



Decomposition Inquisition

Summary:

Investigating a rotting log is an excellent hands-on activity that enables students to see how dead trees are recycled back into forest soil through decomposition. Students investigate three stages of decomposition by looking for and identifying animals found in the rotting log. The activity involves having enough rotting logs to go around for all students, dealing with the mess involved, and dealing with whatever students find in the logs. This can include various types of fungi, insects and spiders. This activity allows the students to discover for themselves the biodiversity of life found in an object that they most likely never would have appreciated before: a rotting log.

Grade Levels:

5th-10th

Setting:

Classroom

Duration:

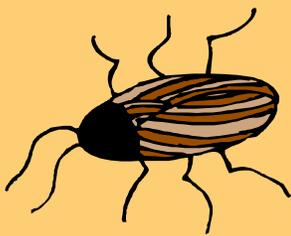
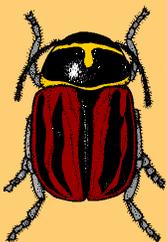
1 hour / 1 class period

Standards:

This activity relates to the PDE Environment and Ecology standards.

Vocabulary

Abiotic, biodiversity, biotic, decay, decomposer, decomposition, dissection, inorganic, microhabitat, nutrient cycle, organic, recycling



Objectives:

By the end of the lesson, students will be able to:

- Explain the concepts of the nutrient cycle
- Explain how species of living organisms adapt to their environment
- Explain the biotic and abiotic components of an ecosystem and their interaction
- Identify several decomposers

Background:

Decomposition, carried out by decomposers like microorganisms and fungi, is the process of breaking down dead matter into basic substances that can then be used again by other living things. The nutrient cycle is the way in which nutrients move between living things, like trees and animals, and the physical environment or habitat. It is the intake of substances like carbon dioxide and water from the physical environment by plants, the consumption of food in the form of plants and animals, the release of waste by all organisms, and the decomposition of all dead things by decomposers.

Materials:

1. Sections of rotting logs: Usually 3-4' of log per group (4 students/group)
2. One section of a log that is not rotting (for comparison)
3. Metal spoons, screwdrivers or some kind of pick to pry apart log
4. Small plastic/glass containers to temporarily hold critters for observation
5. Butcher paper/newspaper/plastic tablecloths to cover floor or table

6. Large heavy garbage bags to transport rotting logs from forest to indoors for dissection.
7. Magnifying lenses or magnified bug boxes.
8. Tweezers
9. Insect, spiders, fungi and plant field guides
10. Observation sheets for students
11. "Diagram of a Rotting Log" student page

Procedure:

1. Start out by asking the students **"What happens to a tree when it falls in the forest?"** Gather and record their ideas. Many times they will say that it disappears, or goes into the ground, rots or disintegrates. Sometimes, they may say that things decompose. If so, ask them to define any terms that they use. Ask them if they think that whatever happens to trees also happens to other living things that die? For example, what happens to a piece of fruit that falls off the tree and onto the ground?
2. Explain to the students that they are going to gently tear apart a section of a rotting log and examine the organisms, both plant and animal, that they find there. To help the students think about what happens when something decays, ask them to answer the following two questions prior to, and when they are done dissecting the log and its contents:
 1. **What happens to the log as it decays?**
 2. **What causes the log to decay?**
3. Divide the students into groups of 4 and provide them with the following materials:
 - A spoon, screwdriver or digging tool per person.
 - copies of the "Diagram of a Rotting Log" student page
 - Tweezers
 - Rotting log section
 - Magnifying lenses and several bug collection boxes
 - Observation Sheets
3. Make the insect, spider, fungi, and plant field guides available at a central location in the room or study area.
4. Place the section of non-rotting log in a central location of the room or study area for groups to observe.
5. If possible, have students work on their logs outdoors to

facilitate clean up and any escaping organisms. However, if the activity is done indoors, cover tables and floor space with butcher paper or newspaper for easier clean up.

6. Give the students 15-20 minutes to dissect and explore the log. Make the students aware that you need them to dissect the log slowly, gently and carefully so as not to harm the microorganisms and to ensure safety for the other members of their observation team. If anyone is observed using the tools in an unsafe manner, they will be instructed to be a recorder only for the rest of the activity.
7. Have them collect organisms and draw the various species on their observation sheets along with an approximate number of each species found. Encourage each group to spend a few minutes looking at the non-rotted log for comparison to their example.
8. Circulate while they are working and help them to think about the kinds of evidence they are finding in the log and ask them to suggest what is happening in this microhabitat. Most students will be unaware that what they are witnessing is the log turning into soil. If they find soil, ask them how they think it got there and help them to see the decomposition cycle in front of their eyes.
9. After 15-20 minutes of observation, gather the students for a class discussion. Ask them to describe their log versus the non-rotted log in the study area. List the different kinds of organisms that were found. Review the list. If the list doesn't include soil, ask, "did anyone find any soil inside their logs?" and "why was their soil in the log?" Then ask the students "what are some of the possible causes of the rotting of your log?" And "do you think that any of the organisms you found had anything to do with the decomposition?" Finally, ask the students to think about what the world would look like if things didn't decay?

Extension

- Have the students give an oral report on a specific decomposer their group found, including biology, life history, preferred habitat, preferred food source, etc.
- Take a field trip to a nearby forest. Bring along some field guides and spend time identifying the main tree species and plants found there. Have students search for rotting logs in different stages of decay and try to identify any insects they may find on the surface of or inside the logs.

Rotting Log Observation Sheet

Observation team members

- 1.
- 2.
- 3.
- 4.

As you explore the log, write down the different organisms (plant and animal) you find, an approximate total number of each kind of those organisms, and write down whether they are an example of an **invader**, **consumer** or **scavenger** type of decomposer. Use the Student Page titled "Diagram of a Rotting Log" to help you determine which type of decomposer your organisms are. In the space provided on this sheet provide a small drawing of each of the organisms you list. Using the field guides provided by your teacher, try and determine the common name of your organisms.

<p>Example: Click Beetle (15 beetles) Invader decomposer</p> 		

Diagram of a Rotting Log

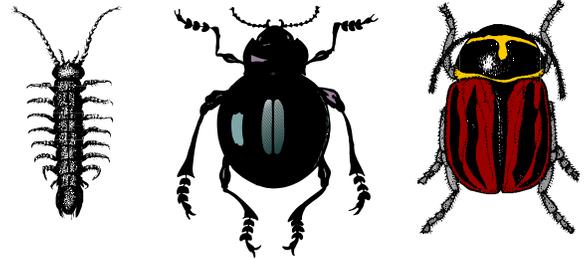
Dead trees are recycled back into the forest soil through decomposition. The stages of decomposition may be classified in three main categories:

INVADERS



**Bacteria, Fungi, Engraver beetles,
termites, bark beetles**

Invaders attack dead, dying, or weakened trees and start the process of decomposition. Wood-eating insects enter the tree by boring holes into the bark. They pave the way for other “invaders” such as bacteria and fungi, that dissolve the wood structure and allow moisture to enter. This moisture makes the tree a suitable place for mosses, lichens, and other plants to live. As they grow, they penetrate the wood, causing it to break apart and decompose even further. Many insects find this an ideal environment for laying their eggs.

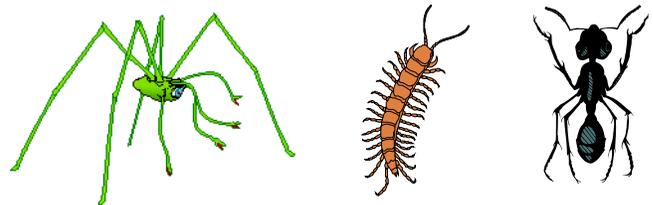


CONSUMERS



**Milli–and centipedes, mites, ants,
insect larvae, spiders, woodpeckers**

Fungi and bacteria provide a lot of nutrients for consumers such as insect larvae, which feed on other organisms and their remains. Insects like the moist habitat of the rotting log where they can find shelter and food. At this stage of decomposition, more plants, animals, and insects are inhabiting the tree, causing further decay. Some wood-eating insects leave the decaying tree in search of new fallen logs.

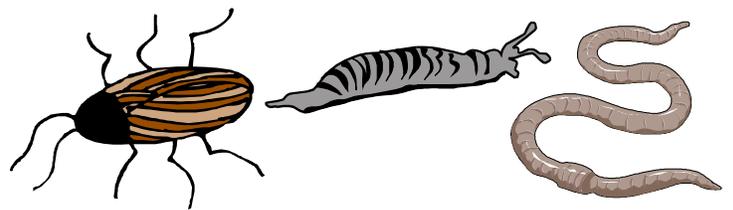


SCAVENGERS



**Snails, wood roaches, slugs,
Springtails, earthworms**

Scavengers eat dead plant and animal material and often choose decaying logs for their food and home. Snails and slugs come in and break down the log until it has virtually disintegrated. It is covered with plant debris, new seedlings, and leaves, and is almost impossible to differentiate from the forest floor.

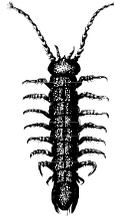


Types of insects

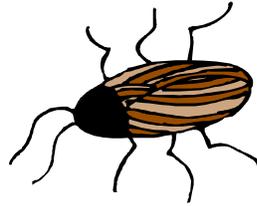
Use this sheet as a reference for the different types of insects you may find when dissecting the rotting log.



Woodpecker



Termite



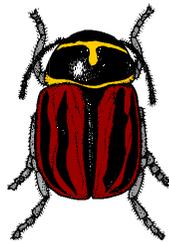
Wood roach



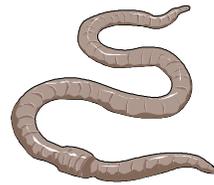
Mushroom



Moss



Bark beetle



Earthworm



Daddy longleg



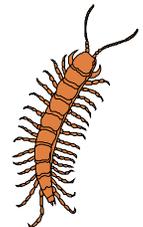
Slug



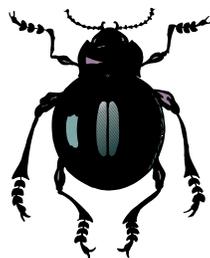
Ant



Lichen



Centipede



Click beetle

Glossary of Terms

Abiotic refers to a non-living factor in an environment like light, water and temperature.

Biodiversity is a term used to represent the variety of life forms in a given area.

Biotic refers to a living organism.

Decay in terms of our rotting log, refers to the aerobic breakdown of proteins primarily by bacteria.

Decomposers are organisms that are often microscopic in size, that obtain nutrients by consuming dead organic matter, thereby making nutrients available to other organisms.

Decomposition, carried out by decomposers, is the process of breaking down dead matter into basic substances that can then be used again by new living things.

Dissection refers to separating into pieces.

Inorganic refers to a non-living organism.

Microhabitat refers to a smaller living area inside a large one where environmental conditions differ.

Nutrient Cycle refers to the way in which nutrients move between living things and the physical environment. It is the intake of basic substances like carbon dioxide and water from the physical environment by plants, the consumption of food products in the form of animals and plants, the release of waste by these organisms, and the decomposition of any dead thing by decomposers like animals, fungi and insects.

Organic refers to an organism that is living.

Recycling refers to collecting and processing a resource or product into new products.

“a fallen tree in an advanced stage of rot can hold far more mass of living tissue than a live and standing apparently thriving one...Rotting logs are, at the very least, critical parts of the biodiversity – the sheer richness of life – in a natural forest.”

J.R. Luoma, The Hidden Forest (1999), pp. 80 & 84