



Science Unit: *Temperate Forest*
Lesson 12: *Forest Decomposition*

School year: 2004/2005
Developed for: Lord Selkirk Annex Elementary School, Vancouver School District
Developed by: Catriona Gordon (scientist), Gwynne Thompson and Donna Milligan (teachers)
Grade level: Presented to grades 1 - 2; appropriate for grades 1 – 4 with age appropriate modifications.
Duration of lesson: 1.25 hours (setting up 2 experiments which last 2-4 weeks: decomposition experiment, and bread mold experiment)
Notes: Lesson requires extension by teacher

Objectives

1. Learn about forest decomposers and the process of decomposition (breaking down of dead plants and animals into smaller parts).
2. Examine rates of decomposition using different materials.
3. Examine the role of fungi in decomposition of forest matter and food.

Background Information

A live tree (plant) collects nutrients and minerals from its environment to make new leaves, wood, roots, branches and bark. Similarly, animals receive nutrients from plants and/or animals and use them to grow and reproduce. When plants and animals die, the nutrients in their bodies are recycled back to the environment. This process is called decomposition. In the forest ecosystem, many organisms act as decomposers, breaking down dead plants and animals into smaller molecules, which are then recycled. Decomposers include fungi, bacteria, pillbugs, termites, sowbugs, earthworms, nematodes, mites, spiders, beetles, carpenter ants, etc. In one handful of rich forest soil there may be up to 5 billion bacteria. Without decomposers to recycle energy and nutrients, we would be buried in dead plant and animal matter, and life would cease on earth.

Vocabulary

Decomposition: The process of breaking down or rotting.
Detritivores / Decomposers: Organisms which feed on dead animal and plant matter, thereby recycling nutrients back into the ecosystem.
Fungi: Plant-like organisms, with no chlorophyll, which usually use dead plant and animals matter as food. (e.g. Mushrooms, molds, yeast, mildew).
Bacteria: One-celled organisms, found almost everywhere on Earth and can only be seen through a microscope.



Materials

Experiment 1

- 4cm square paper cut-outs
- 1 liter of gravel or small pebbles
- orange or mandarin peel from 4-5 oranges
- scissors
- terrarium
- spray bottle
- coloured plastic bag
- plastic tubs (1 for each student group)
- bucket of garden or forest soil with worms
- green leaves (6)
- magnifying glasses or dissecting scopes
- plastic spoons

Experiment 2

- 2 Loaves of non-preservative whole wheat bread (Uprising Bread works well- 1 slice for each student)
- Spray bottle
- Ziploc bags (one for each student)
- Magnifying glasses or dissecting scopes
- Marker
- Samples of edible fungi (soy sauce, blue cheese, yeast, mushrooms)

In the Classroom

Introductory Discussion

1. Who recycles here? What do you recycle?
2. Does anyone have a composter at home? What does a composter do? What animals live in a composter?
3. What happens in the forest when a tree dies? What happens to forest animals when they die?
4. What plants/animals help to decompose (breakdown) dead things?
5. What would happen if we did not have any decomposers?
6. Brainstorm and write on flipchart/blackboard all organisms which could be classified as decomposers (fungi, algae, bacteria, worms, mites, ants, sowbugs, etc.)
7. We are going to make our own composter, using forest soil. We will use three different things to decompose: green leaves, orange peel and plastic. All pieces must be the same size so that we can compare them. A prediction chart can be made where each student can guess how many days it will take for each of the three things to decompose.

Science Activity/Experiment

Experiment 1: Day 1

1. Divide up the class into 3 even groups. Each student gets a 4 cm paper square as a template, a pair of scissors and a piece of orange peel, green leaf, or piece of coloured plastic bag.
2. Each student cuts out a 4 cm square of leaf, peel or plastic to place in the terrarium.



SCIENTIST IN RESIDENCE PROGRAM

3. Students may help to set up terrarium by first putting down a layer of rocks 2-3 cm deep (for better drainage and air circulation), then a layer of soil 10 cm deep.
4. Next, students can come up and place their 4 cm squares of peel, plastic and leaves on soil surface (not overlapping).
5. Finally, another 10 cm layer of worms and soil can be placed on top of material to decompose.
6. Cover outside of terrarium with brown paper up to the layer of soil to keep worms and other organisms in the dark (mimicking real forest soil).
7. Cover terrarium with plastic lid with holes in it to retain moisture.
8. Keep soil moist by having students spray top of soil, regularly and lightly with spray bottle. Do not overwater. Leave terrarium in a cool place for 3 weeks. Wash hands thoroughly after handling soil.

Experiment 1: Day 21:

1. After 3-4 weeks, divide up soil from terrarium into plastic tubs or bins, one for each table group.
2. Let students use plastic spoons or fingers to examine soil to try and find leaves, peel and plastic. Students should place these things on their desks for other students to see. Usually by three weeks, leaves and orange peel have decomposed or have significantly changed appearance. Plastic, however, will not have decomposed.
3. Wash hands thoroughly after handling soil.

Experiment 2: Day 1:

1. Three hours before experiment place one loaf of bread with slices on paper towel to allow them to dry out.
2. Divide class into 2 groups: wet and dry. Half the students get one slice of dried bread and the other half get a slice of bread which they moisten by spraying lightly with water from the water bottle.
3. Students then place their bread into labeled Ziploc bags with their name, date and treatment (wet or dry).
4. Seal Ziploc bags and put in a dark place. Leave bread for 2-3 weeks.

Experiment 2: Day 14:

1. After 2 weeks, give each student their Ziploc bag to examine bread samples. Keep bags closed! Fungal spores can be irritants to some people.
2. Students use magnifying glasses to look at fungi growing on bread. If dissecting scopes are available, then gently open one bag and take off very small samples of bread with fungi to look at under magnification. Students should see fungal threads (hyphae), which appear like spider webs. Have students compare dry bread samples with wet bread samples.
3. Wash hands thoroughly after handling fungi and molds.

Closure Discussion

1. Experiment 1:
 - What did the students find had happened to the leaves, peel, and plastic? Did they look the same as when they were first put into the terrarium?
 - What decomposed fast? What decomposed slowly, very slowly? Were their predictions correct?
 - Why did plastic not decompose?



SCIENTIST IN RESIDENCE PROGRAM

- Who were the decomposers that “ate” the peels and leaves?
 - What happens in the forest when plants/animals die? What parts would decompose fast? Slowly?
2. Experiment 2:
 - What was growing on the bread?
 - Was there a difference between wet and dry bread?
 - Why did we put the bread in the dark? What would happen if we left the bread longer? Dark, moist conditions are ideal for fungal growth (e.g. bathrooms, shower curtains). In the olden days, food was dried as a means of preserving it.
 3. Would decomposition happen in the forest? How?
 4. Show examples of edible fungi such as mushrooms, soy sauce, blue cheese, yeast, tofu. Reiterate the importance of fungi as a decomposer and as a food source.

References

1. B.C. Ministry of Forests. 1999. Forests in Focus, pp. 102-107. ISBN 0-7726-3966-3
2. Burton, Jane and Kim Taylor. 1999. The Nature and Science of Waste. Gareth Stevens Publishing.
3. Hickman, Pamela. 1991. Plantwise. Pp. 54-55, 62. Ontario Federation of Naturalists. Kids Can Press.

Extension of Lesson Plan

1. Show students dried yeast (inactive form), a type of fungi, then place in warm water with sugar added. Show students how yeast “comes alive”, grows and gives off carbon dioxide. Do this experiment in a small clear bottle and place a deflated balloon over bottle opening. Watch the balloon blow up.
2. Talk about reducing waste in the classroom, in students’ lunches, and at home.
3. Visit local garbage dump and/or a recycling plant.

Bread Experiment

Name: _____

Day	I see...	I predict ...
	dry	
	wet	
Day	I see...	I learned ...
	dry	
	wet	