Workshop #4.2
Compost

Age Groups

- 5-8
- 9-13
- 14+

Learning Objectives

- Students will understand what is biodegradable and what ends up in the landfill, and what can be used for compost
- Students will understand the importance of reducing waste
- Students will learn what the uses of compost as fertilizer

Materials/Resources Needed

- Enough plastic bottles for every student or for every two students in the workshop (preferably 2 liter)
- Soil
- Green and brown compostable items (specified below)
- Scissors
- Spray bottle

Estimated Time	**Activity**
10 minutes	**Introduction**: ● Begin with asking the question: where does our garbage go when we throw it "away"? ○ Have a discussion based on those answers and what happens when our garbage sits in landfills. ○ Explain how some pieces of garbage, like food scraps, will decompose while others will stay in the landfill for a very long time, like plastic. ● Why is it bad when our food and other organic material sits in the landfill? ○ When organic waste decomposes, but is so covered and tightly packed that it doesn't receive oxygen, it will release methane. ○ Methane is a greenhouse gas ■ Ask kids if anyone knows what a greenhouse gas is. ■ Explain the connection between greenhouse gases and climate change. ● What is composting? ○ Recycling decomposed organic material and accelerating the natural processes when organic material, or anything that was once living, breaks down.

	○ Composting allows organic material to break down with enough exposure to oxygen that it produces carbon dioxide instead of methane. ● A compost needs green material, brown material, and water to create healthy soil. ● Green material vs. Brown material ○ Green material in a compost includes: ■ Fruits ■ Vegetables ■ Food scraps ■ Coffee grounds ■ Grass clippings ○ Brown material: ■ Twigs ■ Leaves ■ Egg cartons ■ Wood chips
15 minutes	**Age Group: 5-8, 9-13** **Preparation for workshop:** ● Cut the tops off of the bottles (the end with the cap) ● Rinse out the bottles thoroughly **During workshop:** 1. Distribute the bottles so each student has one, or have the students share one bottle if there are not enough bottles for everyone. 2. First, have the students add a layer of soil to the bottom of the bottle so it is filled about an inch. 3. Second, add a layer of food scraps, or green material 4. Repeat steps 1 and 2 until the bottle is filled, and finish with a layer of soil on top. 5. Spray the compost with water until it is damp and let it sit in a sunny spot. 6. Observe the changes over time as the organic material breaks down (estimated time for decomposition is around 8 weeks) **Post-workshop:** 1. If creation of the compost is successful, use the soil to grow a plant to exemplify the uses of compost. 2. Have kids describe observations every week when they check the progress of their compost
For an additional activity	**Age Group: All ages** **Making a Worm Bin for the class** **Objectives** ● If possible, creating a worm bin for the classroom would be an added dimension to understanding composting. It would provide two examples of processing food scraps and creating compost. Kids could potentially record their

	observations in the classroom with the worm bin, and at home with their bottle of compost **Supplies** ● Two 8-10 gallon bins (preferably clear so kids can look inside at worm activity) ● Power drill ● Several large rocks or pieces of wood ● Newspaper, cardboard or egg cartons. ● Worms--red worms are preferred, you can get worms locally at many hardware stores, and can also order them online (http://www.wiserwormfarm.com/Order.htm) **Instructions:** ● First, drill small holes in the bottom of the bin (about 30 holes; each an 1-1$^{1/2}$ inches apart), and in one of the lids of the bin ● Line the bottom of the bin with the large rocks and/or pieces of wood ● Add the shredded cardboard and newspaper ● Add soil and worms ● Add food scraps--NO meats, oils, dairy or fats ● Place the bin on the remaining bin lid on a surface that is not the ground. The bin will collect liquid fertilizer.
5 minutes	**Conclusion** ● Have each student write down one thing they learned from today's workshop

Age Groups: 9-13, 14+

Why compost?

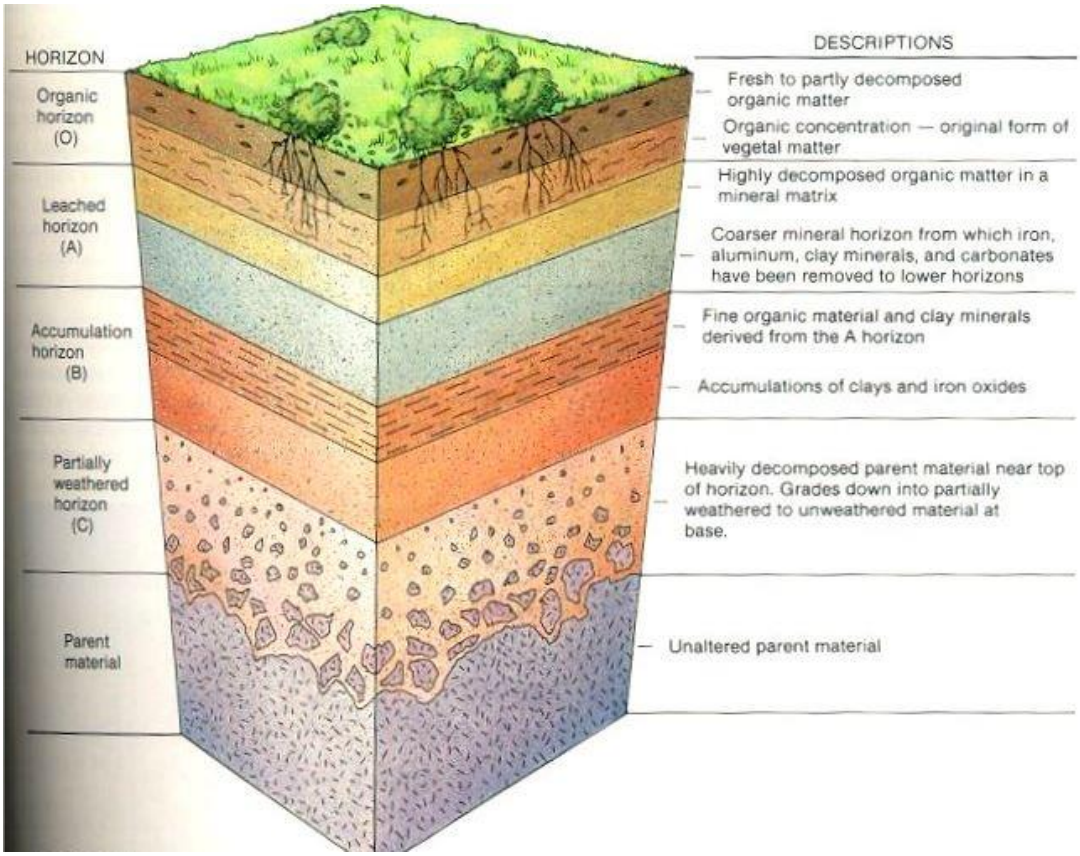
1. Benefits to the physical properties of soils
    a. Organic matter in the compost loosens heavy soils, which improves the soil structure and allows for greater **root penetration**.
    b. Compost is a dark-brown humus material, which provides greater **aggregate stability**. Aggregate stability refers to the resilience of soil aggregates, or small groups of soil grouped together, when faced with disruptive forces such as wind or water erosion, or tillage.
    c. **Water retention** is improved because water is able to bind to organic material, and the changes in structure of the soil because of compost allows for greater movement and absorption in the soil.
    d. The soil structure allows for greater **soil aeration**, and more oxygen is available to the roots.
2. Benefits to the chemical properties of soils
    a. Compost in soil increases the soils **cation exchange capacity (CEC) and anion exchange capacity (AEC)**, which improves the soil's ability to utilize nutrients.

    b. Compost itself supplements the soil with **nutrients** such as nitrogen, potassium, calcium, magnesium, and sulfur. In addition compost provides **micronutrients** such as copper, zinc, iron, manganese, boron, and molybdenum.
    c. The humus and organic matter can **regenerate poor soils.**
    d. Can act as a **buffer** between soil and exposure to acidity, alkalinity, salinity, pesticides, and toxic metals.
3. Benefits to the environment
    a. **Diverts** food scraps and organic materials from landfills, which release methane through anaerobic decomposition.
    b. Can bind heavy metals and other pollutants, preventing them from entering water resources.
4. Economic benefits
    a. Can extend landfill longevity which could potentially delay construction of replacement landfills or waste management strategy (i.e. incineration)
    b. Could create new jobs for citizens
    c. If used as an alternative to other topsoils in areas of new construction, landscape renovations or container gardens, it would not be a cheaper option initially, but by using compost instead of other topsoils, the quality of the plants would increase which would require less management or replacement.

Age Group: 14+

The invasive Earthworm Why to use local and native worms!!!**

1. Non-native earthworms are causing many changes in northern temperate forests

2. 

    a. It is important to understand the horizons of soil in order to understand the influence of earthworms on processes that occur in the soil.
    b. Earthworms compromise the availability or **transformation** rates of key resources
        i. Earthworms generally shift a soil system from a slower cycling, fungal-dominated system, to a faster cycling
        ii. The problem with this is that there is plenty of mixing in the upper layers of the soil, while there are little to no species mixing the soil in the middle horizons or in the deeper layers of the soils. The bottom-most layer of soil is called the C horizon. This is where fixation of atmospheric nitrogen occurs. When atmospheric nitrogen is fixated, microbes in soil will **transform** the atmospheric nitrogen into nutrients that plants can utilize (this also connects to compost because of the aforementioned **CEC and AEC**). Earthworms change the composition of the soil that allows for gaseous pathways to occur.
    c. https://www.redwormcomposting.com/general-commentary/do-composting-worms-pose-a-threat-as-invasive-species/
        i. This is a very comprehensible website that discusses why red worms should be the preferred choice as your composting worms.

Chen, J. H., & Wu, J. T. (2005). Benefits and drawbacks of composting. *Compost Production: A manual for Asian farmers. Food & Fertilizer Technology Center. Taipei*, *106*.

Loss, S. R., Niemi, G. J., & Blair, R. B. (2012). Invasions of non-native earthworms related to population declines of ground-nesting songbirds across a regional extent in northern hardwood forests of North America. *Landscape Ecology*, *27*(5), 683-696.