

By conducting research and modeling a food web, students take a close look at a forest ecosystem and discover ways that plants and animals are connected to one another. Although this activity focuses on forests, you can also use it to study other ecosystems, such as oceans, deserts, marshes, or prairies, by substituting the appropriate information.

WEB OF LIFE



SUBJECTS

Science, English Language Arts, Visual Arts

PLT CONCEPTS

3.2, 3.4

STEM SKILLS

Collaboration, Organization, Problem Solving, Technology Use

DIFFERENTIATED INSTRUCTION

Nonlinguistic Representations, Student Voice

MATERIALS

Resource materials about forest plants and animals; paper, string, or safety pins for nametags; 200 feet of string or yarn.

TIME CONSIDERATIONS

Preparation: 30 minutes

Activity: Two 50-minute periods

OBJECTIVES

Students will

- Conduct research to learn how one organism is connected to other organisms in an ecosystem.
- Use a model to understand the interdependence of organisms in an ecosystem.

BACKGROUND

A forest is a complex living system. In addition to trees, a forest ecosystem is composed of many other plants and animals that interact with and depend on one another.

One way that forest plants and animals are connected is through energy from food. All life depends on **photosynthesis**, the ability of plants and a few other organisms to capture the sun's energy and use it to synthesize simple sugars from carbon dioxide and water. Through photosynthesis, organisms make the sun's energy available to animals. Plant eaters, or herbivores, eat plants directly; in turn, animal eaters, or carnivores, eat herbivores or other carnivores. This flow of energy is called a **food chain**.

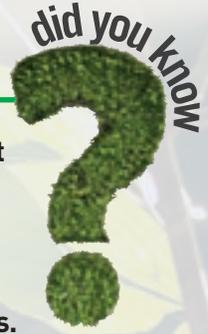
A food chain is a simplified way of showing energy relationships between plants and animals in an ecosystem. For example, one food chain might be sun → plant → mouse → owl: a plant is eaten by a mouse, which in turn is eaten by an owl.

It is rare for an animal to eat only one type of food. A **food web** describes the complex interconnection of all the food chains and cycles in an ecosystem and gives a clearer picture of how plants and animals in an ecosystem are related to one another. No matter how unrelated organisms may seem, they are, in fact, connected. For example, when plants and animals throughout the food chain die, they become food for **decomposers**, which break down the dead matter and release nutrients to the soil, thus continuing the cycle.

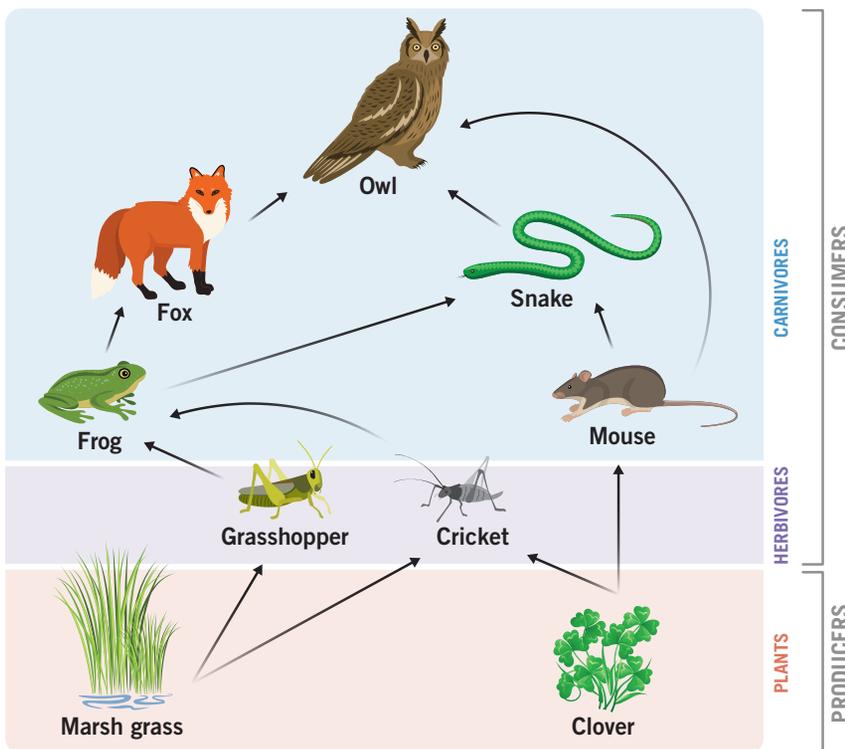
Plants and animals are interdependent in other ways besides food. For example, plants may depend on insects and other animals to pollinate their flowers, disperse their seeds, and keep insect populations in check. And animals may depend on plants for shelter and to help modulate the amount of moisture and sunlight in their environment. For more information about what plants need, see the activity *Here We Grow Again* (in Grades K-2).

FOREST FACT

Forests are home to 80% of the world's terrestrial biodiversity, so it's important to conserve them and practice sustainable forestry. A healthy forest ecosystem includes a variety of plants and animals. One way to assess this diversity is to determine whether there is a mix of plant species of different sizes, ages, and functions, thus creating diverse conditions that provide habitat for many species.



SIMPLIFIED FOOD WEB



A food web describes the complex interconnection of organisms in an ecosystem. Each arrow points to the eater and shows the transfer of energy. This diagram of a food web is simplified, as many more species would actually be involved.

GETTING READY

- Create a list of forest animals and plants that students might research. Aim to include at least two of each type: mammal, arthropod (insect or spider), bird, reptile, amphibian, tree, and other plant.
 - » Animal possibilities: bark beetle, bat, beaver, bear, box turtle, butterfly, chipmunk, deer, earthworm, field mouse, red fox, tree frog, grasshopper, king snake, lizard, mosquito, hawk moth, opossum, barred owl, rabbit, raccoon, skunk, snail, squirrel, tick, or woodpecker.
 - » Plant possibilities: azalea, clover, columbine, cottonwood, honeysuckle, maple tree, Douglas fir, paintbrush, pine tree, poison ivy, or violet.
- Students will need access to resource materials or the internet. Arrange time in the library or media center, as needed.
- Optional: For nonformal audiences or English language learners, you might plan to provide students with the nametags used in Steps 4–9 instead of having them research and make their own. See plt.org/myk&guide for sample nametags for a variety of locales.

DOING THE ACTIVITY



- 1 Ask students to work in pairs or teams to brainstorm components of a healthy forest ecosystem. Invite them to share their ideas with the rest of the group.
- 2 Have each student choose a forest organism to study. Make sure the group selects a variety of plants and animals, including mammals, insects, birds, reptiles, trees, and other plants.
- 3 Instruct students to collect the information about their chosen organism, using the Web of Life Research student page as a guide. After students have completed their research, have them make a nametag for their forest plant or animal, including a picture.
- 4 Have students sit in a circle on the floor or ground, wearing their nametags. Introduce the web of life concept (see Background).
- 5  **NONLINGUISTIC REPRESENTATIONS** Starting with a student who has chosen a plant, ask that student to hold the end of a ball of string and to name another organism in the circle with which that plant interacts (for example, is eaten by or depends on). Unroll the string enough to pass the ball to this second student. Ask the second student to name another organism with which his or her organism interacts. This process will continue until each organism is linked in the ecosystem, and the ball is returned to the first student.

TAKE IT OUTSIDE



Create an outdoor “web of life” to show connections in the immediate environment. Start by tying one end of a string to a tree or other plant. Connect it to other plants, animal signs (chewed leaves, scratched bark, etc.), and nonliving things around it. Ask students what this outdoor web of life tells them about ecosystems.



SAFETY CHECK! Be careful not to harm any plants or animals. Pick up the string when you’re done.





6 Now have students slide back, making a larger circle, until the string is taut. Tell students to keep still. But if they feel a tug, they should tug in response. When everyone is still, tell the student holding the original end of the string to gently begin tugging. Keep reminding everyone that if they feel a tug, they should tug in response. Vibrations will spread through the food web until everyone is tugging and the whole web is shaking.

7 Ask students how the tugging demonstration might illustrate what happens when one of the links in an ecosystem is damaged by natural or human-made stress. (The rest of the ecosystem feels the effects.)

8 Ask students to pick one organism and have it drop out of the web. Ask if any other organisms should drop out because they depended on that organism. After one or more have dropped out, ask the students again to identify an organism to drop out, and repeat the procedure.

9  **STUDENT VOICE** Continue modeling for a few more rounds, then ask the following questions:

- What happens when we remove a link in the forest ecosystem? (Organisms that depend on it are affected. The web itself changes shape.)
- Can another species take the role of one that was dropped? (Sometimes, when a species is removed from an ecosystem, another species may fill that role. For example, if a prey animal disappears, predators might be able to switch to a different type of prey.)
- Were the changes more dramatic when the system was composed of many parts or when it had fewer parts? (They're usually more dramatic when there are fewer parts.)
- What can we say about the relationship between the number of parts in a system and its stability? (In general, the more complex or diverse a system is, the more stable it is.)
- How might humans be connected to this web? (Students may have different ideas, depending on the ecosystem. They might suggest that people are connected to forests through forest products or recreation, or by the fact that forests filter water and air.)



ACADEMIC STANDARDS

SCIENCE

Practices

- Obtaining, evaluating, and communicating information
- Developing and using models

Concepts

- Interdependent relationships in ecosystems
- Systems and system models

ENGLISH LANGUAGE ARTS

Practices

- Writing: research to build and present knowledge

Concepts

- Reading informational text: key ideas and details

ASSESSMENT

Ask students to

- Illustrate the web of life modeled in the activity, using concept mapping or a graphics software program.
- Select a local bird, fish, reptile, amphibian, or mammal, and write about the organisms it depends on and organisms that depend on it.
- Create a web of life illustration showing the impact of one species on other organisms. You might provide students with information or a link to an article about a non-native invasive species (plant or animal) that is causing a negative impact on the local environment.

ENRICHMENT

- Help students create a forest mural showing the “web of life.” Have them draw hills, valleys, streams, and other features on sheets of cardboard or poster paper and then add photos or drawings of the organisms they studied in the activity. Place a push pin next to each plant or animal. Then use yarn to connect organisms to other animals and plants with which the organisms directly interact.
- Make food web mobiles. Have each student select a plant or animal that is part of the forest ecosystem or another ecosystem. Students should research their organism’s place in the food web, cut out shapes representing this organism and others in its food web from construction paper, and decorate them with colored markers. Using a clothes hanger and thread to hang cutouts in the proper arrangement, students can construct mobiles that represents their food webs.

NAME _____ DATE _____

ORGANISM: _____

Research to find the following information about your organism.

1. Where in the forest does it live?
2. What does it eat?
3. What eats it?
4. What other organisms live in the forest with it?
5. In what ways does it depend on other organisms?
6. How does it influence its environment?



CAREER CORNER

WILDLIFE BIOLOGISTS (buy-ALL-uh-jists) study wildlife and their habitats to understand what these animals need to thrive. They look at the relationships of birds, mammals, fish, reptiles, or amphibians to the forest and to each other.



I LOVE MY
GREEN JOB!