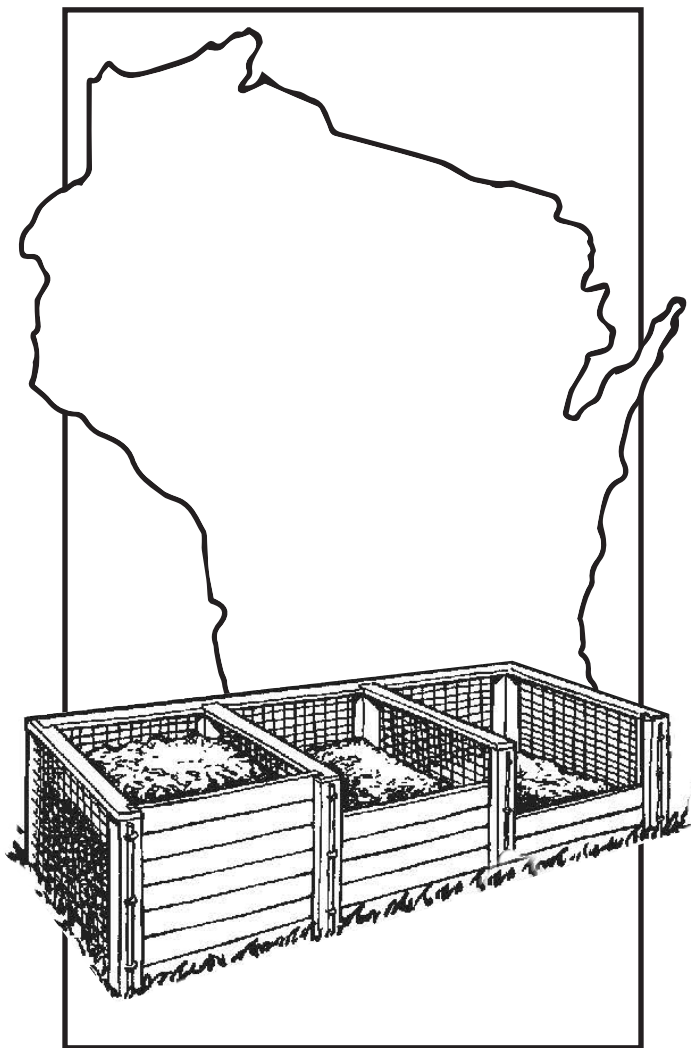


HOME COMPOSTING

The Complete Composter



Wisconsin Department
of Natural Resources
PUB-WA-182
2017

Composting saves money and resources

Composting yard materials saves money for you and your municipality. By using your yard materials to make compost, you save the cost of buying soil amendments to improve your yard and gardens. Municipalities save money and resources when yard materials are managed on-site versus operating drop-off sites or curbside collection programs.

Besides having value as a resource themselves, yard materials would take up a lot of valuable landfill space if not composted or used as mulch. Wisconsin law was changed in 1993 to ban leaves, grass clippings, garden debris, and twigs, brush and branches (6" in diameter or smaller) from going to these disposal sites. From 2012–2015 alone, Wisconsin diverted more than 5.6 million tons of these materials from landfill disposal.

Compost is considered a soil amendment, not a fertilizer, because it does so much more than just provide nutrients such as nitrogen, phosphorus, and potassium (N-P-K). As a soil amendment, compost will improve soil structure and tilth. Compost will also help soil hold more moisture and allows plant roots to penetrate more easily. Adding compost to your soil will increase the number and type of microbes in the soil, helping plants obtain nutrients and keeping a balance among microbes to help limit the number of disease-causing organisms.

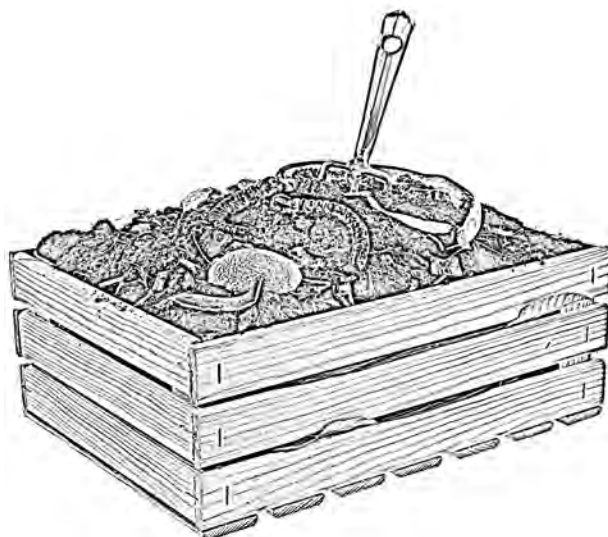
The overall benefit of using compost as a soil amendment is that it improves soil health, which in turn can lead to healthier plants.

A Burning Question

What about burning yard materials? As people recognize the value of yard materials for mulch or compost, fewer people are burning them. Burning pollutes the air, creates fire hazards and can be a health risk and nuisance to neighbors. State air quality and fire control rules restrict backyard burning, and many communities prohibit it entirely.

Table of Contents

Hot composting	4
Cool composting	5
Food scrap composting.	6
Piles, bins and barrels	7
Trench or pit method.	10
Worm bins.	11
Jumping worms and your compost . .	14
Definitions.	15
Frequently asked questions	17
References	22



Hot composting

A hot compost pile breaks down yard materials rapidly. The microbes found in the soil and yard materials are the workhorses of the compost pile. Give them a mix of brown and green materials, water and oxygen, and the microbes will multiply, heat your pile, and help it decompose faster. The pile may reach 140° F or more. Pile temperatures about 130° can kill weed seeds and plant pathogens. Ideally your pile will be at least one cubic yard in size which equates to a pile three feet tall by three feet wide. Piles smaller than this may not achieve higher composting temperatures.

You build your hot pile all at one time by combining two parts of brown materials with every one part of green materials. Some people will build the pile in layers, but feel free to mix them all together as you build. Water is also important; add it as you build your pile. The materials should feel as damp as a wrung-out sponge.

Hot compost piles need periodic turning to mix materials, to open pore spaces that allow oxygen to circulate, and to expose all pile materials to the higher temperatures found in the center of the pile. After you have built your pile, turn the pile every week for four weeks and then every other week for the next two months. Add water as needed to keep the materials moist. The organisms in the pile will become inactive if they are too dry. Overly wet materials will not allow air circulation and may produce undesirable odors and toxins that may be harmful to plants.

Hot composting is ideal for a household that has lots of yard materials, wants a finished product in a short amount of time, *and* is willing to actively work the material.

Cool composting

Cool composting is the laid-back way to recycle your yard materials. A cool pile is built a little at a time or all at once, but little turning is needed. Always put a layer of brown materials (leaves, hay, straw) on the top to control odors.

A cool compost pile remains cool because:

- it contains little or no green materials,
- moisture isn't added, so sometimes the materials may dry out, and/or
- the pile may be too small to sustain higher temperatures. All of these conditions result in slower composting than with the hot pile method.

In a cool compost pile, grass clippings and other high-nitrogen green materials should be mixed with brown materials. Use the same ratio for materials as with a hot pile, 2 parts brown to 1 part green. Do not add diseased plants or any portion of invasive plants or their seeds, as your compost might not reach high enough temperatures to destroy the disease or viable parts of plants and their seeds.

You may turn a cool compost pile occasionally or let it sit. Turning is the solution if odors develop (usually from excess green materials being added or the materials becoming too moist). Finished compost can take 6 to 12 months.

Cool composting is ideal for a household that needs to manage material, has enough space to allow material to sit for 1–2 years, and wants to put minimum work into managing their yard materials.

Food scrap composting

Food scraps may be composted in three ways: hot or cool composting, trench composting or using a worm bin. Check with your community to learn if there are any ordinances related to food waste composting.

What food scraps can I compost?

- Fruits, including peels, rinds, cores
- Vegetables, including pumpkin shells, onion skins
- Coffee grounds and paper filters
- Tea leaves and bags without staples or stickers
- Eggshells

See *Home Composting Materials* for further information (DNR publication WA-1785)

What foods do NOT go into my backyard compost pile?

- Dairy products (milk, cheese, yogurt, sour cream, butter, sauces or foods containing these, etc.)
- Meat, poultry, fish, lard, any type of bones
- Foods containing oils or fats such as peanut butter, salad dressing, mayonnaise, margarine, cooking oil, many sauces

While these foods may be acceptable in commercial or municipal composting programs, home composting does not create the conditions needed to successfully compost them without odor or nuisance animal problems.

Soil incorporation via trench composting

Soil incorporation is the simplest method of composting food scraps from the list above. Dig a hole or trench, chop the food scraps and mix them into the soil, and then cover them with at least 8" of additional soil.

Hot or cool composting

Food scraps may be composted using the hot or cool method. Bury food scraps 8-10 inches into the center of the material or cover them with a layer of dried leaves, hay, straw, or other brown material. A hot pile can make finished compost in as little as 2-3 months.

Add only uncooked vegetable or plant-based scraps from the list above. Vegetables cooked in steam or water only and with no sauce, butter, or oil may also be composted. Using an enclosed bin or making a habit of burying or covering food waste helps keep animals out of your compost.

Piles, bins and barrels

No matter what composting method you use (hot vs. cold, pile vs. open bin vs. enclosed bin), decomposition will occur faster if the materials are reduced in size to about ½ inch. However, it's important that not all the materials are very small; this will slow air circulation, and very frequent turning will be needed to keep the microbes supplied with oxygen. Larger pieces of materials, such as wood chips, help to provide structure for the pile and create spaces for air movement.

Too much moisture or green material (such as grass clippings) may cause odor problems. To minimize odors, mix in some leaves or bulky yard materials and turn the pile more frequently to let air inside.

Any of the following structures could be used for hot or cold composting. Check the references at the end of this booklet for links to more detailed plans.

Compost pile

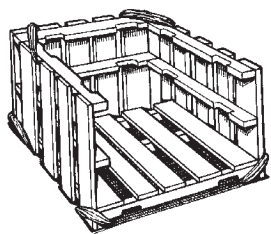
Many people are successful using a compost pile. Make a pile of leaves and grass into a corner of the yard, and let nature do the work. When adding food scraps to a pile, be sure to cover with a layer of brown materials or bury the scraps in the pile.

Woven wire bin

This simple, inexpensive bin uses only a length of woven wire fencing and a few minutes of time to build. For a circular bin, multiply the diameter of the desired bin size by 3.2 to get the length of fencing to buy. Fasten the ends with wire or three or four small chain snaps (available at hardware stores) to make a circle.

To turn the material in the bin, simply open the bin up, move it, and turn the material back into the bin at its new location. To make the bin more stable, attach the sides to posts. To make a bin that will be the right size to keep the compost from freezing during winter, use a piece of woven wire with a 4' height and approximately 16' long and overlap ends by only about 9" to make a circular bin with a diameter of 4-5 feet and a volume of about 64 cubic feet.

Wooden pallet bin



Old wooden pallets are an inexpensive, readily available building material. Pallets can easily be wired together to form a bin. Build bins with removable fronts or sides so that yard materials can be

easily turned with a pitchfork. Wire mesh can be substituted for wooden sides to increase air flow. Covering the bin keeps your compost from getting soaking wet in heavy rains.

Barrel/drum composter

A barrel or drum composter can provide an easy mechanism for turning or mixing your compost. This method requires a barrel of at least 55 gallons with a secure lid. Be sure your barrel was not used to store hazardous materials.

Drill 6-9 rows of 1/2 inch holes the length of the barrel to allow for air circulation and drainage of excess moisture. Place barrel upright on blocks to prevent excessive rusting if using a metal barrel.

Fill 3/4 full with material. Every few days, turn the rotating barrel or place the plain drum on its side and roll it around the yard to mix and let air into the compost. The compost should be ready in two to four months.

This is an easy system for city dwellers where there is a small amount of material. This rolling barrel design is one of the easiest to build at home. Because of the small size of the structure, yard materials in the drum will usually freeze during a Wisconsin winter.

Three-chambered bin

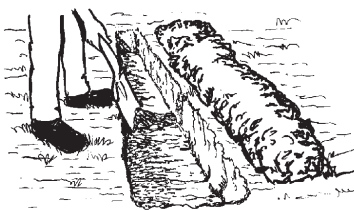
This efficient and durable design yields quick results. It works like an assembly line with three batches of compost in different stages of decomposition. Material is started in the first bin and allowed to decompose for 3-5 weeks. Then it is turned into the middle bin for another 4-7 weeks. The material in the middle bin is turned into the third and last bin as finished or nearly finished compost. New material is started in the first bin each time it is emptied.

This structure should be made from rot-resistant wood such as cedar, plastic lumber, or metal posts and wire mesh or hardware cloth. Each bin should be approximately 3-5 feet wide by 3-5 feet high. Putting removable slats in the front and between bins offers easier access to the contents for turning. Another design option is making the fronts removable doors rather than wooden slats. Plastic or hardware cloth can be used to make tops for shedding heavy rain or snow.

Commercial compost bins

There are many manufactured compost bins on the market made of recycled plastic, metal or wood. Check out your local garden center, home supply stores, or the Internet. Many local communities have annual compost bin sales through their recycling program, UW Extension or other programs.

Trench or pit method



The trench method is easy and can be done right in the garden or next to the garden plot. Dig a

trench 1-2 feet deep and 1-3 feet wide. Fill the trench with leaves, grass, garden debris, and other yard materials throughout the summer. Extend the trench or dig additional trenches as needed. It's not necessary to turn the yard materials, but doing so will usually speed up the composting and improve compost quality.

When choosing the location for a trench, remember that you don't want the trench to dry out or to fill up with water. Also if you pile soil next to the trench, think about where rain could wash that soil; you may wish to cover your soil pile with a tarp.

At the end of the summer, when the garden is done, cover the trench with 1-3 inches of soil. Do not add food scraps until you are ready to cover the trench and use 8 or more inches of soil or more. Next year dig a trench in a different part of the garden.

A pit is a variation of the trench. Dig a pit about 1-4 feet deep, and follow the directions above for a trench.

Worm bins

Using worm bins is a fun and easy way to compost food scraps and is known as vermicomposting. Worm bins use redworms (not earthworms) to eat food scraps and turn them into worm castings — a useful garden fertilizer. Specifically the worm species *Eisenia fetida* should be used for vermicomposting.

Worm bins are commonly made from simple wood boxes or plastic tubs with lids. Put redworms in the box with shredded, moistened newsprint, corrugated cardboard or shredded office paper. A good rule of thumb for sizing the box is to build one square foot of surface for every pound of food waste generated per week. Have the bin be no more than 12-18 inches high since redworms are surface feeders.

One of the easiest boxes to build is called the 1-2-3 box — sides are 1 foot high, the box is 2 feet deep from front to back, and 3 feet wide from side to side (6 square feet surface area), with aeration holes in the bottom and a simple covering of black plastic over the top. A box this size will handle about 6 pounds of food scraps per week.

Drill air holes in the bottom of the wooden or plastic box, and keep the lid ajar so the box is dark, slightly moist, and ventilated. The worms will not leave the box as long as it is

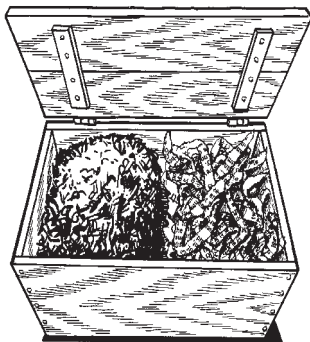
kept relatively moist and there is enough food available. Don't add more food than worms can eat or you will have odor problems.

Optimal temperature for worm bins is between 50°–75° F. Do not let the temperature drop below this level as their feeding will slow down; if the temperature falls below 32° F, the worms will die. Worm bins are usually kept in the house to keep the temperature in the right range. Some people keep their worm bins in the basement. Others prefer a spot under the kitchen sink.

Redworms may be purchased at bait shops, other stores which sell fishing supplies, or from the Internet. Be sure to purchase **redworms (*Eisenia fetida*)** and not earthworms or other worm varieties. They consume half their own weight in food each day! Redworms are only about 2 to 4 inches long when full grown. They are not native to Wisconsin so do not release them into nature if you ever need to find them a new home. Instead, pass them on to another worm composter, or place them in a sealed plastic bag in the trash.

Making a worm home

Once the worm bin is built, shred newspaper or office paper into 1 1/2 inch-wide-strips until you have about 10 pounds of shredded newspaper. Add a small amount of sand to provide grit for the worms' gizzard. Add water gradually until the bedding materials are as wet as a wrung-out sponge. The worms will eat the bedding material and sand as well as your food scraps.



Feeding your worms

Once you add the redworms to their new home, you can start feeding them your food scraps. They will eat lettuce leaves, apple cores, potato peels, watermelon rinds, coffee grounds—the list is long. Just as in standard composting, avoid dairy and meat products, oils, and foods containing fats or oils.

Add food scraps to the worm bin by digging a hole in the bedding at one corner of the bin and burying the scraps in the bedding. The next day, bury the scraps at the alternate corner of the bin; continue alternating sides of the bin and location each day. Some people simply add food scraps to the top of the bedding. This method works, but it can cause odors. If your bin gets smelly, simply add more bedding material to the bin. Add some fresh bedding at least every two months.

Harvesting your compost

As the worms eat their way through the materials in your bin, the contents of the bin darken and begin to smell moist and earthy. This is the vermicompost, your finished product.

There are a couple of easy ways to harvest your vermicompost. One way is to carefully move the finished compost to one side of the bin, and fill the empty side with fresh, moist bedding material. Give the worms 4 or 5 weeks to move over to the new bedding materials, and then remove the finished vermicompost.

Another method is to put a can filled with food scraps and fresh bedding into the finished compost. Punch holes in the sides and the bottom of the can large enough for the worms to enter. In 4 or 5 weeks, the can should be filled with worms. The finished compost can be removed from the bin without the worms. Remember to refill the bin with fresh, moist bedding material.

Using worm compost

Vermicompost is a rich soil enhancer. It contains many nutrients needed to grow strong, healthy plants in your house and in your garden. Some of the ways it can be used:

- Mix with peat moss, garden loam, vermiculite or sand to make potting soil.
- Sprinkle on your houseplants soil as a top dressing.
- Spread 1 inch thick on the surface of your garden or dig it into soil.
- Add by the handful when you transplant vegetables and other plants in your garden.



Jumping worms and your compost

Keep an eye out for jumping worms, an invasive species, in your yard and compost. Jumping worms produce a grainy soil that looks like hardened coffee grounds. If you suspect jumping worms in your compost, remove all the worms you find and place them in a sealed plastic bag for disposal. Additional information and management tips can be found on DNR's jumping worm page at <http://dnr.wi.gov/topic/Invasives/fact/jumpingWorm/index.html>

Definitions

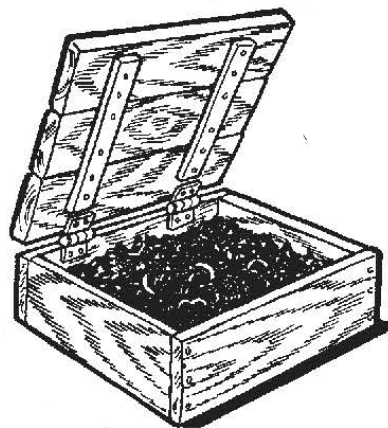
Yard materials: leaves, grass clippings, yard and garden debris, and brush no greater than 6 inches in diameter. Includes garden vegetable plants, tree seeds, pine needles, weeds, flowering plants, seeds, small woody materials, and pine cones.

Tilth: suitability of soil for growing plants.

Green materials: yard materials that are usually green in color and contain lots of nitrogen. Examples are green garden plants, grass clippings, and fruit and vegetable scraps. These materials should be mixed into the compost pile within a couple of days.

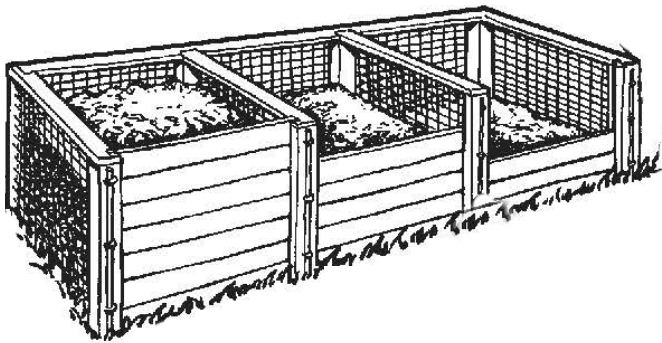
Brown materials: yard materials that are usually brown in color and contain lots of carbon. Examples are dry leaves, wood chips and twigs. Brown materials can be stored and mixed into the compost pile along with the fresh green materials. Paper is also considered a brown material.

Compost: a soil-like material rich in stabilized carbon produced by the breakdown of yard materials and sometimes food scraps (see food scrap composting section for more details).



Composting: the decomposition of organic matter, such as yard materials and food scraps, by microbes in the presence of moisture and oxygen that produces heat and a soil amendment called compost.

Mulch: the term *mulch* is used differently by different people. Often *mulch* refers to materials that are placed on the ground surface to limit weed growth and to hold soil moisture. Leaves or grass clippings can be used around vegetable plants, and wood bark or chips can be used around woody-stemmed and forest-type plants. Yard materials may be used as mulch without being composted. You can also make mulch of grass clippings right on the lawn with a mower.



Note: Before bringing wood mulch onto your property, make sure it won't be a source of disease or insects. If you treat your grass with herbicide, mulch it right on the lawn with your mower; don't move it to other plantings.

Frequently asked questions

When should I start my composting?

Start your pile any time in spring, summer or fall. Be sure to save several bags of leaves in fall so you have brown materials to use the following summer when you have lots of green grass and garden debris.

What ratio of different materials should I add to my compost?

The ratio of different materials is the amount of one kind of material versus another. A good ratio to use is at least 2 parts brown material to 1 part green material (see definitions above). While having a lower ratio of brown to green makes the pile decompose more quickly, having too much green material will cause your pile to need frequent turning to keep up with decomposition and may lead to odor issues and less nitrogen being held in the pile.

Do compost piles freeze in winter?

Home compost piles usually freeze during Wisconsin winters, but will restart on their own when they thaw in spring. Approximately 64 cubic feet of materials is needed to prevent freezing, and this amount of material may remain somewhat active (decomposition may continue to occur but at a greatly reduced rate). A much larger amount of material, probably too much for a home composter to manage, or an insulated bin would be needed to maintain a hot composting pile through winter.

Why are pet wastes not acceptable to use in compost?

Pet wastes from cats, dogs, meat-eating animals and birds may contain disease organisms which can be transmitted to humans. These organisms are destroyed by high heat, but home composting typically doesn't reach the necessary temperatures. Manure from plant-eating animals can be composted safely but should be done only in a hot pile.

Can I add pine needles to my compost?

Pine needles are high in resin, which can make them difficult to compost. Pine needles make good mulch for acid-loving plants such as lilies of the valley, blueberries, raspberries, blackberries, roses and conifers. The best use of pine needles is to leave them under the pine tree where they fall. Pine needles condition the soil and protect the shallow root system of their parent tree.

No more than 10 percent of a mixed yard material compost pile should be pine needles. Some gardeners compost pine needles with leaves or another carbon source separately for their acid-loving plants.

Can I add oak leaves to my compost?

Oak leaves compost well, but a little slower. Although they are initially acidic, the compost process is a great neutralizer. Once oak leaves are composted, the finished compost will have a pH close to neutral. To help oak leaves break down faster in



a compost pile, consider using your lawn mower to chop them into finer pieces before adding them to your pile. This will expose more surface area to the microbes and speed up the compost process.

Can I use agriculture lime on my compost pile?

Lime is not recommended as it can slow the composting process and cause ammonia odors due to a higher pH in the compost pile.

Can I add toxic weeds or plants to my compost pile?

Many of the native plants and weeds in Wisconsin that produce toxins (black walnut or butternut leaves, nightshade, monkshood, etc.) can be added to your compost pile. Compost these in small amounts only. However, black walnut or butternut leaves should not be used as mulch without prior composting. To identify a specific plant and see if it is toxic, check with the local library or the County Extension agent before adding it to your compost pile or using it as mulch.

Where should I put my compost pile?

Here are some guidelines on where to locate your compost pile:

- Within reach of water with a garden hose
- In a convenient area near garden or house
- Protected from direct winds
- In a spot with good drainage
- Three feet away from buildings
- Away from neighbors' windows

What if I don't have enough materials of the right kinds for a compost pile?

Sometimes you will end up with too much of one type of material, and not enough of another. Here are some suggestions for balancing out your compost pile:

Not Enough Grass: Add another nitrogen source to your compost. Add more coffee grounds, a 2-inch layer of livestock manure, or 1 cup of blood meal.

Not Enough Leaves: Add a bulking material such as wood chips, small sticks or straw to provide a carbon source and allow air to circulate through the pile. Composting grass, which is a source of high nitrogen and easily compacts, without a bulking material can create a strong ammonia smell.

Does a composting require a license or approval?

Usually compost piles are fine as long as they are maintained in a nuisance-free manner. However, check with your local municipality to see if there are any backyard composting rules. Your local community may have additional requirements or limitations on backyard composting of food scraps. Composting of only yard materials, vegetable wastes and manure, if less than 50 cubic yards in size at one time, does not require an approval or license from the DNR.

Will the compost pile smell bad?

It shouldn't. A properly-tended pile won't create unpleasant odors. Turning the pile to add oxygen or adding a bulking carbon source should end an odor problem quickly. Finished compost has an earthy, greenhouse smell.

Will the compost pile attract animals?

You might see animals around your compost pile if you are composting food scraps improperly. Food scraps should be buried 8–10 inches into the center of a compost pile. DO NOT throw food scraps on top of your compost pile at any time! Animals may come around if you supply them with an easy food source.

What happens to pesticides when they are composted?

Pesticides include herbicides (weed killers), fungicides (fungus killers) and insecticides (insect killers). *Most* pesticides which are *currently available* to homeowners are degradable organophosphates. The active ingredients in most pesticides usually break down in 6-8 weeks.

Grass clippings or weeds treated with organophosphate pesticides can be safely mixed into a compost pile or mulched back onto your lawn. However, hard-to-control invasive plants are sometimes treated with herbicides containing other active ingredients that break down much more slowly. Plants treated with these long-lasting herbicides will produce contaminated compost that could kill plants to which it is applied.

WARNING: Uncomposted grass and weeds treated with any pesticide should not be used as mulch.

When can I use my compost?

Generally it's best to let your compost mature before using it. You'll know the compost is mature when the materials are dark in color and have a texture like soil. Immature compost may prevent seed germination and kill plants because it is still breaking down and heating. Small amounts of immature

compost may be used infrequently around mature plants if kept 4 inches away from the stem but should not be used on seedlings or for seed starting.

What about stumps and root balls?



Stumps, roots or shrubs with intact root ball may still be sent to landfills or incinerators which burn solid waste to recover energy. If you have

room and are very patient, you could also compost them in a separate, long-term pile.

References

This booklet is designed to answer some of the common questions people have about composting and yard management. If you are interested in more information on these topics, check online or with your local library for the following publications:

Composting overview, Wisconsin DNR, <http://dnr.wi.gov/topic/Recycling/Compost.html> -includes general information and downloadable publications

Composting at Home, U.S. EPA, <https://www.epa.gov/recycle/composting-home>

Composting at School, Wisconsin School Garden Network (formerly Wisconsin School Garden Initiative), www.communitygroundworks.org/content/school-garden-briefs#In_the_Garden

Composting: How Organic Gardeners Let it Rot and Make Homegrown Humus, Gaia Rodale, CreateSpace Independent Publishing Platform, 2014

Let It Rot! The Gardener's Guide to Composting. Stu Campbell, Storey Books, 1998

Small Scale or Backyard Composting, Cornell Waste Management Institute, <http://cwmi.css.cornell.edu/smallscale.htm>

Making and Using Compost in the Garden, UW Extension Horticulture, 2013, <https://hort.uwex.edu/articles/making-and-using-compost-in-the-garden/>

UW Extension Learning Store barrel composter plans, <https://learningstore.uwex.edu/Barrel-Composter-P1692.aspx>.

Also available from this website are plans for can, concrete block, wire mesh, wood & wire, pallet, and 3-bin composters

UW Extension Master Composter Home Study Course, <https://learningstore.uwex.edu/Master-Composter-Home-Study-Course-P1780.aspx>

Vermicomposting: Composting with Worms, University of Nebraska-Lincoln Extension, <http://lancaster.unl.edu/pest/resources/vermicompost107.shtml>

Worms Eat My Garbage, 2nd edition. Applehof, Mary, Flower Press, 2003

Other resources

For more information on composting or DNR yard waste regulations, contact your municipal recycling staff, a County Extension Agent, or a DNR waste management specialist.

Other yard waste management brochures available from the DNR are:

PUB-WA-1785 *Home Composting Materials*

PUB-WA-072, *Home Composting: Reap a Heap of Benefits*

PUB-WA-073, *Yard Care: Do Your Share!*

Wisconsin Department of Natural Resources
PO Box 7921
Madison, WI 53707
608-266-2111

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