NATURE'S TRASH COMPACTORS

FACILITATOR

What if every plant and every animal that had died since the beginning of time still sat where it fell? Would there be any room for the living? Could the living stand the smell? Fortunately, nature takes care of things that die. Specialized organisms called "decomposers" go to work immediately to break down dead matter.

Goal

To observe microorganisms and macroorganisms that contribute to decomposition and determine factors important in decomposition.

Activity Time

1 to 2 hours for initial nature walk
1 to 2 hours to observe decaying log
30 minutes to assemble compost bags
30 minutes per week for several weeks to observe compost bags
1 hour to prepare final report of observations

Time to Get Ready

30 minutes

What You Need

Have the following for the group:

- 1 aquarium or large tub

Have the following for each team of 3 or 4:

1 hand lens
several mold, fungi, and insect guides
1 dissecting microscope, microviewer, or hand lens (optional)
5 microscope slides and cover slips (optional)
1 box colored pencils or markers
1 knife or pair of scissors
1 8-oz measuring cup
1 balance or postal scale
1 metric ruler
1 handful of grass clippings
1 handful of dead leaves, pine needles, sticks, or other organic matter
1 cup of potting soil
2 zippered, plastic bags
1 measuring teaspoon
1 pair of tweezers or forceps

Getting Ready

- Even in urban areas, participants can explore organic material that has accumulated over time by examining things like piles of leaves. Preview the area where you will take the participants to verify that it has plenty of organic material.
- If no parks or woods are nearby, collect decomposing logs or partially decomposed matter from a compost pile and conduct the entire activity indoors. The participants will need to omit Step 1 of **What To Do**.
- If participants only meet once a week, you may need to add water to the bags between meetings.
- If the group will only meet once, assemble several bags every couple of days for 2 to 3 weeks prior to the group's meeting.

Useful Information

Because not all garbage decomposes readily, many communities recycle plastic, metal, and glass to reduce wastes. But recycling is not an original concept. Nature has been doing it since the beginning of time. Specialized organisms called "decomposers" break down dead matter, reducing it to basic chemical parts. These are returned to the soil, water, and air, and supply us with carbon, hydrogen, nitrogen, and oxygen. Without it, dead matter would be piled high around us.

Composting puts the natural processes of decomposers to work turning dead plant and vegetable matter into usable soil enhancements. Within a compost pile, the decomposers come in an assortment of shapes and sizes. Chemical decomposers digest plant matter by secreting enzymes. The workhorses of the chemical decomposers are bacteria. When viewed through a powerful microscope, they appear as spheres, rods, or chains. Higher forms of bacteria called actinomycetes are responsible for the earthy smell of compost. They form long, thread-like, branched filaments that look like spider webs. Fungi are often the easiest chemical decomposers to see. They may form gray or white fuzzy colonies on the compost surface.

Many other organisms are classified as physical decomposers. They break up the particles by chewing and grinding. This activity helps the chemical decomposers do their job. Physical decomposers include mites, millipedes, centipedes, sowbugs, snails, slugs, spiders, springtails, beetles, ants, and worms.

Suggestions to Modify the Activity for Those Who Are Exceptional

Specific modifications for this activity are found here. For common considerations when modifying activities for exceptional participants, see page V of the **Introduction**.

Blind or Visually Impaired

- Allow the participants to touch, smell, and describe the textures of the different organic matter, such as moist, dry, dense, and porous. This will allow for better understanding of the variable and will provide for independent hypotheses and formations of conclusions. If feasible, show the class a compost heap and allow the class to experience the "earthy" smell. Individuals who are blind have a good understanding of color and will appreciate the detailed observations.
- Construct tactile diagrams of molds, fungi, and other microbes. Show the participant the difference between a sphere, rod, and chain with objects found within the room.

Deaf or Hard-of-Hearing

- See the ***General Modifications*** for *Blind or Visually Impaired* listed in the **Introduction**, page V.

Mobility Impaired

- See the ***General Modifications*** for *Mobility Impaired* listed in the **Introduction**, page V.

Physically Impaired

- See the ***General Modifications*** for *Physically Impaired* listed in the **Introduction**, page V.

Cognitively Impaired

- See the ***General Modifications*** for *Cognitively Impaired* listed in the **Introduction**, page V.

For More Information

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How to Start the Activity

Show a pile of rubbish to the participants. Ask them to imagine that there is a pile for everyone in the room, building, city. Have them discuss the problems that would occur if this rubbish did not break down.

Take the participants on a nature walk to find areas where nature is breaking down old materials in a forested area. If a walk is not possible, bring in a rotten log to examine.

Let's Make a Hypothesis

Discuss the following questions to help guide the participants to make hypotheses.

- What happens to dead materials in the woods?
- What affects how fast materials break down?
- What is needed for decomposition to occur?
- Does the presence of one material affect the breakdown of another material?

What the Data Mean

Data in this activity are qualitative. Have the participants describe the result of decomposition that they observe.

NATURE'S TRASH COMPACTORS

PARTICIPANT

Questions to Think About

What would happen if everything that ever died stayed unchanged where it fell? What do you think the Earth would smell like? How deep would we be in all this? Fortunately, that doesn't happen. Soon after plants and animals die, specialized organisms known as decomposers go to work on them. These organisms are essential to compost piles. Do you know anyone who composts? Why do they do it?

Safety Notes

- Wash hands after handling organic materials.
- Food, drinks, and gum are not allowed.
- Closed-toe shoes should be worn at all times.
- Use the knife carefully when probing the log.

What to Do

1. Take a walk in the woods or some other place where fallen branches and leaves have been on the ground for a long time. Look at the fallen trees and branches. Can you tell which ones fell most recently? Examine a fallen tree. Are all parts of the tree in the same condition? Draw pictures and describe what you see in different areas. Do you see any patterns of change on different parts of the tree or from tree to tree? Find several places where piles of leaves have accumulated. Dig through the pile and into the dirt below. Can you make a hypothesis about the conditions required for the fastest changes to occur in the leaves and the logs?

2. Take a log inside. Put it inside an aquarium or large plastic tub. Make drawings of all the different organisms you can see on the outside. Carefully take the log apart using a knife. Record all signs of living things and the changes that have occurred in the log. Use field guides to identify organisms.

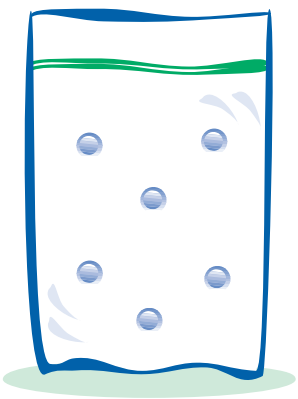

Figure 1. Bag with air holes.

3. Open 2 zippered, plastic bags. In bag #1, place a handful of grass clippings and a cup of fresh potting soil or compost and mix well. In bag #2, try a different combination of materials. For example, use whole leaves and no potting soil or crushed leaves and compost. One team could add plastic or metal. Would you expect the plastic or metal to decompose? Why or why not? Seal both bags. Use a sharp pencil to poke 6 air holes in each side of the bags. Place both bags in a warm, dark place. See Figure 1.

4. Examine the bags once a week. Add a teaspoon of water each time you make observations. Record whether the grass has changed in appearance from the prior week. Estimate, measure, or weigh the changes in the volume of material. Construct a graph or chart to document your observations. What changes indicate that decomposition is taking place? Give some examples.

5. What did you learn from this activity? How does this activity relate to your life? What do you think accounts for the difference in the two compost bags? Which bag's contents decomposed faster? How do you know? Why do you think this happened? What factors do you think might influence the speed of decomposition?

6. How can you learn more about decomposition? What would happen if you repeated the experiment at different temperatures e.g., room temperature (21°C) and in a sunlit window (32°C)? What if you changed the contents of the bags? kept them in different places? exposed them to light? added compost activator or garden soil? added more or less water? Could you design an experiment to test a new hypothesis or question? What procedure would you use? What would you use as a control? What would you measure? What variables are important? How many trials would you include? Could you graph your results?

What Did You Find Out By Doing the Activity?

Before doing "Nature's Trash Compactors," did you know:

- what physically happens to organisms that die?
- why some organisms feed off other organisms?
- why organisms and humans recycle?

From this activity, did you discover:

- how organisms that feed off dead matter help the environment?
- how recycling by humans relates to organisms in nature?
- what would happen if dead animals were left to sit forever?
- what factors affect how quickly dead matter can be broken down?
- what you can do to increase recycling in your area?
- why using a garbage disposal for leftover food can help the environment?
- what organisms feed off dead plant and animal matter?