

Compost is the gardener's best friend!

Benefits of composting at home

- Composting reduces the amount of organic waste we send to landfill. This reduces the environmental and economic impacts of landfills and turns this “waste” into a valuable resource.
- Composting mimics how nature returns valuable organic matter, nutrients and micronutrients to the soil. This reduces our reliance on chemical fertilizers which contaminate our waterways and leave our soils depleted, unhealthy and potentially toxic. Many commercial fertilizers (petroleum-based) contain toxic metals such as arsenic, mercury, lead, dioxin, chromium and cadmium.
- Compost contains beneficial microorganisms and macroorganisms that feed soil naturally to improve plant health, reducing the need for pesticides, herbicides, fungicides and other toxic products.
- Compost reduces water use because it dramatically increases the soil's ability to retain moisture.
- In clay soils, compost improves aeration and drainage. It reduces erosion and runoff by increasing the permeability of heavy soils. In sandy soils, compost increases water-holding capacity and increases soil aggregation.
- Compost reduces fluctuations in soil moisture—especially valuable for soils found in the foothills.
- Composting neutralizes pH. Mature compost generally has a pH between 6 and 8.
- Composting is fun, free and very satisfying!
- Composting allows you to trade raw materials with your neighbors, build healthier soil, grow healthier plants and make the planet a better place!

Why not let GreenWaste do it?

- Huge amounts of fuel are expended on transporting and processing your kitchen waste, yard trimmings and fall leaves—when it could be easily processed at home.
- GreenWaste compost may contain other peoples' herbicides, pesticides and other toxic materials you do not want in your vegetable garden soil.
- When you make your own compost it is a living, vibrant material. You can make as much of it as you need. And, you don't have to pay for it.

Tools for composting

- Any wheelbarrow OR a **dream garden cart with 2 wheels**—costs over \$200 but you can push it with your little finger. It tips over easily to unload but doesn't tip sideways!
- Your basic pitchfork and shovel
- *Optional:* a long-stemmed compost thermometer—costs about \$25, or attach an old meat thermometer to a string. Record temperatures on temperature chart downloadable from our website:  **ncmg.ucanr.org**
- *For the true compost nerd:* pH paper or pH test kit to follow the process of decomposition. During the initial stages, organic acids are formed, which are favorable for growth of fungi and breakdown of lignin and cellulose. As composting proceeds, these acids become neutralized until compost is “done” and has a pH between 6 and 8. Learn more about monitoring pH at compost.css.cornell.edu/monitor/monitorph.html





NO EFFORT REQUIRED!

Easiest way to use your leaves and pine needles—practice “leave it”!

Using raw materials directly—without composting

The best way to compost your pine needles and oak leaves is a technique we call “LEAVE IT!” In this method designed by nature, the tree drops its leaves or needles, which decompose naturally and eventually turn into compost to feed itself! The top layer creates a protective skin or mulch for the decomposing leaves below, feeds the universe of decomposer organisms in the soil and eventually becomes compost. The top layer protects these organisms from birds, soil from rain/wind erosion/ the elements and prevents competing plants from growing. With LEAVE IT we abstain from raking. We let nature feed itself. Unless the leaves are in your gutters or driveway or are a fire hazard.

When you must rake dry leaves for fire safety...

During fire season—in the “lean & green” areas surrounding your structures—rake the very top dry layer only, leaving the already decomposing, rich material below to feed your trees and plants. Use the top layer to mulch bare soil and pathways to prevent water or wind erosion, compaction and to suppress weeds. Or stockpile as a material for composting.

No need to rake fire safety areas in winter—practice “leave it” to prevent erosion/loss of topsoil and protect soil microbiology so it can feed the trees as Mother Nature intended. When everything dries out and fire safety becomes a concern, rake the top dry layer off only.

Trees and plants aren’t ambulatory or money-based like we are so can’t just go to the store to buy their food. So—when we we have to rake up their food—it’s up to us to mimic nature by returning it in the form of compost. In this day and age, when so much of our planet’s soil has been covered by concrete, structures or roads, it is even more important to do our best to nurture what is left.

Using leaves, wood chips and pine needles as mulch

Use these most hard-to-break-down “browns” on permanent pathways and pathways between vegetable garden beds. Thick hardwood chips are slow to break down and excellent for pathways.

Pine needles have a waxy coating so are very slow to break down—best used on flat ground or where you won’t be slipping as much. They are also excellent as an easy-to-move top layer for your compost pile.

Mulch for weed suppression and moisture retention

General rule: mulch is an insulator so, when soil in your vegetable beds is cold and you want it to warm up with “solar gain” do not mulch.

Add mulch in summer to keep soil cool to and keep it from drying out as quickly.

Use wood chips as bedding...



Get creative and use your wood chips or fallen leaves as bedding for chickens or other animals, then later compost the coop or stall waste. At the county fair, many livestock people were using wood chips as stall bedding.

Or you can stockpile your fallen leaves and wood chips as "browns" for later use in composting. Keep them, they are valuable!!!

Turn the page to learn how leaves and wood chips are an important part of the basic "recipe" for composting...

Don't burn branch piles!

Burning pollutes the air, adds greenhouse gases, wastes materials that could be composted and damages the surface of soil. If brush piles are burned in a forested or timbered setting, the heat from burning can top kill many of the surrounding trees.

Instead you can have branches chipped to use as mulch or as a brown in your compost pile.

In a forested setting inaccessible to a chipper and away from your house, you can stack up branches and leave them to provide a habitat for toads, birds and other beneficials.

NO EFFORT REQUIRED!

Grasscycling—another way to practice "leave it"!



When you mow, take off the bag and let it fly. The clippings will feed your lawn naturally and reduce your need for fertilizers. By leaving your clippings on the lawn and

allowing them to work their way back into soil, you will improve soil health and reduce pesticide and fertilizer use.

A hundred pounds of grass clippings can generate and recycle as much as 3–4 pounds of nitrogen, one-half to one pound of phosphorus, and 2–3 pounds of potassium back to the lawn. These are the three most important nutrients needed by lawns, and are commonly supplied in lawn fertilizers.

Also, Grasscycling does not contribute to thatch (an organic debris layer between the soil and live

grass) since grass clippings are 75-85% water and decompose readily.

If you have a neighbor who is not open to Grasscycling, convince him or her to give the bagged clippings to you for your compost pile. Just make sure they aren't using any herbicides or pesticides you don't want in your compost.

Later you can share some of the bounty from your vegetable garden with them!

Save your energy—and do not blow!

Using a blower to remove leaves and debris in the garden targets the bottom 5 feet of foraging space that the birds count on. Especially avoid using a blower in your garden between March and July, when the birds are nesting and raising their young. Any disturbance can force birds to abandon their nests. Be careful pruning and mowing, and if you see bird activity in your hedges, avoid walking close to that area.

THE INGREDIENTS for compost

The same recipe applies, whether for a SMALL (cold/slow) or LARGE (hot/faster) pile. This chart shows browner browns to the left and greener greens to the right. If you have ingredients on one side, balance with the same volume of ingredients from the other side. Layer browns and greens, adding water to keep it damp like a wrung-out sponge as you layer. Browns are usually lighter in weight than greens—but we want layers in roughly equal amounts rather than by weight (3" of browns, 3" of greens...)

for FASTER compost
equal volumes of browns & greens

browner
carbons (colder)

- shrub trimmings
- dried garden debris
- corn stalks
- leaves
- wood chips
- bark
- oak leaves
- rice hulls
- pine needles
- spent flowers
- peanut shells
- corn cobs
- 100% cotton or wool undyed fabric
- oat straw
- sawdust from untreated lumber
- wheat straw
- aged horse manure & bedding
- cardboard & newsprint, uncoated paper, paper napkins, paper bags, coffee filters

greener
nitrogens (hotter)

- fruit & vegetable scraps
- fresh garden trimmings
- fresh poultry manure
- fresh grass clippings without herbicides or pesticides
- pond weeds
- spent flowers
- cover crops
- coffee & tea grounds
- urine
- fresh cow manure
- hair, wool, fur, fingernails, toenails, feathers
- alfalfa or grass hay
- blood/bone meal
- weeds before gone to seed
- fresh sheep, llama, alpaca, goat manure

Fresh horse manure will compost by itself—perfect balance of browns & greens containing the perfect amount of moisture

Do not use charcoal briquettes—they contain sulfur oxides and other chemicals that are toxic to soil and plants.
Do not use manures from humans, dogs, cats or pigs—they may contain pathogenic bacteria, viruses and parasites that require prolonged high temperatures to be destroyed.

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Readily available browns/carbons

- Trees, woody, stemmy, branchy plants—ideal woody particle is size 1/4" to 1-1/2" so that a larger surface area accessible to decomposers.
- Fall leaves are easy to stockpile/store all winter until you can score a bunch of greens and make your batch.

Common greens/nitrogens

- Leafy, tender parts of plants
- Pond weed, kitchen waste/coffee grounds
- Lawn clippings (make sure they contain no pesticides/herbicides)
- Greens plentiful year round: manure from equines, bovines, ducks/chickens, alpacas/llamas/sheep/goats



Keep your pile damp like a wrung-out sponge and covered!

- Keep your pile wet and moist—but not dripping wet
- Cover your pile in summer to keep it from drying out. Cover it in winter to prevent it from getting too soggy. Use a UV-resistant material or a heavy-duty plastic tarp that you replace before it starts to deteriorate.

Notes on compost ingredients in the foothills...

- **Fresh horse manure** is the perfect combination of browns, greens and moisture for composting. So—if you have JUST horse manure—you don't need anything else. A horse produces approximately 50 lbs. of manure per day. The inclusion of urine-soaked stall bedding is excellent because urine adds nitrogen. As a bonus, the bedding adds air to the manure to keep it from becoming too dense in the pile.
- It's hard to know whether **aged manure** is more brown or more green. Rain may have leached it out to the point where you may have to treat it as a brown. Also once manure has dried out, it's hard to get it moist again. If you have the choice—FRESH horse manure is BEST.
- You're in luck if you have fruit trees and know someone with **donkeys**. Donkeys LOVE to eat prunings from apple and pear trees, olive trees, fig trees, pineapple guavas (*Feijoa sellowiana*)—and will promptly turn it into donkey manure for your compost pile!
- **Weeds** not yet gone to seed are an excellent green layer for the compost pile. Thistle plants are especially plentiful in spring and are easy to pull out—wear thick gloves!
- **Cattails** around ponds are a very plentiful green in our area. They are easy to cut, lightweight and easy to transport. Don't worry if they've gone to seed— they require really WET soil so won't grow in your garden.
- Grow your own greens by planting a **cover crop**. Cut them down before they go to seed and use them in your compost pile or compost in place.
- Adding **human urine** to your compost is a wonderful, completely free, environmentally-friendly way to recycle nitrogen that would otherwise be flushed down the toilet with drinking water. If the urine contains pharmaceutical residues, it is best to add it to a batch pile that will become hot enough to burn off any potentially harmful residues.
- **Unusual items** you can compost include: human hair, toenails/fingernails, pet fur, feathers, wool, 100% wool or cotton fabric, dead insects from nontoxic traps, toothpicks/wooden skewers, old spices, freezer-burned food, aquarium water, cobwebs, old flowers from hospitals, funerals, weddings, etc.
- Yes you can compost invasive **Himalayan Blackberry** plants—*before* they get berries full of seeds! Let the sun dry out and kill thoroughly first before adding blackberries or other weeds that are hard to kill to your compost pile. Before adding to your pile, make sure they are so brittle and dead they will never come back to life!
- You need a very hot pile to compost **meat, bones, grease, whole eggs, and dairy products** and avoid attracting rodents. Greenwaste compost gets hot enough to decompose these materials safely.
- Using **wood ash** in small quantities in a cooking compost pile may or may not be problematic. Since ash can combine with water to produce a caustic chemical—lye—we do not recommend putting wood ash in a hot, moist pile. Instead, add small amounts to finished compost—roughly two handfuls per wheelbarrow load.

What NOT to include in your compost pile

Do not include oxalis, burr clover, bermuda grass or star thistle gone to seed in your main compost pile. They will come back to haunt you.

Do not include pig, dog, cat or human feces in your main compost pile because they contain pathogens/viruses/parasites that require prolonged high temperatures to be destroyed.

Do not include charcoal briquettes—they contain sulphur oxides and other toxic chemicals.

Do not include plywood, particle board, treated or painted wood or sawdust from any of these.

Do not include diseased plants.

Whether you have enough material for a larger/hotter pile or a smaller/cooler pile, the recipe is the same—equal volumes of greens to browns that you layer and keep damp like a wrung-out sponge. You can also go as high as 2-to-1 greens to browns. Start your pile with about a 5" layer of browns, then keep adding layers about 3" deep of greens and browns. Keep alternating the layers. Sprinkle with water as you go if needed. Top the pile with at least 5" of browns to exclude flies and other flying insects. Plentiful in many parts of the foothills, pine needles are an excellent top layer.



Larger batch pile = hotter/faster

A batch pile is when you add materials all at once to form a large pile that heats up and composts faster than a smaller pile.

Large populations of the fastest decomposers—thermophillic bacteria—only occur in **larger compost piles**. Compost heat is the by-product of the respiration of this category of bacteria. The bigger the pile the hotter and the higher population of heat-producing bacteria—the smaller the cooler. *Most commercial bins and tumblers are too small for significant heat.* If a pile is big but not moist/aerobic and properly made of equal volumes of browns and greens, it won't support a high population of heat-generating bacteria and hence won't heat up as much.

The very minimum size for a batch pile is 3x3x3'—4x4x4' or larger is better. If you can't do a large pile, it's fine—your compost will just be slower and not get as hot.

If you make a large batch pile, sit back and let these naturally occurring microorganisms go to work. *After about 3 days you will have heat—there is nothing tricky about it.* You don't have to do anything but enjoy it by monitoring with a thermometer. The temperature will peak and sustain for a week to weeks, then slowly start to decline.

As the temperature drops, the mesophylic bacteria come into play. These decomposers operate at 68-113F. Later mesofauna decomposers go to work. These includes slugs, sow bugs and worms (worms, like humans, are most productive 55-77F). All these decomposers work in concert and set the stage for each other. *Teaming with Microbes* is a great book to read about this.

After temperatures decline, you have the OPTION of turning your pile to get the cooler outside areas

to the inner hotter area. If you turn it, the pile will heat up again, but a little less each additional time you turn it. When the pile stops heating up, let it sit for at least 6 weeks. As the compost cures, particles will shrink, organic acids will dissipate and pH will stabilize and move closer to neutral. Compost is "done" when the original materials are unrecognizable, the pile temperature is less than 10 degrees warmer than ambient, it is dark brown and smells earthy.

2 reasons to turn your compost pile

1. To aerate your pile if it has become dense, soggy and stinky or to add water if it has dried out and is not damp like a wrung-out sponge.
2. To move the material on the outside edges to the center to heat up/compost more quickly

After temperatures decline—you also can choose NOT to turn your pile. It's fine to practice "leave it" at any point and let the other decomposers finish it off slowly. You can just let nature do the work. If you had a large enough batch to begin with and your compost pile has had one good round of heat—that may be good enough for you.

2 reasons NOT to turn your compost pile

1. Less wear and tear on your body, less sweating and think of all the time you will save!
2. You see the advantages of letting nature do the work for you!

2 main benefits of making a larger batch pile instead of a slower, cooler pile

1. Sustained temperatures of 135-155F kill pathogens and weed seeds.
2. Batch composting is faster and a larger scale approach so you produce a lot more compost.

If you want to kill weed seeds/pathogens and you want to produce a lot more compost—at least one round of hot composting is the way to go.

As your pile decomposes continue to monitor it to keep it moist but not soggy. You can add a little fresh material when you turn the pile or you can keep adding on to one end of the pile. At some point, however, you will want to stop adding material and let the pile cure to completion.

An unturned batch pile in fall will supply you with compost for your spring garden, and another pile started in spring will take care of your fall needs.

Creative ways to use the heat generated by a batch pile

- In spring use the top of your hot pile as bottom heat to germinate seeds outdoors or propagate plants instead of a greenhouse or bottom heat pad. The bonus is that the plants are already “hardened off.”
- Use HEAT as a weapon—locate a new pile on top of something you want to kill/smother—such as a weed-filled area you want to transform into a vegetable bed with pathways around it.

Smaller continuous pile = cooler/slower

A smaller, continuous pile, where you keep adding organic materials as they become available, will not heat up like a larger pile.

Not everyone can get enough greens for a nice big batch pile. If a cold pile makes more sense for you, just layer kitchen waste with yard trimmings, old leaves and weeds. Eventually, after a year or 2, the part at the bottom will decompose—but 3 things can go wrong. These are all easy to fix!

1. Bugs, yellow jackets, flies/maggots—The solution is to **cover your pile with a thick layer of mulch**. Pine needles are ideal because they are easy to pull back so you can keep adding to your pile. As in nature, this top layer will also protect the decomposers as they work.

2. It stinks—Too wet: mix in fallen leaves as you go and cover with mulch and UV-resistant material to keep rain out.
3. Critters, rodent population exploding, attracting rattlesnakes—Turn edible waste into manure first—cooperate with neighbors—feed it to chickens/ducks, then add the manure to your compost pile (manure never attracted rodents!) OR look into an indoor worm composting system or use a rodent-resistant barrel system. A common problem with barrels is that it dries out—remember to keep the contents damp like a wrung-out sponge.

How to avoid attracting rodents and unwanted critters with kitchen waste

- Use a rodent-resistant bin such as a secure barrel/tumbler.
- Convert your kitchen scraps to chicken, turkey or duck manure before composting—then compost the manure.
- Collect kitchen waste inside in a sealed container until quite slimy and no longer attractive to rodents, then layer this mucky mess into your compost pile with stockpiled browns.
- OR dig a hole in the hottest part of your compost pile using a pitchfork and bury kitchen waste at least 12” deep.

How long does it take?

A well managed batch compost pile will be ready in 2–4 months, whereas a smaller untended pile will take a year or longer.

Whether large or small, once completed, your compost pile will be about half its original height, and will have a pleasant, earthy smell.

The best location for each compost pile is within reach of water, convenient to where you plan to use the compost, and accessible to a vehicle if you plan to import a large volume of materials such as manure or cattails.

The type of enclosure you choose is whatever works best in your situation. Your compost can be in a pile, against a hillside or enclosed in straw bales, wood pallets or a bin system. An enclosure that is modular or easily movable allows you more flexibility and functionality.

Just 1 teaspoon of fertile soil with compost regularly added to it has 100 million bacteria and 400–800 feet of fungal threads.

How much compost do you need?

As a general rule, you'll want to top dress at least 2" of compost per season—so two big batch piles per year might be enough for your needs—and maybe enough for your fruit trees and other areas as well.

Uses of compost

When compost is ready to use, it should be dark and crumbly, and you should not be able to recognize the original composted items. If compost is not used promptly, keep it covered to prevent loss of nutrients through leaching.

- Add compost each season you plant to build good soil. The best time to top dress or incorporate compost to the vegetable or flower garden is during fall or spring. You can also use it to top dress soil around trees, shrubs, annuals and perennials. Or use a digging fork to incorporate compost into soil without inverting the layers, thereby disrupting soil microbiology.
- Compost is very suitable to use for potting houseplants or starting many types of seeds. Mix compost with other materials such as perlite and vermiculite, with about 30% of the volume being compost. Research has shown that microorganisms found in mature compost can suppress plant diseases such as those causing "damping off."
- Finished or unfinished compost can be applied as a mulch 3–4" thick on the soil surface. Keep compost mulch 2–3" away from plant stems/trunks. Nutrients will filter into soil without robbing nitrogen from the root zone. Compost will increase soil moisture retention, insulate from extreme temperatures, and provide nutrients and organic matter for soil structure. However, it will promote weed growth if not covered with mulch. Compost or mulch should be reapplied yearly to replenish the decomposing layer.



The regular addition of 5% organic matter (compost) unlocks the fertility and minerals in depleted/compacted soils.

- Compost may be used as a lawn or pasture top-dressing.

Get creative!

- Get kitchen waste or other materials from coworkers or neighbors (especially from your neighbors with horse or chicken manure) then share the bounty from your garden.
- Dedicated compost piles: compost noxious weeds that have already gone to seed in a **dedicated pile**. When this compost is finished, water it to germinate the weed seeds in warm weather. Kill them with a hoe, water again and repeat. Once you are confident you have killed all the weeds, your compost is ready to use anywhere in the garden. If you have dedicated compost piles for human, pig, cat or dog feces, do not use the resulting compost for growing vegetables or anything you plan to eat.
- Smother weeds by **sheet mulching** and restore large areas without herbicides.
- Compost in place—**lasagna gardening**.

| | Mother Nature  | Chemical fertilizers  | Organic fertilizers  | Commercial compost  | Homemade compost  |
|--------------------|--|---|---|--|---|
| ingredients | whatever grows and dies/falls "leave it" grasscycling cold compost pile | specific nutrients single or combinations derived from chemically manufactured materials | specific nutrients single or combinations derived from rock, mined natural deposits, agricultural byproducts, ocean products | municipal sources from "green waste" other producers use manures forest waste and/or agricultural waste read the label! | browns & greens you choose micro and macroorganisms from your site |
| pros | no cost, low effort feeds soil/organisms mulch benefits | low effort rapid results addresses specific nutrient needs or soil deficits | low effort rapid or slow results addresses specific nutrient needs or soil deficits feeds soil/organisms | low effort adds organic material slow-release nutrients over long period, can't "burn" plants can have truckloads delivered | bin free to low \$ high quality with slow-release nutrients microorganisms can't "burn" plants feeds soil/organisms |
| cons | slooooo process low quantity possible plant pathogens and noxious weeds nutrients: status quo |  salt build up alters/decreases soil microbial populations rapid growth = more vulnerable to insect attack toxic trace elements toxic runoff | more expensive than chemical fertilizers hard to time nutrient release high carbon footprint (transport) | high carbon footprint (transport & processing) possible herbicide/pesticide contaminants, plant pathogens and noxious weeds | compost thermometer approx. \$20 higher effort requires space  |

FUN!

 **Nevada County Master Gardeners** ncmg.ucanr.org (530) 273-0919
Sources: *Teaming with Microbes*, Jeff Lowenfels and Wayne Lewis • *Western Nevada Co. Gardening Guide* <http://web.extension.illinois.edu/homecompost/>

- Insulate/contain your pile with straw bales.
- If your compost includes materials that have been treated with pesticides, set it aside for one year before using it. However, compost made from weeds treated with Clopyralid (a component in many weed & feed products) should never be used on vegetable gardens.

Home-made compost is best!

In composting, different bacteria/fungi microorganisms predominate at different temperatures, but each contributes value to the compost. The highest quality compost is the kind with the longest cool-down or curing period, when the low-temperature decomposers and worms have time to go to work.

Basic recipe review

Mix roughly equal volumes of greens and browns. Use small pieces, sprinkle with water as you

compile it to keep the pile damp like a wrung-out sponge with ample oxygen. Cover in summer AND in winter. Size matters: Any batch larger than 3x3x3' will allow bacteria to heat up and decompose the pile faster. Insulating with straw bales helps.

Remember "compost happens." It can happen faster or slower; it can happen without bad odor or being a stinky mess.

Master Gardener hotline and workshops

We want you to be able to make compost easily, efficiently—and without creating a fly resort or alienating your neighbors!

Call our hotline anytime for help, 273-0919, or join us for one of our compost workshops!

Visit our website: ncmg.ucanr.org

