

OUTDOORS ✿ GRADES 2-6 ✿ FALL, SPRING ✿ ACTIVITY



# Let's Make a Compost Cake

## DESCRIPTION

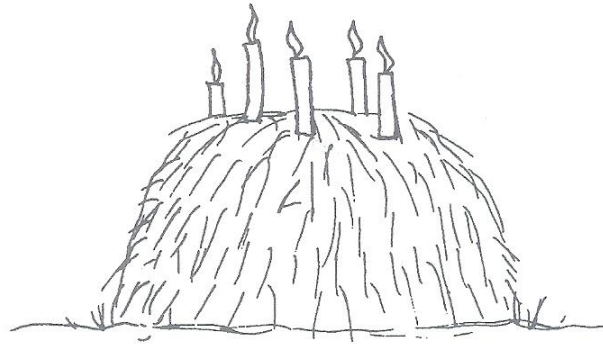
Students build a compost pile.

## OBJECTIVE

To experience the process of decomposition and the nutrient cycle.

## TEACHER BACKGROUND

See detailed description of composting, page 466. Be sure students wash hands well when done with this activity.



## MATERIALS

- ✿ compost materials
- ✿ shovels and spading forks
- ✿ wheelbarrow
- ✿ water access and hose with fan spray nozzle
- ✿ meter stick
- ✿ compost thermometer
- ✿ science journals

## PREPARATION

1. Select a permanent compost area for the garden. The ideal location is close to the garden for easy hauling as well as easy access. The area should be a minimum of 3 square feet (1m<sup>2</sup>).
2. Collect composting materials.

## CLASS DISCUSSION

What types of materials decompose? (*materials that have been alive*) Why is it important for these materials to decompose? (*they become nutrients for other plants*) Is this a cycle? What are the parts of this cycle? (*living plant or animal grows, dies, decomposes, provides nutrients for another living plant or animal to grow*) What is the cycle called? (*nutrient cycle*) Do you think we can create a nutrient cycle in our garden? (*Record predictions.*)

## ACTION

1. Demonstrate building a miniature compost cake with samples of browns (*carbon-rich materials such as dead plants, leaves, or straw*), greens (*nitrogen-rich materials such as grass clippings, fresh plant matter, or food scraps*), and soil (*or old compost*) prior to building the actual pile. Discuss the different ingredients that can be used in the pile. Stress the importance of the size, ingredients, and moisture level.

2. Go to the garden and equip students with shovels, spading forks, and a wheelbarrow. Have students use their spading forks to loosen the ground where the pile will be.
3. Divide groups of up to 10 students at a time into teams of Browns, Greens, and Soil. Assign one student to be the waterer. Begin with a browns layer of stalky material to allow drainage. Rotate groups, layering browns, greens, and soil repeatedly until the pile is at least 3 feet (1 m) tall. Browns layers and greens layers should be 4 to 6 inches (10 to 15 cm) thick; soil or old compost layers should be 1 to 2 inches (2.5 to 5 cm) thick. The waterer should water each layer as it is added to the pile. Be sure students maintain the rectangular shape of the pile and keep the corners square. Like the foundation of a house, each layer becomes the base for new layers, and if they're not square, the pile will collapse and the heat needed for decomposition will be lost.
4. Have students measure and record the dimensions of the compost pile.
5. Have students use a compost thermometer to take the pile's temperature.
6. Have students draw the compost cake in their journals, recording layers, measurements, and temperature.
7. Check your pile monthly and make sure it is moist enough. In dry periods you may need to water the pile.

**WRAP UP**

What are the ingredients of a compost cake? What will happen to the organic matter? What will the pile look like in a few months? How will the compost be useful after it is decomposed? What materials could you use at home to make compost?

**DIGGING DEEPER**

1. Record the temperature of the compost cake each day for the next week and put the readings on a class graph. The pile will heat up to approximately 160°F (71.1°C) and then start to cool down. Let the students feel the heat from the pile. Discuss how the heat is being produced through the biological activity of the microorganisms.
2. In a month, measure the dimensions of the pile again. How has it changed? What layers can you identify? Help students turn the pile to increase the speed of decomposition.
3. Have students observe chunks of compost through a microscope and record what is seen.





# Composting

*"Behold this compost! Behold it well...  
It grows such sweet things out of such corruptions..."*

— Walt Whitman

**H**ealthy soil = healthy plants: When you build and maintain fertile soil rich in organic matter, you literally lay the groundwork for thriving plants that can develop quickly, resist pests and diseases, and yield a bountiful crop.

Each time you harvest crops or pull weeds, you make a "withdrawal" from the soil's pool of nutrients and organic matter; if these aren't replaced, the soil is eventually robbed of the resources plants need to flourish. Organic matter in the form of compost can help replenish nutrients and at the same time improve soil structure, making it easier to work and a more hospitable place for plants to thrive.



## Composting Defined

Compost is a mixture of decomposed vegetation that is used to improve soil structure and provide plants with necessary nutrients for growth and development. Composting is the art of ecologically reusing waste. When making a compost pile, we are mimicking the nutrient cycle in nature. We are promoting the biological decomposition of organic matter under controlled conditions and demonstrating the concept of cycles and changes. In addition, we are showing our students a way to divert waste headed to landfills.

Decomposition is the result of the efforts of billions of microorganisms, mainly bacteria and fungi, which eat the organic matter and in so doing break it into smaller, simpler molecules that become available as nutrients for plants. As they eat their way through the compost, they give off heat. This heat speeds the decomposition process and can be felt and measured by students.

Compost allows students to see that what we call waste may be nutrients in disguise. You can add organic matter (food wastes, weeds, leaves, manure) to the compost pile and retrieve it a few months later as valuable fertilizer. Composting gives students an opportunity to experience the nutrient cycle and create abundant fertilizer that builds the garden soil — and is free!

## Composting Methods

There are two basic methods for making compost: One is fast and the other slow. The fast method produces compost in three to four months. You build an entire pile and then turn it every few days, so that the outside of the old pile becomes the inside of the new pile. This technique speeds up the decomposition process. It is labor-intensive, involves collecting a large amount of material all at once, and is not always advisable for school gardens, unless you have plenty of time and energy to keep turning your pile. The slow method, which takes 6 to 12 months to produce a useable product, is often more applicable in school gardens. Using this technique, you build a layered pile of organic matter, and leave it to decompose until it is ready for use in the garden. You can also build a compost pile over time, adding layer by layer as materials become available.

## Collecting Materials

Traditionally, compost is made in the fall when there is an abundant supply of dried materials. But building compost piles throughout the year will provide your garden with compost year-round. The more materials you gather, the more compost you can make. You may want to schedule a school-wide composting day

and gather materials in advance. Most decomposable materials are useable. Good examples include kitchen vegetable scraps; crop wastes; and straw, chicken, goat, horse, and cow manure. **Do not include:** feces from meat-eating animals; animal parts; noxious weeds; plants with resins; meat or fish; greasy foods; toxic materials. There are all kinds of compost materials around you just going to waste! Check stables for manure and straw and produce companies and grocery stores, restaurants, and the school cafeteria for food wastes. Check to see whether there are any composting guidelines or restrictions in your community before you begin.

Good compost pile materials fall into three categories:

- ☼ **Carbon, or dried matter:** dried leaves, straw, dried grass, small branches
- ☼ **Nitrogen, or fresh matter:** kitchen scraps, manure, lawn clippings, leaves, crop leftovers, coffee grounds, weeds (not noxious weeds or those that contain seeds)
- ☼ **Soil/finished compost:** both can help to introduce beneficial microorganisms

Be sure to include plenty of materials from all three categories.

### Building Your Compost Pile

*Carbon + Nitrogen + Soil/Finished Compost + Air + Water = Compost*

Compost is made by layering carbon and nitrogen material in alternating 4- to 6-inch layers. Between these layers you can sprinkle a thin layer of soil or compost. It is also essential to water each layer lightly as you build the pile.

**Pile size.** The pile should be a minimum of 4 square feet. This size is essential for optimal decomposition and adequate heat retention. Keep the pile under 5 feet high; any higher, and it can become too compressed and deprived of air. But you can make the pile as long as you want. A properly built pile can heat up to 160°F and destroy many pathogens and weed seeds.

**Pile shape.** Make the pile rectangular. You can assure this by constantly forking materials out to the corners and edges with each added layer. Without care, the pile can become a giant mound or pyramid rather than the desired 4-foot rectangle, and it will tend to dry up easily.

**Aeration.** Composting is most efficient when aerobic decomposition (decomposition in the presence of air) is taking place. If the pile is too dense or wet, anaerobic decomposition occurs and produces a strong smell. If anaerobic decomposition develops, turn the pile and add coarse or bulky material, such as straw or twigs.

**Moisture.** Moisture goes hand in hand with aeration. The pile should be the consistency of a squeezed-out sponge. A soggy pile encourages anaerobic decomposition. If the pile gets too wet, add straw and porous materials and mix them in well to soak up the moisture. If rain is a problem, put a roof over the compost area or cover the pile with a large tarp.

**Size of materials.** By chopping up materials, you expose more surface area for the decomposers to work on. The smaller the materials, the faster your pile will decompose. Have students chop up the materials with a spade before adding them to the pile.

### Involving Students

Have students work in teams to complete these compost-making tasks. Each student should have an assignment:

- ☼ **Nitrogen:** collect and layer green materials
- ☼ **Carbon:** collect and layer brown materials
- ☼ **Soil/finished compost:** collect and sprinkle on soil or compost
- ☼ **Choppers:** chop up larger materials
- ☼ **Edge monitors:** make sure the pile is being built with straight edges, and maintain the corners by pulling materials to the edges
- ☼ **Moisture monitor:** constantly watering each layer of the pile.

### Ready-to-Use Compost

In general, the pile has finished decomposing when the compost:

- ☼ is dark brown and looks like soil
- ☼ is composed of nonrecognizable ingredients
- ☼ has an earthy, humus-like odor

The exterior of the pile will not fully decompose. Check at least 6 inches into the interior of the pile to observe its characteristics. The entire process will take 3 to 12 months, depending on the type of pile, how you maintain it, and the materials you use.

Once the pile is decomposed, sift it through a heavy-gauge wire screen. It is then ready for use in soil mixes, garden beds, or as a fertilizer around trees, shrubs, and perennial borders. Be generous. An adage recommends that the less your soil looks like compost, the more compost you need to add!

### Compost-Related Lessons:

- ☼ Compost Bags, page 101
- ☼ Let's Make a Compost Cake, page 103
- ☼ What Good Is Compost?, page 96