

Assignment Discovery Online Curriculum

Lesson title:

Forest Food Webs

Grade level:

6-8, with adaptation for older students

Subject area:

Life Science: Ecology

Duration:

Two class periods

Objectives

Students will

1. understand the seasonal changes that affect life in a temperate forest ecosystem; and
2. understand how organisms in a temperate forest are dependent on one another for proper nutrition.

Materials:

- Reference materials about plant and animal life in temperate forests, which may include field guides, encyclopedias, and Internet resources
- Index cards
- Card stock or poster board for seasonal displays
- Five different colored skeins of yarn
- Bulletin board or display space to create a seasonal food web
- Copies of Take-Home Activity Sheet: Life in a Temperate Forest

Procedure:

1. In this activity, students will learn about the interdependency of life in a temperate forest by studying selected organisms from an Asian temperate forest and creating a food web. Begin the lesson by discussing, and listing on the board, the different kinds of life that can be found in a forest. Encourage students to help you generate the list.
2. Explain that three major types of organisms live in an ecosystem: producers, consumers, and decomposers. Producers create their own food through the process of photosynthesis. Consumers must hunt or forage for the nutrients they need to survive. Decomposers obtain nutrients by breaking down parts of organisms into simple forms; for example, mushrooms feed off plant tissues on tree bark, and bacteria on a forest floor feed off the leaf tissue of fallen leaves, causing them to decay. Go back to the list you've created and have students help you mark items with "P" for producers, "C" for consumers, and "D" for decomposers.

3. Review with students the three types of consumers: herbivores, carnivores, and omnivores. Explain that herbivores are animals that eat only plant material, such as the caterpillar. Carnivores eat animals; for example, forest ants eat other insects. And omnivores eat both plant material and animal flesh. Humans are omnivores. Ask students to look at the consumers on their list and decide which type best describes each one.

4. Next, define food webs and food chains. Food webs are diagrams that show how organisms living in an ecosystem depend on one another to obtain the nutrients and energy they need to live. For example, make a food web for an oak tree. Caterpillars eat the tree's leaves for nourishment; beetles live on the tree and eat the bark; woodpeckers eat the beetles living on the tree; jays and squirrels eat the acorns; and the oak tree makes its own food with energy from the sun through the process of photosynthesis. The web becomes more complex as additional organisms are added to it. A food chain is a smaller, less complicated diagram that examines one piece of the food web to show how specific organisms obtain their energy from other organisms. Food chains show a single line of energy transfer. An example of a food chain from the food web above would be oak tree—beetle—woodpecker—bird of prey (the beetle eats the oak tree, the woodpecker eats the beetle, and the bird of prey eats the woodpecker).

5. Tell students that they will be creating food webs for the Asian temperate forest ecosystem in northern Japan. Explain that the temperate climate in Japan is similar to that of North America. Temperate climates have four distinct seasons. The plants and animals living there must adapt to the changing seasons to survive.

6. Explain that the plant life in the Japanese and the North American temperate forests is dominated by deciduous trees, or trees that shed their leaves in the fall. Students will find that some Japanese tree species are similar to trees found in North America, such as oaks, maples, and beeches. Some animals will be similar as well, such as jays and squirrels. However, they will find some interesting differences in Japan, including the Japanese cherry tree and the macaque.

7. Now divide the class into four groups, each representing one of the four seasons in the Asian temperate forest. Using the chart below, assign the students in each group one organism to research. To create an effective web, assign five or six animals and at least three plants per season to each group.

Spring	Summer	Fall	Winter
Cherry tree	Cherry tree	Cherry tree	Cherry tree
Maple tree	Maple tree	Maple tree	Maple tree

Oak tree	Oak tree	Oak tree	Oak tree
Beech tree	Beech tree	Beech tree	Beech tree
Macaque	Macaque	Macaque	Macaque
Squirrel	Squirrel	Squirrel	Squirrel
Great spotted woodpecker	Great spotted woodpecker	Great spotted woodpecker	Great spotted woodpecker
Dogtooth violet	Dogtooth violet		
Hornet	Hornet	Hornet	
Horned beetle	Horned beetle	Horned beetle	Horned beetle
Ant	Ant	Ant	Ant
Dormouse	Dormouse	Dormouse	Dormouse
Caterpillar/butterfly	Caterpillar/butterfly	Caterpillar/butterfly	Caterpillar/butterfly
	Moth	Moth	
Jay	Jay	Jay	Jay
			Duck

- Next, hand out copies of the Take-Home Activity Sheet, which provides questions to help guide students in their research. Explain that students' homework assignment will be to research a particular organism to determine what food resources it needs for survival. Students must also research how the organism and its food resources change with the seasons. Students assigned a plant to research must describe how the plant's vegetation changes throughout the seasons and what nutrients the plant needs. Students assigned an animal must research how the animal finds nutrients during each season and specifically what the animal eats. Students should also determine whether their organism serves as prey for another animal.
- Students should create an illustration or cut out an image of their organism. Then have each student use the information from his or her activity sheet to create an index card for the organism, which should include
 - the plant's or animal's name;
 - what it eats;
 - what eats it; and
 - how it adapts to a particular season.
- Divide a bulletin board into four sections and label each section with one of the four seasons. Have each group create a display that shows the food web for a season. The displays should include the pictures or illustrations of the organisms along with the index cards.
- Have each group discuss how the organisms are dependent upon each other for survival during each season. Assign a different color of yarn to each group. Have students from each group approach the board and use lengths of yarn to show the

interdependency of the organisms in the season that group worked on. For example, in the fall display, the oak tree would have yarn leading from it to squirrels and jays, which eat the acorns, as well as to macaques, which eat the oak's brown leaves and twig bark

7. Then have students step back and look at all four seasons. Are any food sources missing? For example, if a squirrel is pictured in the winter section of the bulletin board, its major food source, the oak tree, should be illustrated there as well. The caterpillar in summer eats green leaves, so trees with green leaves must be shown in the summer section. If major food sources are missing, have students take the time to add them to their displays.
8. After the food web diagram has been completed, discuss with the class which organisms in the web are producers and which are consumers. From the list of consumers, have students provide examples of herbivores, carnivores, and omnivores. Do any organisms vary their eating strategies? Discuss with students why it might be advantageous to be an omnivore.

Adaptation for older students:

Students can compare and contrast a number of different forest habitats, such as temperate, coniferous, and rain forests. Divide the class into groups; assign each group a forest in a specific location and have the group create a food web for the forest. Have the class compare the organisms found in the forests as well as the climates that characterize them. Students should be able to describe organisms as producers, consumers, and decomposers. Discuss the biodiversity of each type of forest. Have students conduct research to discover which type of forest habitat is considered the most threatened environment in the world.

Questions:

1. Discuss why decomposers are important to food webs and the environment. List examples of decomposers that might be found in a local forest habitat.
2. Animals must adapt to changing seasons in their habitats. How do animals in your area survive seasonal changes? Which animals hibernate, migrate, or become dormant? Which animals change their appearance with the seasons? How does this help them survive?
3. Hypothesize what would happen if a particular organism became extinct in the Asian temperate forest. Would this missing organism affect the rest of the forest? Provide examples of human activity or natural disasters that could affect the food web.

4. Discuss the different energy needs of organisms in a food web. Compare the energy levels in the Asian forest food web with the energy levels in another food chain.
5. Discuss ways in which humans change animal food chains. One example is what has been fed to some cattle, who are natural herbivores. In tracing the spread of mad cow disease, scientists discovered that ground-up animal parts added to cattle feed were the cause. Debate how food resources for animals and humans should be controlled.
6. Think of all the organisms you had an interaction with in the past day. How did they relate to you? Discuss whether any of the organisms were predators or prey.

Evaluation

You can evaluate your students on their assignments using the following three-point rubric:

Three points: exceptionally well-done research; accurate and detailed information on the assigned organism; complete answers to all activity sheet questions; demonstration of a clear understanding of seasonal food webs

Two points: somewhat carefully completed research; somewhat detailed information on the assigned organism; completion of most of the activity sheet questions; demonstration of a general understanding of seasonal food webs

One point: partially completed research; lack of detail on the assigned organism; completion of some of the activity sheet questions; little demonstration of an understanding of seasonal food webs

Extension Ideas:

A Forest Close to Home

As a follow-up to this activity, students could create a food web for a temperate deciduous forest of North America. Have each student choose an organism from a local temperate forest or assign each student an organism to research. Students can construct a food web for a North American temperate forest using the same procedure they used for the Asian forest. After completing both the food webs, they can compare and contrast the North American ecosystem with the Asian forest.

Forests of the World

Have students locate all the areas in the world with temperate deciduous forests. Provide students with a blank map of the world and have them plot all the temperate forest

locations. Further research could be done to include taiga, or coniferous forests, and tropical rain forests. Have students estimate the land area occupied by forests today.

Suggested Reading:

Temperate Forests (Biomes of the World series)

Michael Allaby. Grolier Educational, 1999.

Explore the reach of temperate forests around the world and learn about the plant and animal life that thrives within them as the seasons change. Using color photographs, drawings, and diagrams, this book provides an excellent introduction to forest ecology. A glossary, list of further readings, and extensive index are included.

The Trees in My Forest

Bernd Heinrich. Cliff Street Books, 1997.

Sometimes the best way to understand the larger picture is to look on a small scale. In this combination of science and the personal, the author explores his own Maine forest and exposes the reader to the cycles of nature. Illustrated with fine pencil drawings, this is a delightful in-depth look at forests and our strong connection to them.

Vocabulary:

coniferous

Definition: Trees bearing cones and having needle-shaped leaves.

Context: A small number of **coniferous** trees can be found in temperate forests.

deciduous

Definition: Trees and shrubbery shedding foliage at the end of the growing season

Context: **Deciduous** trees are the dominant plant life found in temperate forests.

dormancy

Definition: Biological rest or inactivity.

Context: During cold winter months, deciduous trees exhibit **dormancy** to survive the harsh winter.

habitat

Definition: The place in which an organism lives.

Context: Organisms live in a variety of different **habitats**, such as forests, meadows, streams, and lakes.

hibernation

Definition: A state of dormancy in which some animals pass the winter in a torpid state.

Context: Small mammals survive harsh winters by lowering their body temperatures and metabolic rates during **hibernation**. This allows them to conserve energy when food supplies are not available.

temperate

Definition: Marked by moderate temperatures, weather, or climate.

Context: **Temperate** forests are a type of biome that experiences seasonal changes.

Academic Standards:**Grade Level:**

6-8

Subject Area:

Science

Standard:

Understands relationships among organisms and their physical environment.

Benchmark:

Knows ways in which organisms interact and depend on one another through food chains and food webs in an ecosystem (e.g., producer/consumer, predator/prey, parasite/host, and mutually beneficial or competitive relationships).

Grade Level:

6-8

Subject Area:

Science

Standard:

Understands relationships among organisms and their physical environment.

Benchmark:

Knows how energy is transferred through food webs in an ecosystem (e.g., energy enters ecosystems as sunlight, and green plants transfer this energy into chemical energy through

photosynthesis; this chemical energy is passed from organism to organism; animals get energy by oxidizing their food, releasing some of the energy as heat).

Credit:

Mary C. Cahill, middle school science coordinator, Potomac School, McLean, Virginia.

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Life in a Temperate Forest

Organism name: _____

1. Describe the organism's appearance, including its size, color, and dominant features.
2. What does the organism eat, or how else does it get its nutrients?
3. How does this food source change during each season?
4. How does the organism react to seasonal changes?
5. What eats or preys on this organism?
6. Is this organism a producer or a consumer?
7. What is the average life span of the organism?
8. During which seasons is the organism most active? Why?