Lesson 3: Forest Energy Flow

NUTSHELL

In this lesson — with an open area for playing a game — students are introduced to the idea that trees create their own food energy. By acting out the flow of energy, students learn how producers and consumers interact. As a conclusion, students draw their own comic strip about the adventures of Zippy the Energy who lives in a forest.

ENDURING UNDERSTANDINGS

- Ecosystem structure consists of different types of organisms (i.e., producers, consumers,) interacting with one another and their environment. Humans are part of ecosystems.
- Ecosystem functions include the fixation of energy through the process of photosynthesis, the flow of energy through food chains and food webs, and the cycling of matter.

ESSENTIAL QUESTION

- How does energy from the sun become energy for a beetle?

OBJECTIVES

Upon completion of this lesson, students will be able to:

- Identify trees as solar collectors and energy fixers.
- Draw the transfer of energy within the forest and identify producers (plants), and consumers (herbivores and carnivores).

SUBJECT AREAS

Arts, Science

LESSON/ACTIVITY TIME

Total Lesson Time: 40 minutes

- Introduction.....10 minutes
- Activity .....15 minutes
- Conclusion.....15 minutes

STANDARDS CONNECTIONS

Standards for this lesson can be viewed online at the LEAF website ***(www.leafprogram.org)***.

FIELD ENHANCEMENT CONNECTIONS

This lesson ties closely with ***Field Enhancement 3, Forest Energy Scavenger Hunt.***

BACKGROUND INFORMATION

What is **energy**? Energy can be a hard thing to understand because we can't see or touch it. Energy is the ability to do work. We use energy all the time. We use energy not only to run and play, but also to sit in school or sleep at night. Humans get energy from the food we eat.

Forests are **ecosystems**. Ecosystems have energy flowing through them all the time. Where does that energy come from? The energy in a forest ecosystem (and all other ecosystems) comes from the sun. There are two main types of organisms that energy flows through – producers and consumers.

Plants are **producers**. Even though the sun provides energy to the forest, only plants can use that energy. The green chlorophyll in the leaves of a plant use sunlight, carbon dioxide, and water to make sugars and carbohydrates that are forms of energy plants can use to live and grow. Plants are actually making their own food. This is the process of **photosynthesis**.

MATERIALS LIST

For Each Student

- Copy of Student Page *1, Energy Ingredients*
- Crayons or markers
- Scissors
- Paper
- Copy of Student Page *2, The Adventures of Zippy the Energy (optional)*

Animals are **consumers**. **Primary consumers** are animals that eat plants to get energy to live and grow. **Secondary consumers** are animals that eat other animals to get energy to live and grow. In either case, the energy the consumers are using came from the energy created by plants. Humans are both primary and secondary consumers.

Fungus and bacteria are called decomposers. These organisms are consumers that are often noted separately due to their important role in nutrient cycling.

VOCABULARY TERMS

Consumer: An organism that can't produce its own food energy and must get it by eating producers or other consumers.

Ecosystem: An area that contains living and nonliving things existing together and interacting. Ecosystems come in all sizes (e.g., forest, meadow, log).

Energy: The ability to do work (e.g., grow, reproduce, move).

Nutrients: The minerals in the soil that a tree needs to live and grow.

Photosynthesis: The process a plant uses to combine sunlight, water, and carbon dioxide to produce oxygen and sugar (energy).

Primary Consumer: A consumer that gets its energy from producers (plants). These are often called herbivores.

Producer: An organism that produces its own food energy by using sunlight, water, and carbon dioxide through the process of photosynthesis. Producers are plants.

Secondary Consumer: A consumer that gets its energy from other consumers. These are often called carnivores.

PROCEDURE

Introduction - Producer/Consumer Review

1. Discuss energy. Ask students what energy is. *(Energy is the ability to do work. We use energy to move, think, and even when we are sleeping. You can't see energy.)* Ask where people get energy from to move and work. *(From eating food.)*

2. Ask students if trees eat. *(No. **NOTE: This is review from Lesson 1.**)* Ask how plants such as trees get their energy. *(They make it with their leaves.)*

3. Discuss with students that since people don't have leaves, we can't make our own food. Only plants can collect sunlight and use it to make food energy.

4. Tell the students they are going to pretend to be trees, shrubs, deer, or mushrooms. Have students stand in an open space where they have enough room to safely stick their arms out. Demonstrate the actions for each of the organisms.
   - **Tree:** Stick your arms over your head as though they were branches. Explain that a tree is a plant. Remind them they just learned that plants make their own energy. They are called **producers**.
   - **Shrub:** Squat down and stick your arms out as though they were branches. Remind them that a shrub is a plant so it is a **producer**.

- **Deer:** Touch your hands to the side of your head and spread your fingers apart like antlers. Tell the class that deer are animals and can't make their own food. They get energy by eating plants. They are called **consumers**.
- **Mushroom:** Squat down on the floor pretending to suck the energy out of the dead plants and animals. Mushrooms can't make food; they get their energy from dead plants. They are also **consumers**.

5. Begin by calling out "producer" or "consumer." Students should again act out the organism. When you have called out each several times, ask students to sit down in a group. Review the terms "producer" and "consumer."

Activity 2 - Energy Transfer

1. Hand out Student Page ✎***1, Energy Ingredients***. Explain that trees combine sunlight, carbon dioxide from the air, and water from the soil to make food. They do this with their leaves. The food is what they use to grow and live.

2. Ask students to color and cut out the food energy circle at the bottom of Student Page ✎***1, Energy Ingredients***. Collect the circles; they will be used later.

3. Have the class brainstorm other producers and consumers than the ones used above.
   - *Producers can be any kind of green plant they think of.*
   - *Consumers can be mammals, insects, birds, fish, fungi, etc. If humans are not on the list that the class creates, stress to them that we are consumers too.*

4. Divide the class in half. Assign one half to be producers and one half to be consumers.

5. Distribute the food energy circles that the class made in the introduction to the producers. Each producer should have two energy circles.

6. Explain to the class that they are going to learn how energy flows between producers and consumers. Give them instructions and have them follow along step by step.

7. Ask the producers to stand in two rows facing each other with space between the rows. The producers should hold their food energy in their hands in front of them.

8. Ask the consumers to come into the playing area between the rows of producers. Each should collect only one energy circle from the producers. Producers must always have one energy circle left.

9. Explain that the consumers have used the energy in the energy circle. Producers need to add more. Ask the consumers to return the circles to the producers. Review how the producers (plants) will make food energy. *(They use sunlight, water, and carbon dioxide from the air to make food energy with their leaves.)*

10. Have students play one round as they have just practiced it.

11. Tell students that in the next round, you will remove one or two producers. Ask them what they think will happen. Allow the students to speculate. Don't give away the outcome. Begin the round, but remind the consumers they may not take an energy circle from a producer who only has one left. A consumer who cannot collect an energy circle must leave the playing area.

12. The result of the round will be that some of the consumers did not survive because they did not get any energy. Through questioning, lead the students to the conclusion that there have to be producers making energy for consumers to survive.

13. Review the steps in the flow of energy. Producers make food energy using sunlight, carbon dioxide, and water. That food energy passes to consumers.

Conclusion - Zippy the Energy

Hand out Student Page ✎***2, The Adventures of Zippy the Energy***. Assign students to write and draw a comic strip entitled "The Adventures of Zippy the Energy." Students should include where Zippy started (as sunlight, carbon dioxide, and water) and what Zippy did along the way through the forest. (The trip through producers and consumers.) Display the completed comic strips in the classroom.

CAREERS

The career profile in this lesson is about Alan Haney, Ecologist, University of Wisconsin-Stevens Point, and is found on page 52. A careers lesson that uses this information begins on page 90.

SUMMATIVE ASSESSMENT

Choose a story/picture book to read to the class that contains images of producers and consumers. As you read through the book, ask students to point out which items are producers or consumers.

SOURCES

Benson, D. E. (1999). *Living with Nature and Wildlife: Doing Our Part.* Washington D.C.: Wildlife Management Institute.

Miller, G. T., Jr. (1991). *Environmental Science: Sustaining the Earth.* Belmont, CA: Wadsworth Publishing Company.

NOTES

Career Profile

Alan Haney, Forest Ecologist

This is Alan Haney. Alan is a forest ecologist. He really has two different jobs. As an ecologist, Alan studies forest communities. He looks at how all the things in a forest work together. He is also a Professor of Forestry at the University of Wisconsin-Stevens Point, so he teaches college students about forests. In the summer, Alan takes students into different forests to learn about them. Sometimes he teaches adults who are not in college about forests too. Foresters can use what Alan learns to make decisions about forests.

Alan went to college for nine years. He has taught, done research, and managed forests for 35 years. Alan has worked in six different states. Even before he went to college and worked at different jobs, Alan was learning about the outdoors. He grew up on a farm and learned how plants and animals depend on the environment around them. Alan is a member of different clubs that are interested in trees and forests. He is also a member of clubs that are interested in birds.

Alan says that his favorite parts of his job are "sharing my love of forests with others and being outside, especially in the woods."

If you would like to be a forest ecologist like Alan, he says you should study science and math. He also says you should take every chance you can to get into forests with other people who like the same things you do.

Alan is working on the tops of trees that blew down in a storm.

NOTES

"Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop away from you like the leaves of Autumn."

John Muir

ENERGY INGREDIENTS

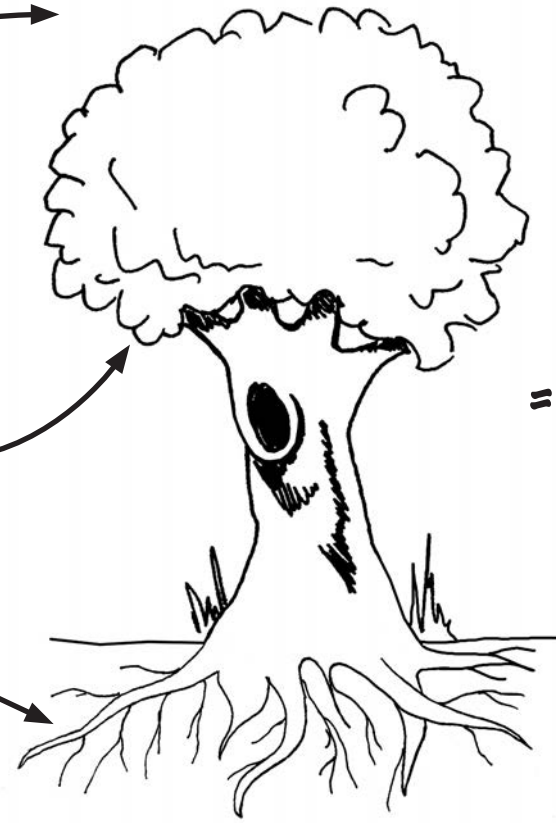
Sunlight

+

Carbon Dioxide

+

Water



= Food Energy

FOOD ENERGY

THE ADVENTURES OF ZIPPY THE ENERGY

1

2

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