



Lesson Three

Composting & Vermicomposting

Lesson Overview

This lesson covers the basic elements of composting, how to properly make compost, and why it is important for our gardens and plants.

Lesson Objectives

Participants will identify one thing that can go in the compost pile.

Participants will identify one thing that cannot go in the compost pile.

Participants will identify the basic elements needed to make great compost.

Participants will learn what vermicomposting is and identify basic worm care.

Time Needed

1 hour

Staff Needed

2 Garden Educators

Key Terms

Compost

A mixture that consists largely of decayed organic matter and is used for fertilizing and conditioning soil and land.

Earthworms

A burrowing annelid worm that lives in the soil. Earthworms play an important role in aerating and draining the soil and in burying organic matter.

Earthworm Castings

A cylindrical mass of earth voided by an earthworm

Vermi-Composting

The use of earthworms to convert organic waste into fertilizer.

Decompose

to break down, rot, or decay

Humus

a dark soil-like material made up of broken-down vegetable and animal matter

Organic matter

something that comes from living organisms, such as plants and animals

Inorganic

composed of matter that is not plant or animal, something that is not and has never been living

Microorganism

tiny organism, such as bacteria, that breaks down organic matter and cannot be seen without magnification

Mineral

an inorganic substance found in soil that is used by plants and needed for a healthy diet

Nutrient

a material that provides nourishment (food) and gives organisms energy and helps them grow

Soil Compaction

Soil compaction occurs when soil particles are pressed together, reducing pore space between them. Heavy equipment and tillage implements can cause damage to the soil structure. Soil structure is important because it determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity.

Introduction to Lesson Three

How Compost Works

Composting happens with organic matter decomposes and turns back into soil that can be used as fertilizer in the garden. There are a few key elements to proper and successful composting but for the most part it is every easy.

GREENS & BROWNS

Compost is made up of two key ingredients — green matter (nitrogen) and brown matter (carbon). Successful compost piles need a mixture of both of these. The best way is to lay or use the “lasagna method” when building a compost pile.

On average you will need 2x browns to greens for proper decomposition.

AIR

Compost piles need air. They need air flow (which is why it is good to turn them with a pitchfork every now and then). They need to be exposed to air — this allows them to heat up and the decomposition process will take place.

WATER

Compost piles need water. If the compost pile is too dry it will not heat up. You do not want it to be dripping or oozing, but rather slightly damp. If the compost area is completely dry water it in nicely with a hose.

Why Compost is Important

Compost keeps the soil healthy by feeding the micro-organisms and our plants. We can never add too much compost or compost tea to the soil. It is something that can go on all season long. Healthy soils also are less susceptible to pests and diseases, so as discussed in Chapter One it all begins with keeping the soil healthy.

FOOD WASTE

There is too much food waste in our food system and collecting our food scraps to go into the compost pile can help us address this issue. As educators we need to help our participants understand that if we want to have secure and sustainable food systems we need to make sure we turn our carrots into compost (instead of letting food go to the landfill).

Key Compost Care =

2x browns to greens

- Mix together a variety of ingredients.
- Shred or chop all ingredients, if possible.
- Build the pile large enough to retain heat.
- Turn or aerate the heap regularly to let in the air.
- Keep the pile as moist as a damp sponge.

Activity One - Compost Relay

Materials // Large 5-gallon buckets or laundry baskets, laminated “Compostable” and “Not Compostable” sheets, 10 - 15 compostable items, 10 - 15 items that are not compostable

Ages // Ages 2-5 (put the items in the bucket) Ages 6 - 15 (relay)

Time // 15 - 20 minutes

Activity Description //

Ask participants if they know what compost is. Say “Did you know you can actually build soil?” Explain that composting is creating new soil.

Have them play the “What goes in the compost?” game. Have two large buckets, bins, or laundry baskets that are labeled – A “Yes, Compost Me” bucket and a “No, Don’t Compost Me” bucket. Have a blanket, grassy space, or table and lay out all the items you brought. Work together or if you have a larger group split into two groups. Have the groups toss items into the “yes” bucket or the “no” bucket depending on what they think.

If you have two sets of items and two groups you can make it a relay race to see who finishes first. After all items are in the buckets go through each one to discuss why or why not that particular item goes in the compost.

Let participants use the “Can You Compost It” spinning chart for help, if they need it.

Activity Two - Make A Compost Wheel

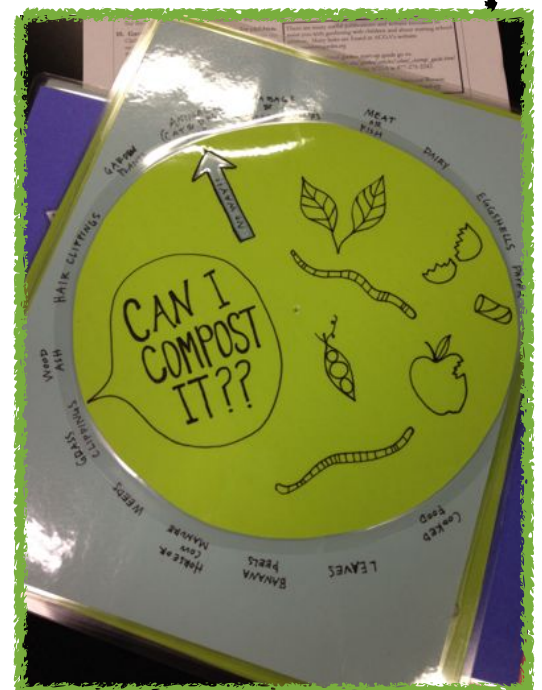
Materials // Colored cardstock (two pieces for each participant), thin black markers, brads (one for each wheel), laminator

Ages // 6 - 10

Time // 30 minutes

Activity Description //

Participants can make their own “Can You Compost It?” Wheel using two piece of cardstock and a brad to secure the wheel. Use the example. This is a great activity for older participants because they can take this wheel home and use it there. Laminate the two pieces of cardstock once they are finished before securing them. This will help the wheel keep longer!



Activity Three - Inchworm Walk/Relay

Materials // None needed

Ages // 2 - 6

Time // 5-10 minutes

Activity Description //

Split the participants into two groups and have them stand in two separate lines. Have every participant put their left hand behind their back, the person behind them holds that hand with their right hand. When given the signal they have to run to the other end of the relay space. The first team who is intact like an inchworm wins!



Activity Four - Applying Compost to the Garden and Prepping the Compost Area

Materials // None needed

Ages // 2 - 6

Time // 5-10 minutes

Activity Description // Compost can be applied to the garden at anytime. Applying compost to garden beds that are already planted is a great activity, Use compost from composting areas that are available to your or purchase bags of organic compost if you need to.

Compost should be sprinkled around the base of the plants and then watered in. Explain that compost is like food and medicine for our plants. They need lots of micro-organisms and nutrients to make sure they grow up healthy and strong.

During this lesson it is a good practice to check or spruce up the current compost area if there is one.

- Break down any large plants or plant matter that seems like it is not composting.
- Add some soil to the compost from the garden (this will help kickstart things)
- Water the compost
- Try to get the lasagna or layer technique going in the pile
- Try to get the right ratios of green matter and brown matter

Activity Five - Earthworm Fun Facts & Earthworm Prints

Materials // Hand trowels, large poster board with labeled earthworm, colored construction paper, rulers, markers and pens.

Ages // 2 - 6

Time // 5-10 minutes

Activity Description //

Show participants a large picture of an earth-worm with labeled body parts. Describe the functions of an earthworm while showing the visual-aid.

Share these awesome earthworm facts from **Handout - Earthworm Fun Facts**. Ask if there are any questions. Then go digging for earthworms!

When you find earthworms, take construction paper and gently make earthworm prints that the kids can take home, or measure the earthworms and see who can find the longest one. Make sure you are digging in a spot that will not disrupt the roots of your plant (if the garden is already planted).

Activity Six - Exploring the Vermicompost Bin

Materials // Hand trowels, vermicompost bin, food scraps

Ages // 2 - 6

Time // 5-10 minutes

Activity Description // All ages, even adults love the vermicompost bins. Open them up and explain the worms are one of the best things for our soil, they keep it healthy and aerated. We can also feed worms our food scraps (which is called vermicomposting) and they will turn it into soil in a matter of days. Explain how to create the worm bin and how to care for it. Then let the magic happen — find a few red wigglers and let the participants hold them. Remind them that the worm bin is their home so we need to make sure they get back into it safe.

Activity Seven - Cooking Up Compost

Materials // Two five gallon buckets, compostable browns — mulch, small twigs, hay or straw, brown paper, cardboard, compostable greens - food scraps, lawn clippings, plant matter, wooden spoons, watering can with water.

Ages // 4 - 10

Time // 5-10 minutes

Activity Description // Set out all the materials needed & the “compost recipe” cards. Have the browns (carbon) in one box and the greens (nitrogen) in one box. Follow the recipe on the card. Let each participant “cook compost” or put the recipe together. This will help them remember exactly how compost is made. At the end, have them water what is in their bucket, then add it to the actual compost area.

Compost Recipe

1. Start with Sticks (Place a layer of sticks on the ground to maintain airflow underneath the pile.)
2. Scoop Some Soil (Even a small scoop of soil helps populate the pile with beneficial decomposers.)
3. Break Down Browns (Chop/shred brown matter, like leaves or paper.)
4. Make a Super Bowl (Place a layer of brown matter—2x the amount of greens you are going to add—on the pile. Arrange it like a bowl or a nest.)
5. Fill with Greens (Fill the bowl created in step 4 with kitchen scraps, etc.)
6. Cover with Browns (Cover the greens-filled bowl with more browns.)
7. Keep it Damp (Water lightly. It should feel like a wrung-out sponge.)

Activity Eight - Build A Vermicompost Bin

Materials // 2 dark, plastic, non-transparent 10 gallon storage bins, a drill with $\frac{1}{4}$ and $\frac{1}{16}$ bits, bedding = shredded paper and newspaper, torn up cardboard & some dried leaves, small amount of compostable food scraps, one pound red wiggler worms, a few full newspaper sheets, 4 equally sized wood blocks or bricks, small plastic spray bottle.

Ages // 6 - 18

Time // 30 minutes

Activity Description //

Building a worm compost or “vermicompost” is a great way to have fun with worms and expand the composting operation at your garden. Use **Handout 1.2 Taking Care of Your Worms**, which will provide you with all the information needed to care for you vermicomposting bin.

- Drill 20+ $\frac{1}{4}$ inch holes into the bottom of both bins for drainage. Drill $\frac{1}{16}$ inch holes along the top side of both bins. Drill 30+ $\frac{1}{16}$ inch holes in the lid of one of the bins. Leave one lid without holes.
- Put a brick in the bottom of the non-drilled bin and stack the drilled bin on top.
- Place shredded paper and newspaper in one bin leaving the other empty. Mix this “bedding” with a shovel full of black dirt and spray with water to lightly dampen. Add a little bit of compostable food scraps buried into the bedding (no meat, dairy, oils, and be careful with citrus).
- Add your worms. Lay a few pieces of wet newspaper on top of the bedding. Create a seal by tucking the wet newspaper around the edges of the bin.
- Cover with the ventilated lid and put the non-ventilated lid upside down. Place four wood blocks or bricks on top of the lid and prop the two buckets on top.



Activity Nine - Build A Compost Area

Materials

Materials // Four wood pales, hand drill, about 20 screws, shovels, finished compost in a bucket

Ages // 6 - 18

Time // 30 minutes

Activity Description //

If the garden doesn't already have a composting area, put one up! The easiest way to build a compost is by using (1) metal or wooden t-posts and fencing around the posts with the front side open.

Another option is (2) Use four wood pallets. Lay one on the ground and drill the three other pallets together to create the frame, leaving the front open. Dig the three standing pallets into the ground a little bit so they are sturdy.

If you already have a compost area explore it! Put the items you brought for the “What Goes In The Compost?” game into the compost pile, add both nitrogen & carbon elements demonstrating the “lasagna” method. Show participants how to turn the compost. If you have compost ready to go on the garden, now is the perfect time. Spread and mix compost into your garden beds before planting using pitch forks This is what we call “top dressing.”

Show participants what Finished Compost looks like. Ask them to describe it.



Activity Ten - Making Compost Tea

Materials // 5 gallon bucket, finished compost, watering can with unchlorinated water, cheesecloth OR a compost tea brewer

Ages // All Ages

Time // 10 - 15 minutes

Activity Description //

***Adapted from homecompostingmadeeasy.com**

- Step 1 Fill a bucket 1/3 full of quality finished compost
- Step 2 Add water to the top of the bucket (unchlorinated is best, or good well water).
- Step 3 Let the mixture steep for 3-4 days. Stir it now and then.
- Step 4 Strain the mixture through cheesecloth or other porous fabric (burlap, old shirt) into another bucket. Add the remaining solids to your garden or compost bin.
- Step 5 Dilute the remaining liquid with water so it's the color of weak tea (use a 10:1 ratio of water to tea).
- Step 6 Use tea immediately for optimal absorption into the soil around plants.

HOW TO USE COMPOST TEA

AS A ROOT DRENCH

Can be used unfiltered by applying directly to the soil area around a plant. The tea will seep down into the root system. Root feeding is not affected by rainy weather.

AS A FOLIAR SPRAY

Strain tea thru a fine mesh cloth (cheesecloth, burlap, even an old shirt). Then dilute it with dechlorinated water, if possible, or good quality well water. Use a ratio of 10 parts water to 1 part tea. The color should be that like weak tea. Add 1/8 tsp vegetable oil or mild dish-washing liquid per gallon to help it adhere to leaves.

Method of application and weather - A pump sprayer or misting bottle works better than hose-end sprayers for large areas or for foliar feeding as they don't plug up as easily. The beneficial micro-organisms are somewhat fragile so it is important to note you should avoid very high pressure sprayers for application. Re-application after rain is necessary and one should avoid applying to the leaves during the heat of the day.

Activity Eleven - Composting Our Food Scraps

Materials // Empty 5 gallon buckets with lids, 5 gallon buckets with hay or sawdust, plastic scoops, list of items that can be composted

Ages // All Ages

Time // 10 - 15 minutes

Activity Description // During this week of the program challenge the different schools and sites to try composting their food scraps (lunches or snacks) for at least one day or up to 1 week! Leave them with labelled 5 gallon buckets with lids and a 5 gallon bucket of hay or sawdust with a scoop. Participants and classrooms can compost any/all uncooked veggie scraps from lunches and snacks into the bucket. Following this they can cover it with a scoop or two of sawdust or hay. These buckets will then be collected and added to the compost area in their garden or off-site if a composting area is not available.



Activity Twelve - Greens (Nitrogen) and Browns (Carbon)

Materials // Laminated cards listing different green matter and brown matter items that are compostable

Ages // All Ages

Time // 10 - 15 minutes

Activity Description // This activity emphasizes the two main elements that make up a compost pile. Pass out a list of items that can go in a compost (some of them being green matter/nitrogen and some being brown matter/carbon). Make sure there is an even number of the items. Then have all the participants spread out into a large open space. Tell them that they need to work together as a team to create a layered or lasagna compost pile, which means they need to layer 1 part greens to 2 parts browns.

For example —

1 Part Food Scraps	Green
1 Part Hay	Brown
1 Part Coffee Grounds	Brown
1 Part Grass Clippings	Green
1 Part Hay	Brown
1 Part Leaves	Brown

You could also split the participants into two groups and see who can complete this task first.

Then — Ask participants what else the compost needs in order for it to turn into soil?

Air (Turning it)

Heat

Water

Finally, break the participants into two teams. Have them work together to find different green and brown items around the garden area. See what they collect and share the items with the group.

Activity Thirteen - Composting Play

Materials // Labels with different items found in a compost some of which SHOULD be in the compost and others that SHOULD NOT (for example — rotting egg shells, plastic, old tires, milk carton, carrot tops, strawberry jam, mulch, grass clippings, hair). Try to make them fun but easy enough for the age group. You need enough of these signs for most of the participants (excluding 3-5 depending on the size of the group). One laminated sign that says COMPOST PILE.

Ages // Ages 6 - 10

Time // 15 minutes

Activity Description // Every participant gets a lanyard and laminated sign with a different item that is in a compost pile. A few participants are selected to be the Compost Kings and Queens (a team of 3 or 5). All at once everyone starts running and the Compost Kings and Queens need to retrieve (tag) the correct items that go into the compost and leave the items that shouldn't go in the compost. The compost area will be a designated place. Once participants with correct items are tagged and are in the compost area they cannot come out UNLESS an participants with incorrect items are tagged and put in the compost this upsets the entire pile and all participants can run free!

The game is complete once the Compost Kings and Queens have all the participants with correct items in the compost and none of the incorrect items! Play again by switching roles!

Activity Fourteen - Turning & Tending the Compost

Materials // Pitchforks, hayforks, shovels

Ages // Ages 10 - 18

Time // 20 minutes

Activity Description // Other than making sure the compost area has the right ratio of browns to greens the compost also needs to be watered and turned. This is especially important if we haven't had a great deal of rain. Turning the compost or moving it from one chamber to the next is easily done with a pitchfork or hayfork. It will take some time. This is an activity where you can engage many participants and give them each a chance to dig it out or turn it.



turning the compost



a brand new compost area

Handout — Making Healthy Soil

Follow these steps, and you are sure to have healthy soil in your garden!

- **Keep your soil living.**

To grow food you need microorganisms & worms in your soil

- **Do not use synthetic chemicals,** including lawn chemicals

- **Do not compact the soil**

(don't run heavy equipment over your garden area). The soil needs good air flow for roots to grow, and water to be absorbed properly. Garden soil should not be walked on regularly or have any other heavy equipment run on top of it regularly.



- **Use compost** -- Create a compost area for all your greens & brown (plant matter, veggies scraps, leaves) This will decompose & create rich soil for your garden

- **Use mulch & cover crops!** We don't want the soil to be bare, instead we keep it covered with mulch like wood chips, hay, leaves, or grass clippings (chemical free) and we plant cover crops when we are not using our garden.

Handout — Earthworm Fun Facts

*adapted from SF Environment curriculum

- First, worms have 5 hearts!
- Worms don't have eyes; a worm "sees" by feeling things with hairs/bristles on its body. AND Worms don't have ears.
- Worms don't have lungs like we do that breathe in air for oxygen. Instead, worms breathe through their skin. It's important that a worm's skin stays wet in order for it to breathe.
- Worms need oxygen just like us, but without moisture, their bodies don't allow gas exchange or breathing to happen.
- Worms don't have any bones. That's why they are squirmy when they move.
- Worms have both male and female parts. This means that all worms can reproduce and have babies.
- Worms eat with a mouth that is a flap. Just like an elephant's trunk, a worm uses its flap to scoop up their food.
- Worms don't have teeth. Instead, they grind up their food through their gizzard, which is like a stomach that has tiny pieces of sand and minerals in it. These tiny particles grind up the food in the gizzard so the worm can digest or get nutrients from what it has eaten.
- Whatever food the worm can't digest ends up passing on through the body as "castings." That's a fancy word for worm poop! These castings become compost.



Handout — Taking care of worms

Here are important steps you need to take care of your vermicomposting bin...

Worms need oxygen and ventilation

Make sure the holes are big enough in the bin for the worms to get adequate air flow.

Worms need bedding

Bedding can be created by using shredded newspaper or shredded cardboard or leaves. Maple leaves are best, do not use Walnut leaves.

Keep the bedding wet

Use a spray bottle to wet the bedding as needed. It should be as damp as a wrung-out sponge. Worms breathe through their skin and need to remain wet in order to breathe.

Feed the worms

Worms prefer a vegan diet — this means they only want to eat plant-based foods like fruit, vegetables, beans, nuts, seeds and grains like rice, pasta and bread. Add small amounts of food at a time in one corner of the bin.

Check on the worms occasionally & harvest the compost

After about four months you can harvest the castings, the easiest way to do this is to push everything to one side, add new food and bedding for the worms to eat on the other side, and watch them migrate (this might take a few days) then remove the castings and sprinkle around your garden. You can also make compost tea using the castings.

