

Little World

SDH 2017

OVERVIEW:

When was the last time you actually sought out those little creatures all around us? We generally spend much of our time trying to scoot these creepy crawly things away. But insects and decomposers like fungi and bacteria serve a valuable purpose in the world. This class will allow students the opportunity to learn about the little world of decomposers. They will search everywhere to see firsthand what these creatures look like and what they actually do with all of their time.

OBJECTIVES:

Students will be able to:

-) Understand the niche of decomposers within an ecosystem.
-) List four categories of decomposers.
-) Describe adaptations of common decomposers.
-) Give examples of environmentally responsible choices related to decomposers.

VOCABULARY:

Adaptation	Bacteria	Camouflage	Decomposer
FBIS	Fungus/Fungi	Humus	Invertebrates
Niche	Nitrogen Cycle	Mimicry	Scavengers

NEXT GENERATION SCIENCE STANDARDS:

-) Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant's parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. (5-LS2.A)
-) Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. (5-LS2.B)
-) Cause and Effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)
-) Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)
-) Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

MATERIALS:

blindfolds/bandanas
bug boxes
paper
pens/pencils
stick

PROCEDURES:

1. Introductory Demonstration: Energy Stick (found in class binder/activity glossary)
 - A. Conduct demonstration.
 - B. Debrief: What category of creatures recycles nutrients in the environment? Discuss with a partner: Are humans decomposers or just consumers? Do we break dead material down and make it into useful nutrients? Share theories. What are a few categories of decomposers that can help recycle dead plant and animal matter back into useful nutrients?
2. Characteristics of a Decomposer Discussion
 - A. Explain what a **decomposer** is. Include that the breaking down of matter into usable nutrients is their **niche**.
 - B. Use the acronym **FBIS** to describe the categories of decomposers.
 - i. **Fungi**: Fungi decompose by sending out branches of root-like hyphae to break down organic matter. Mold and mushrooms are common examples of fungi. It takes 50-100 years for fungi to break a tree trunk down into dust.
 - ii. **Bacteria**: Bacteria are microscopic organisms that can live anywhere and are responsible for recycling dead fungi and animal matter. How small are they? 25,000 laid end to end would only

be one centimeter! Together with fungi, bacteria are responsible for 80-90% of forest decomposition. Bacteria may sound scary, but most bacteria are more helpful than harmful to humans. A 100-lb human can have 1-lb of bacteria inside of them helping them break down dead material (food!) into useful nutrients.

- iii. **Invertebrates/Scavengers:** Many invertebrates as well as scavengers, like turkey vultures and ravens, break larger dead animals and plants into smaller pieces to be decomposed by fungi and bacteria. Most insects and other invertebrates, including worms, are largely responsible for the **humus** layer of the forest floor. This layer of decomposing organic matter is below the freshly fallen leaves/pine needles and above the more compact and dense soil. ****Note:** arachnids (spiders) are consumers, not decomposers.

3. The Role of a Decomposer Discussion

A. Decomposers keep the forest clean by breaking down dead plants and animals. Imagine if all of the leaves, pine cones and fallen trees from millions of years were still on the ground! They also recycle nutrients, changing nitrogen from the air into a form that can be absorbed by plants.

B. Recycling nitrogen is important because it helps plants produce their food and helps animals, like us, build protein. This process is called the **nitrogen cycle**.

- i. Activity: Nitro Tag (Found in the activity glossary/activity video).
- ii. Conduct Round One. Then pose the question, "Is there enough nitrogen remaining for the last omnivore to survive?"
- iii. Conduct Round Two.
- iv. Debrief: In which round did you feel more involved? (*Round 2*) What does capturing another person's blindfold signify in the second round? (*Recycling nitrogen*) What niche are you filling if you recycle nitrogen in the ecosystem? What are some things that fix nitrogen in the environment? (*bacteria on the roots of legumes like soybeans, peas, clover, other beans etc.*)

4. Decomposer Survival

A. Review the niche of decomposers (*recycle nutrients, keeping the forest healthy with space*). What special **adaptations** help decomposers survive and do their job?

- i. Fungi partner with other organisms to help it survive. Fungi partner with lichen and algae to trade nutrients from dead material for sugars from photosynthesis. Trees can do the same thing, sometimes donating 10% of their photosynthetic output to the fungus attached to the roots.
- ii. Bacteria are very versatile and adapt to different living conditions. Some bacteria can even survive without water for years! Many take hosts as a source of protection and energy. We have thousands of types of bacteria living in our intestines that help us digest our food. Very few bacteria actually harm humans (70% of bacteria are harmless or helpful).
- iii. Invertebrates can have special features that help them survive:
 - (1) **Mimicry:** some insects look or behave like other things-Giant Silk Moths looks like they have big eyes on their back to scare away predators; Walking Stick bug looks like a stick and stays very still; some moths evade bats by pretending to fall out of the sky like leaves.
 - (2) **Camouflage:** many organisms can blend with their environment; the Earth Fan mushroom hides among the pine duff and the Indian Dead-Leaf Butterfly blends perfectly with a bush when it closes its wings.
 - (3) Earthworms can survive weeks without oxygen and have special organs that help regenerate their bodies if they are cut.
- iv. One scavenger, the Turkey Vulture, has a quirky adaptation. It directs urine onto its legs and feet because the strong acid rinses bacteria away that might accumulate when it lands on or near carrion.

B. Activity: Invent A Decomposer (found in activity glossary)

- i. Debrief: Have a few students share their work with a partner. What is your decomposer's name? Which decomposer's body plan did you mimic? What is one adaptation that helped your decomposer do its job? Where would your decomposer live? As a group, pose the question: Why do you think there are a variety of decomposers in each ecosystem?
- ii. Now that they have hypothesized and invented a decomposer, segue into exploring for decomposers and evidence of decomposers in the experiment.

5. Experiment: FBI Hunt

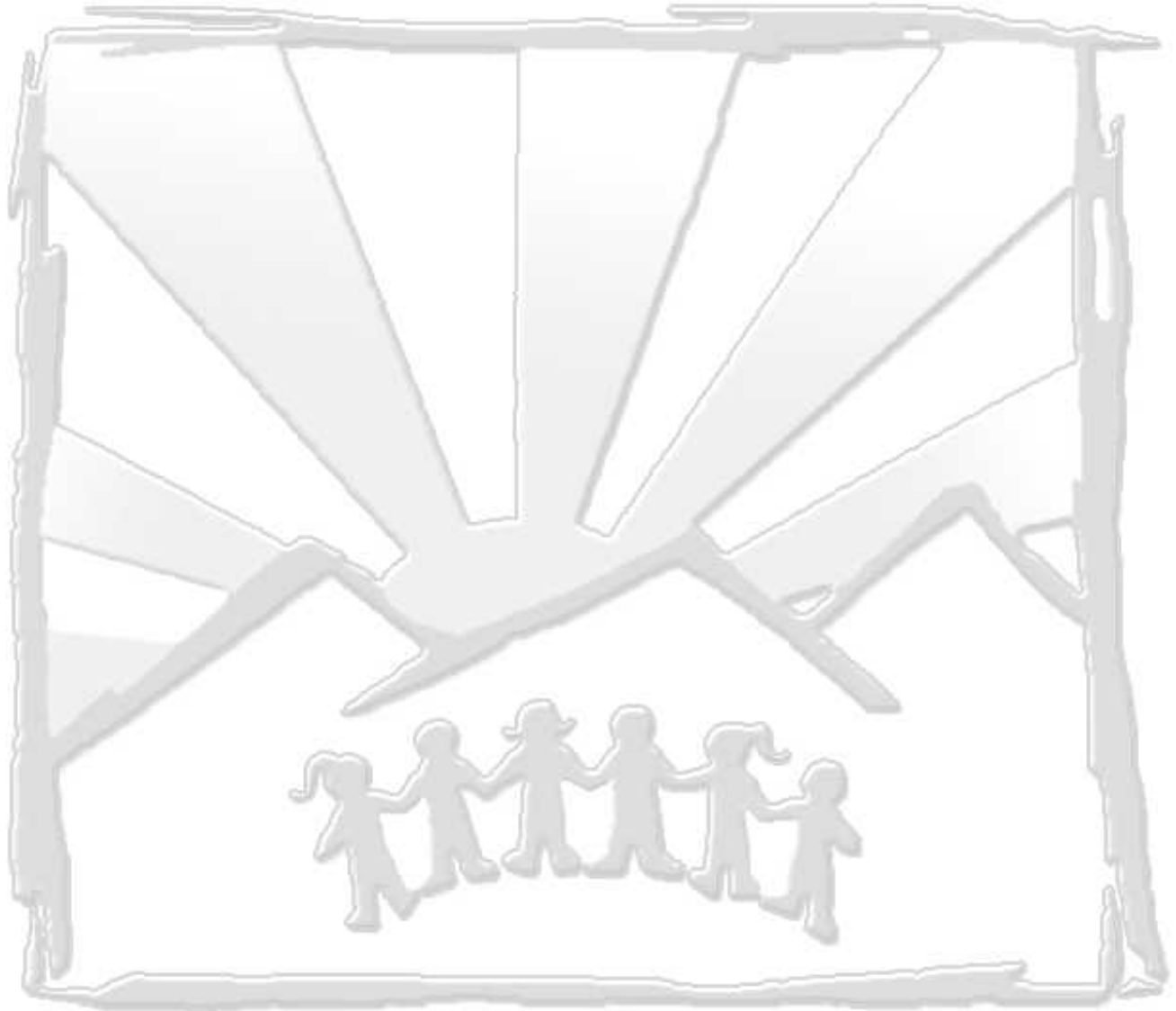
A. Now it is time to see what is in the forest around us. Conduct experiment.

- B. Debrief: Was it easy or difficult to find the different types of FBIs? Why? Many decomposers are very small. Can we identify evidence of decomposers even if we cannot see the insects themselves?
6. Wrap Up
- [*What?*] Concisely review the major points of the lesson, all the way back from the introductory activity.
 - [*So what?*] What was important for you to discover from the lesson? Why was it important for all of us to take this class?
 - [*Now what?*] What can you now do with this information? What changes can you make in your life? What can you teach to others? Who will you tell? What will you say?
 - Pass out beads after all students have contributed.

THINGS TO THINK ABOUT:

Special Needs: If the ground is frozen, you may have to get creative in helping students find FBIS. Evidence of decomposition is always prevalent under the bark of a fallen log, etc.

Weather: Temperature affects FBIS and the ability to find them. Read *In the Forest of T.S. Shrew* as an alternative to the FBI hunt if weather is inclement.



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