	100–500:1	Grass clippings	15–25:1
Mixed paper	150–200:1	Animal manure	5–25:1
Newspaper; cardboard	560:1		

Source: Dickson, N., T. Richard, and R. Kozlowski. 1991. Composting to Reduce the Waste Stream: A Guide to Small Scale Food and Yard Waste Composting. Ithaca, NY: Northeast Regional Agricultural Engineering Service. <http://cwmi.css.cornell.edu/compostingtoreduce.pdf>.

Compost piles need ventilation. Anaerobic (lacking oxygen) piles smell bad, compost slowly, and produce dense, wet, and smelly compost. Aerobic piles with oxygen throughout will produce little or no odor. To aerate the pile, turn the organic materials with a digging fork or shovel. If you are unable to turn the compost pile, poke it with an aerating device or broom handle to help air flow into it. Mixing the pile once per week by moving the material from the outside to the center will hasten the composting process. A pile that is not mixed may take three to four times longer to produce useful compost.

During the early phase of decomposition, organic acids are produced and the compost pile becomes more acidic. Some people advocate adding lime during this stage to increase the pH of the pile and increase microbial activity; however, lime converts nitrogen to ammonia gas, thus removing nitrogen from the pile. Crushed clam or oyster shells, eggshells, and bone meal tend to reduce the acidity of composts. Over time, the pH in the pile rises so that the acidity of the composted material becomes near neutral.

Compost piles produce heat as microorganisms feed on waste. Pile temperatures must exceed 131°F to kill most pathogens harmful to humans and pets, and they must surpass 145°F to destroy most weed seeds. A pile temperature that climbs to 160°F, however, can kill decomposers and slow the composting process. Temperatures will be hottest in

the center of the pile, and they will be cooler on the outer edges. If the pile does not heat adequately, it may be too small, there may not be enough oxygen or nitrogen, or it may be too dry or too wet. (See Table 2 to troubleshoot common problems.) Turn the pile when the center begins to feel cool to the touch. Turning the pile helps revive the heating process by introducing oxygen and undecomposed material into the center.

Some people ask, “Should I add worms to the pile to help it compost faster?” No, your compost pile should be too hot for worms to tolerate. Vermicomposting, in which earthworms break down the ingredients, is a different process. Visit worms.ncsu.edu for more information.

It takes one or two years to compost if you leave the pile alone, or several months if you aerate the pile weekly. The pile will shrink 20% to 70% depending on the organic materials it contains.

When heating ceases, cover the pile with a fabric weed barrier and let it cure for six to twelve weeks. During that time, mist the compost to keep it slightly damp and poke it occasionally to let air in. As the compost cures, particles will shrink, organic acids will dissipate, and pH will stabilize and move closer to neutral. Compost is basically ready to use when you cannot recognize the original materials, the pile temperature is less than 10 degrees warmer than ambient, it is dark brown or black, and it smells earthy (not like ammonia or rotten eggs). To make

Table 2. Troubleshooting Composting Problems

Symptom	Problem	Solution
The pile smells like rancid butter, vinegar, or rotten eggs.	The pile is too wet, or there is not enough air, or there is too much nitrogen.	Turn the pile; mix in leaves, straw, sawdust, or wood chips.
The pile is not heating up.	The pile is too small, too dry, or does not contain enough nitrogen.	Make the pile larger, provide insulation, add water while turning, and add nitrogen sources.
The pile is attracting animals.	Food scraps are not well covered or meat and/or dairy products were added.	Cover food with brown leaves, wood chips, or finished compost; keep meat and/or dairy out of the pile; enclose the pile in 1/4" hardware cloth.
The pile is damp but won't heat up.	There is not enough nitrogen.	Mix in grass clippings, food scraps, and other sources of nitrogen.
The pile is dry.	There is not enough moisture or too much airflow.	Water and mix well; cover loosely with a tarp or landscape fabric to help hold in moisture.
The pile is damp and warm in the middle but nowhere else	The pile is too small.	Add more material and moisten.

sure the compost is fully mature and stable, test it on radish seeds to make sure it does not prevent germination or damage the plants. You can send a sample to the North Carolina Department of Agriculture & Consumer Services* to determine the levels of nutrients, C:N ratio, pH, and soluble salts.

Using Compost

For smaller particles of compost, and to separate coarse, unfinished materials from finished compost, a simple screen can be made with half-inch mesh hardware cloth and a wood frame. Place the screen on top of a wheelbarrow or inclined at an angle on the ground. Load the screen with compost and use your gloved hand or a square-end shovel to scrape the compost against the screen. Remove the screen to reveal sifted compost. Organic materials that were too large to pass through the screen may be added back into your compost pile.

Potted plants, garden and field crops, lawns, shrubs, and trees can benefit from compost. In clay soils, compost improves aeration and drainage, and

makes it easier to work with hand tools. In sandy soils, compost increases water-holding capacity and increases soil aggregation. Compost may suppress some plant diseases and pests, and it encourages healthy root systems. Although compost contains macroand micronutrients, it is often not enough to supply all plants' needs. Thus, you should have your lawn and garden soils tested** and fertilize accordingly. Your local Cooperative Extension center has soil test boxes and instructions.

*Send compost as "Waste Sample" to North Carolina Department of Agriculture & Consumer Services: Agronomic Services — Waste/Compost Analysis; information is available at www.ncagr.gov/agronomi/uyrwaste.htm.

** Send soil as "Soil Sample" to North Carolina Department of Agriculture & Consumer Services: Agronomic Services — Soil Testing; information is available at www.ncagr.gov/agronomi/sthome.htm.

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Published by:

NC State Extension

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04/17—DI/DI

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AG-791

