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Whether it's homemade or purchased in bulk, compost can improve your soil. But adding too much can harm plants.

How to Use Compost in Gardens and Landscapes

Weston Miller and Jeremiah Mann

OVERVIEW

- Compost is partially broken-down organic material. You can make compost at home or buy compost. Finished compost is available in bags at plant nurseries and home improvement centers. You can also buy compost in bulk from landscape supply companies.
- Compost is a soil amendment. Choose the right type and amount of compost for your project.
- Use compost to improve soil for planting vegetable gardens, landscape areas and lawns. Adding compost to your soil improves its ability to accept and store water. It also helps aerate soil.

- Adding compost increases the activity of soil organisms. They help to provide nutrients to your plants over time.
- Compost may not replace fertilizer. Lawns, vegetables and fruiting trees and shrubs often need additional fertilizer to thrive.
- Apply the correct amount of compost to your work site.
- Adding too much compost may be harmful, especially in vegetable gardens. You can apply too much compost at one time or over several years. Too much compost in soil stunts plant growth. It also may create water pollution.

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KEYS TO SUCCESS

Follow these guidelines to add the right amount of compost to your site for growing vegetables.

- **For new garden beds:** Apply a 3- to 4-inch layer of compost to the soil surface. Add other amendments such as lime and N-P-K fertilizer as needed. Incorporate the materials into the top 8 to 12 inches of soil with a digging fork or spade. Or, use a rototiller.
- **For existing garden beds:** Apply a layer of compost, a quarter-inch to 1-inch deep, to the bed surface each year. Add other amendments such as lime and N-P-K fertilizer as needed. Incorporate the materials into the top 8 to 12 inches with a digging fork or spade. Or, use a rototiller.
- **When filling framed raised beds** enclosed by retaining walls, use a soil mix. Don't fill them with compost by itself. See Section 2.

Add compost to soil before you install landscape plants. Spread a 3- to 4-inch layer of compost over the area you intend to plant. Mix the compost into the soil as deeply as possible. Then install new plants into the amended soil.

Adding compost improves growing conditions for lawns.

- **For new lawns:** Before you establish a lawn with seed, add a 1- to 2-inch layer of compost to the work area. Rake or rototill the compost into the soil. Apply a layer of compost, one-quarter to one-half inch deep, to cover newly sown lawn seed. Use the same preparation when installing sod. See *Practical Lawn Establishment and Renovation*, EC 1550, <https://catalog.extension.oregonstate.edu/ec1550>.
- **For existing lawns:** apply about ¼ inch of compost over the grass. Work it into the soil surface. You can use an aerator machine or device to incorporate the compost into the soil. Perform this work in the spring when the grass is actively growing. See *Practical Lawn Care for Western Oregon*, EC 1521, <https://catalog.extension.oregonstate.edu/ec1521>, and Turfgrass maintenance calendar for Central Oregon, <https://extension.oregonstate.edu/gardening/lawn/turfgrass-maintenance-calendar-central-oregon>.



Photo: MN Pollution Control Agency/CC BY-NC 2.0

Figure 1. High-quality compost should look like dark topsoil. It has a light, crumbly structure.

SECTION 1

Choose the right compost product for your needs

Purchased compost products vary. Compost is made from a wide range of organic materials. Source materials are often mixed together in the composting process.

Compost source materials include:

- Yard debris.
- Forestry products such as sawdust and ground bark.
- Crop residue such as straw, processed mint plant material and rice hulls.
- Animal manures from chicken, cows and other livestock.
- Food scraps from homes and businesses, including wineries and breweries.
- Mushroom production waste.
- Compost from worms (vermicompost).

Compost quality varies. Quality depends on the type of raw materials. It also depends on the compost production method.

MAKE YOUR OWN COMPOST

See *Making and Using Compost*, University of Missouri Extension, <https://extension.missouri.edu/publications/g6956>

How should compost look?

High quality compost should look like dark topsoil. It has a light, crumbly structure (Figure 1).

Look for compost that doesn't have large particles. It should pass through a $\frac{3}{8}$ -inch screen. There shouldn't be any rocks, trash or other debris. The compost in Figure 2 has large pieces that should be removed for vegetable gardens and lawns. Chunky compost is acceptable for landscape areas.

How should compost smell?

High-quality compost smells earthy like forest soil. Don't buy compost that has a foul odor or smells like ammonia or sulfur. These smells indicate that the composting process isn't complete.

Other important factors about purchased bulk compost

Before you purchase bulk compost, ask the vendor about the product. Inquire about the following factors:

- Does the compost contain weed seeds? How do they know? Consider visiting the site where the compost is stored. Make sure the storage site is not full of weeds.
- What is the moisture content of the finished product?
 - ◆ Wet compost contains greater than 60% moisture content. Wet compost is clumpy and doesn't spread well.
 - ◆ Dry compost contains less than 20% moisture content and creates a lot of dust when spread. Dry compost is difficult to mix into the soil. The compost tends to stay on the soil surface.
- Ask how the vendor handles herbicide contamination. How do they reduce potential sources of contaminated compost? See *Herbicide Contaminated Compost and Soil Mix: What to Know — and What You Should Do About It*, <https://catalog.extension.oregonstate.edu/em9307>.
- What are the results of laboratory analysis of the available compost products?



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Figure 2. Look for compost that doesn't have large particles.

Table 1. Chemical and physical properties of compost

Property measured	What to look for in finished compost
Organic matter	Greater than 30%
Carbon to nitrogen ratio (C:N)	Below or equal to 30:1
Percent nitrogen	0.5 to 3.0 percent
Percent phosphorus	Greater than 0.2%
pH (scale of acid to base, 7.0 is neutral)	6.0–8.0
Metals	Meets state and federal agency standards
Soluble salts	Finished composts made from mushroom and manure sources may have high soluble salts. Salts from compost can harm vegetable seeds and transplants and lawn seed. Soluble salts from compost can also damage sensitive plants such as blueberries.

How much compost should you buy?

Get the right amount of compost for your job.

- Determine the volume you need. Volume is the thickness of your compost layer multiplied by the area or your workspace.
- What is the surface area of the space where you will apply compost? Calculate the area in square feet. Multiply the length in feet by the width in feet, resulting in square feet.
- How thick is the compost layer? Convert inches to feet. For example, 3 inches deep equals 0.25 feet.
- Calculate the volume of compost needed. Multiply the surface area by the thickness of the compost layer to get the volume in cubic feet. For example, 10 feet long by 10 feet wide by 0.25 feet thick equals 25 cubic feet of compost needed.

If these calculations seem daunting, use an online compost calculator to determine how much compost you'll need.



Photo: Ryo Chigiwa, CC BY 2.0

Figure 3. Bags of purchased compost often contain 1–2 cubic feet of material.

Compost in bags

Bags of purchased compost often contain 1-2 cubic feet of material (Figure 3).

Use bagged compost for smaller jobs.

For vegetable gardening, a single 1-cubic foot bag of compost covers 12 square feet of area to a depth of 1 inch. That's the largest amount of compost to add each year for existing vegetable areas.

For new vegetable and landscape beds, a single 1-cubic foot bag of compost will cover an area 2.5 feet long x 2.5 feet wide (5 square feet) with 2.4 inches of compost.

It's practical to buy compost in bags up to a point in terms of cost and effort. For example, to cover 100 square feet of area with compost 3 inches deep, it would take 25 1-cubic foot bags. For this amount of compost, consider purchasing it in bulk and paying for delivery.

Compost in bulk

Bulk compost comes in increments of cubic yards. One cubic yard equals 27 cubic feet of material.

For larger jobs, you can buy 1–2 cubic yards of compost.

Bulk compost deliveries are based on a flat fee, not on the amount delivered.

People often buy bulk compost in units of 7.5 cubic yards. Figure 4 shows a unit of compost being delivered.

Consider using a full unit of compost for larger jobs. For example, 7.5 cubic yards of compost covers an 800-square-foot area about 3 inches deep.

This example shows the correct volume of compost to amend a larger area for a new vegetable growing area or landscape bed.



Photo: MarieTDebs, iStock

Figure 4. Bulk compost comes in increments of cubic yards. One cubic yard equals 27 cubic feet of material. People often buy bulk compost in units of 7.5 cubic yards.

SECTION 2

How to use compost

Vegetable gardens

For new vegetable beds, add 3–4 inches of compost.

For existing vegetable beds, add one-quarter to 1 inch of compost per year.

After you spread the right amount of compost, follow these steps.

1. Add amendments such as lime and N-P-K fertilizer as needed.
2. Incorporate the materials into the top 8–12 inches with a digging fork or spade. Or, use a rototiller.
3. Remove debris and chop the soil clods with a rake.

Spread the compost over the area to the desired depth. Wheelbarrows, 5-gallon buckets, shovels and rakes are useful tools for spreading compost (Figure 5).



Photo: Interfaith Garden, CC BY-NC-SA 2.0

Figure 5. Spread the compost over the area to the desired depth.



Photo: Annie Corrigan/WFIU, CC BY-NC 2.0.

Figure 6. Use a digging fork, spade, or shovel to mix in the compost and other amendments.

Use a digging fork, spade, or shovel to mix in the compost and other amendments. Loosening the soil decreases compaction and increases the amount of air in the soil (Figure 6).

How to fill raised beds

Raised beds use retaining walls to hold in soil (Figure 7). Retaining walls for raised beds can be made from wood, bricks or similar materials.

Raised beds efficiently use space by creating clearly defined paths and growing areas. You can make them into any shape.

Make wheelchair-accessible raised beds 28–34 inches tall.

Before you fill your raised bed, break up the soil surface at the bottom of the area. Add 2–3 inches of compost or soil mix and other amendments such as lime. Mix the added materials into the existing soil.

If you excavated soil while installing your raised beds, mix in compost and use it to fill the raised beds. Add up to 25% compost by volume to fill the depth of the bed.

If your raised bed is not yet filled, you'll need to purchase a soil mix to fill it.

Use bagged potting soil to fill the raised bed for smaller jobs. For example, it takes 12 1-cubic-foot bags to fill a 3-foot-by-8-foot bed with 6 inches of potting soil.

For larger jobs, purchase a bulk soil mix from a landscape supply company. For example, it takes 1.7 cubic yards of soil mix to fill four raised beds (3 feet by 8 feet) with 6 inches of soil mix.

Common bulk soil mixes include:

- Three-way mix with equal parts topsoil, sand and compost.



Photo: artnoose, CC BY-NC-SA 2.0

Figure 7. Raised beds use wood or other materials as retaining walls to hold in the soil. The bed is filled with excavated native soil with compost mixed into the surface.

- Four-way mix with equal parts topsoil, sand, compost and lava rock or vermiculite.
- Specialty planting mixes for raised bed and container growing.

Expect your newly filled beds to compact over time as the compost in the mix further decomposes. Refill the raised beds as needed.

For more information about raised beds, see *Raised Bed Gardening*, FS 270, <https://catalog.extension.oregonstate.edu/fs270/html>.



Photo: Blaine O'Neill, CC BY-NC 2.0

Figure 8. Compost added to raised beds.

OUR TOP TIP

Don't fill raised beds with compost by itself. Fill beds with native soil or soil mix. Compost lacks the mineral component of earthen soil and planting mixes. Compost must be mixed with these materials to support plant growth.

Figure 8 shows only compost being used to fill raised beds. This compost application isn't recommended.



Photo: Neil Bell, © Oregon State University

Figure 9. Compost mixed into soil for a landscape bed.

Landscape areas

- Add compost to soil before you install landscape plants.
- Spread 3–4 inches of compost on the area you intend to plant.
- Mix it in as deeply as possible with a fork or shovel. Or, use a rototiller to mix the compost into the soil.
- Dig planting holes. Install plants into the amended soil.
- For large areas or compacted soil, consider using heavy equipment to prepare the site.

Spread compost over the area where you want to install new plants. Mix the compost in as deeply as

possible. Then dig planting holes in the amended soil. Install the new plants. Figure 9 shows a properly amended planting area.

For large areas or compacted soil consider using heavy equipment.

Before digging with a tractor, locate utilities in the area. Visit <https://digsafelyoregon.com> or call 811 before you dig.

Prepare the soil the right way so plant thrive

With proper planning and action, you can ensure the successful establishment of plants in your new landscape areas.

The sequence of photos below shows how soil amended with compost promotes healthy landscape plants:

- The soil in a landscape bed was amended with compost and mixed in with heavy equipment.
- Plants were installed in the fall. They were well watered at that time.
- Then, without any additional irrigation or fertilizer, the drought-hardy plants grow into the space over time.

Mix compost into the soil as deeply as possible (Figure 10A). Add about $\frac{1}{3}$ compost by volume. So, if you can dig 2 feet deep with a tractor, you could add compost up to 1 foot deep. Incorporate the compost into the existing soil (Figure 10B).



Figure 10A. Mix compost into the soil as deeply as possible. Add about $\frac{1}{3}$ compost by volume. For large areas or areas with compacted soil, consider heavy equipment.



Figure 10B. The planting bed after being amended with compost, which was mixed deeply into the soil.



Figure 10C. The landscape bed ready for planting.



Figure 10D. Landscape plants after being installed in the fall. The plants were watered at the time of planting.



Figure 10E. Mulch was applied to the surface. Mulch helps to conserve water in the soil and keeps weeds from germinating.



Photos: Neil Bell, © Oregon State University
Figure 10F. After a year, the plants have started to fill in the area without any additional irrigation or fertilizer.



Photo: mattsson, iStock

Figure 11. Add 1–2 inches compost to the area as you prepare the soil. Rototill it into the soil.

The landscape bed is now ready for planting. The surface was raked. Edging was installed between the planting bed and pathway (Figure 10C).

Landscape plants were installed in fall. The plants were watered at the time of planting as shown in Figure 10D.

Mulch was applied on the surface. Woody mulch helps to conserve water in the soil. It also helps keep weed seeds from germinating (Figure 10E).

After a year, the plants have started to fill in the area without any additional irrigation or fertilizer (Figure 10F). When the soil is prepared the right way, drought-tolerant plants thrive with minimal ongoing inputs in areas with adequate rainfall.

Lawns

New lawn installation

Use compost to improve the growing conditions for lawns. Adding compost helps to improve soil structure.

The first step if you plan to install a new lawn is to apply compost over the worksite and mix it in with a rake or rototiller. A thin layer of compost may be used as mulch after seeding turf.

Add 1–2 inches compost to the area as you prepare the soil (Figure 11). Rototill the compost into the soil. Don't overtill the soil.

You can use a thin layer of compost as a mulch after seeding. Mulch helps to keep seeds moist during sprouting and early growth.

Figure 12 shows a wire mesh cylinder or mulch roller tool being used to cover a newly seeded lawn area with mulch. It's filled with mulch and used to apply a thin layer of mulch to the surface. This tool is available at tool rental centers.

For more information, see *Practical Lawn Establishment and Renovation*, EC 1550, <https://catalog.extension.oregonstate.edu/sites/catalog/ec1550>.



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Figure 12. Use a wire mesh cylinder or mulch roller tool to cover a newly seeded lawn area with mulch.

Compost for existing lawns

Topdressing is adding compost on top of an existing lawn. Adding compost often improves soil conditions promoting grass growth. Spread new lawn seed over the area before or after applying compost.

Late spring and early fall are the best times of year for this work. New seeds will sprout quickly when the soil temperature is above 60 degrees Fahrenheit.

Follow the steps below to top dress your lawn with compost:

1. First, mow the lawn short. Use a bagging mower or a rake to collect the cut grass (Figure 13). Even better, use a dethatching machine to thin the grass. The goal is to expose the soil surface for the next steps.
2. Use a core aerating machine on the lawn area (Figure 14). The machine pokes holes in the soil surface and leaves the plugs of soil on the surface. Break up the plugs with a rake.
3. Spread compost one-quarter to one-half-inch deep across the lawn area (Figure 15). The compost will fill in the holes left by core aeration. Spread lime and N-P-K fertilizer at this time.



Photo: BrianAJackson, iStock

Figure 13. First, mow the lawn short. Use a bagging mower or rake up the cut grass.

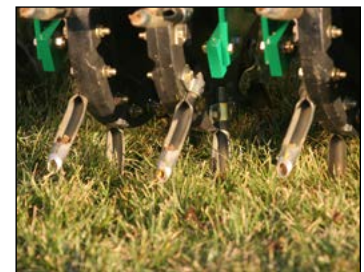


Photo: lawnstarter.com

Figure 14. Use a core aerating machine on the lawn.



Photo: Dorin_S, iStock

Figure 15. Spread compost one-quarter- to one-half-inch deep across the lawn area.



Photo: Robin Gentry, iStock

Figure 16. Use a seeder to spread seed over the entire lawn.

4. Use a seeder to spread seed over the entire lawn area (Figure 16). Applying seed over an existing lawn (overseeding) will help fill in gaps in the lawn to create a dense stand of turf.
5. After you apply lawn seed, apply water to the seeded area. Keep the seedbed evenly moist until the seeds sprout. Be ready to water three to four times per day to keep the soil and seeds from drying out.

For more information, see *Practical Lawn Care for Western Oregon*, EC 1521, <https://catalog.extension.oregonstate.edu/ec1521>, and *Turfgrass Maintenance Calendar for Central Oregon*, <https://extension.oregonstate.edu/gardening/lawn/turfgrass-maintenance-calendar-central-oregon>.

SECTION 3

Avoid problems with compost

Herbicide-contaminated compost and soil mix

Compost and soil mix products sometimes contain herbicide residue. This residue can damage certain vegetable, fruit and flower crops.

The residue likely comes from contaminated hay, grass clippings or manure. These materials may make their way into the regional composting system.

Before you buy bulk compost or soil mix

Before you purchase a bulk load of compost or soil mix, contact the vendor.

- Ask how they handle herbicide contamination risk.
- Have they reduced potential sources of contamination?
- Do they perform bioassay tests on their finished compost product for herbicide residues? Bioassay tests use plants such as peas grown in the compost or soil mix to check for abnormal growth caused by herbicide contamination. Basic lab testing might not indicate herbicide contamination.

Be aware of the symptoms

Gardeners and landscapers should be aware of symptoms of plant injury from herbicides.

Herbicide damage from contaminated compost or soil mix is caused by growth regulator herbicides. These herbicides more often affect broadleaf plants. Look for distorted or cupped leaves. The damage occurs in new growth, including the end of the shoots (Figure 17).

See *Herbicide-Contaminated Compost and Soil Mix: What You Should Know — and What You Can Do About It*, <https://catalog.extension.oregonstate.edu/EM9307>.



Photo: Mary Ann Hansen, Virginia Polytechnic, Bugwood.org

Figure 17A. Distorted, cupping tomato leaves. This is a symptom of growth regulator herbicide injury.



Photo: Doug Doohan, Ohio State University/ OARDC, Bugwood.org

Figure 17B. Cucumber leaves elongate and cup following exposure to growth regulator herbicides.

Adding too much compost

When too much compost is added to the soil, plants growing in the amended area fail to thrive. Plants often look stressed, stunted or burned growing in soil with too much compost.

Plants' response to too much compost looks similar to fertilizer burn. Figure 18 shows a chrysanthemum growing in a container with too much fertilizer. The leaves look burned and purple.

If too much compost is added to the soil, nutrients including phosphorus and potassium can leach past the root zone and move beyond your garden. The nutrients may leach into surface and ground water from rain or irrigation. Nutrients in surface water supports algae growth and low-oxygen water.

The surface water shown in the pond in Figure 19 is covered with a thick layer of algae. Algae growth often results from too much nutrients. Excess nutrients in surface waters often come from fertilizer. Adding too much compost to soil can have a similar impact on surface water and groundwater.



Photo: Scot Nelson

Figure 18. Plants exposed to too much compost display an injury similar to fertilizer burn.

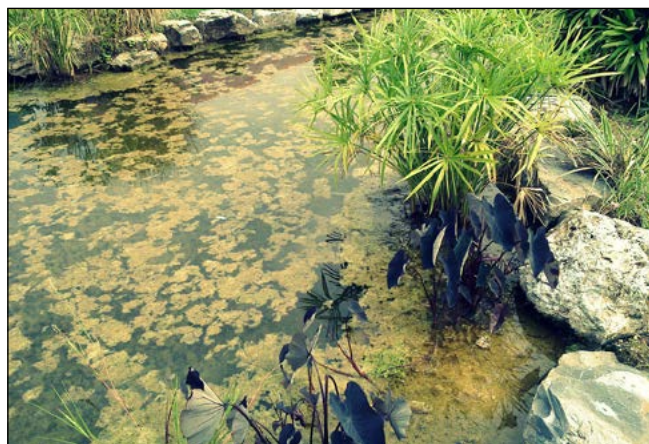


Photo: RM Visuals, CC by 2.0

Figure 19. Excess nutrients in surface waters often come from fertilizer. Adding too much compost to soil can have a similar effect on surface water and groundwater.

Compost resources

- Bell, N., D. Sullivan, L. Brewer, J. Hart. 2017. *Improving Garden Soils with Organic Matter*. EC 156, <https://catalog.extension.oregonstate.edu/ec1561>, Corvallis, Oregon: Oregon State University Extension Service.
- Edmunds, B. 2020. *Raised Bed Gardening*. FS270, <https://catalog.extension.oregonstate.edu/fs270>, Corvallis, Oregon: Oregon State University Extension Service.
- Landschoot, P. 1997. *Using Composts to Improve Turf Performance*, <https://extension.psu.edu/using-composts-to-improve-turf-performance>, University Park, Pennsylvania: Penn State Extension
- Starbuck, C. J. 2020. *Making and Using Compost*. g6956, <https://extension.missouri.edu/publications/g6956>, Columbia, Missouri: University of Missouri Extension.
- Traunfeld, J. 2019. *Soil to Fill Raised Beds*. <https://extension.umd.edu/hgic/topics/soil-fill-raised-beds>. College Park, Maryland: University of Maryland Extension.
- Cooperative Extension Fresno County. 2020 Accessible Gardening. https://ucanr.edu/sites/mgfresno/Central_Valley_Gardening_with_Master_Gardeners/Projects/Accessible_Gardening_147/. UC Extension Fresno County, Fresno, California: University of California Agriculture and Natural Resources.

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