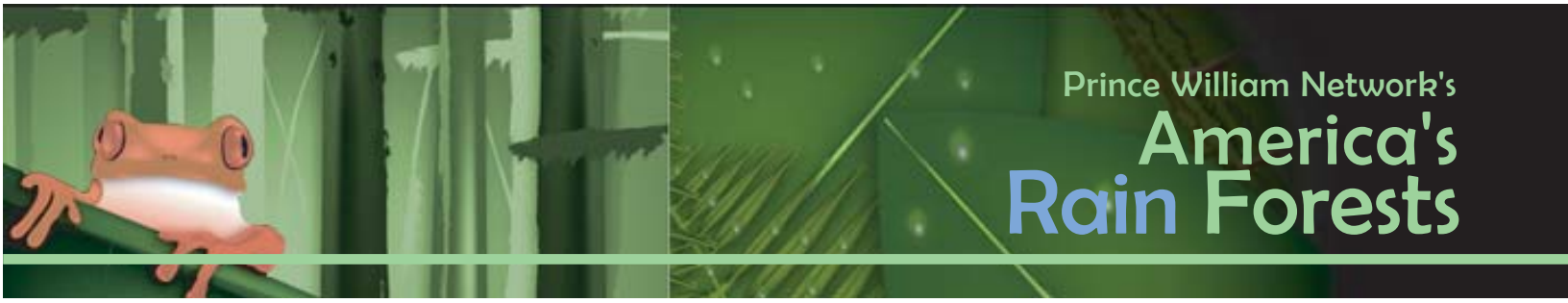


Web of Life

Rain Forest Ecology

National Science Education Standards

- Standard C: *Life Sciences* — Populations and ecosystems.
- Standard C: *Life Sciences* — Diversity and adaptation of organisms.
- Standard F: *Science in Personal and Social Perspectives* — Populations, resources, and environments.

OVERVIEW

In this activity, students will take a close look at one particular ecosystem (a forest) and will discover the ways that plants and animals are connected to each other. By substituting the appropriate information, you can also use this activity to study other ecosystems, such as oceans, deserts, marshes, prairies.

OBJECTIVES

Students will:

1. Collect information about various organisms in an ecosystem.
2. Create a mural that depicts the interdependence of various organisms with other components of the ecosystem.
3. Create a simulated food web of life using a ball of string.

SUBJECTS

Science, Language Arts, Visual Arts

VOCABULARY

Dominant, photosynthesis, food chain

TIME

Two, 50-minute periods

MATERIALS

Enough large sheets of cardboard from boxes (or heavy paper) to construct a mural 4' x 8' (1.2 m x 2.4 m), tape, glue, pins, a ball of string or yarn, resource materials about forest plants and animals, folders (optional)

BACKGROUND

A forest is a living community dominated by trees. Each plant in the forest, from tiny mosses to giant trees, has its own specific needs for things like sunlight and moisture. Because environments vary tremendously, a specific location will be better for certain plant species than for others, and those species will grow more abundantly as a result. The most ***dominant*** tree species in a forest usually determines the forest's appearance and suitability as a habitat for plants and animals. For example, in some forests, large, dominant trees may reduce sunlight and monopolize soil moisture and nutrients, thus limiting the types of plants that can grow beneath them.

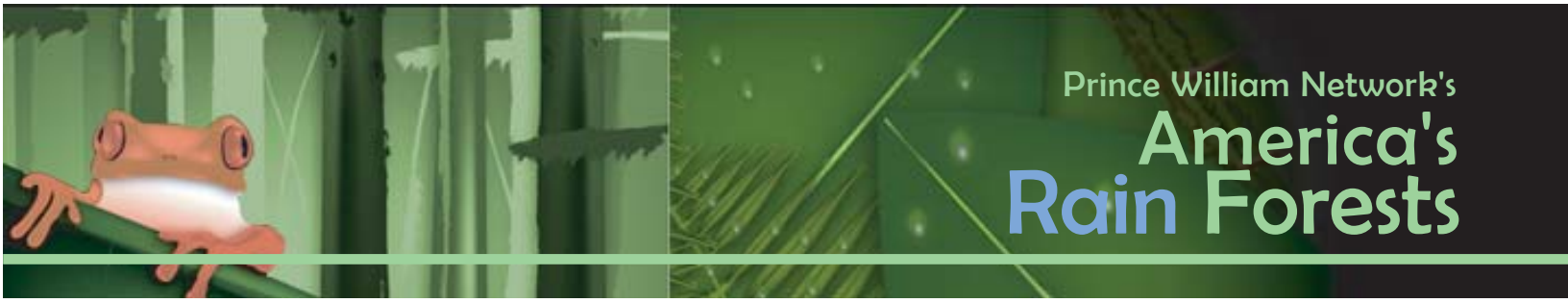
While trees and plants are usually its most conspicuous elements, the forest ecosystem also depends on animals. Animals are vital to most plants because they help pollinate flowers and disperse seeds. At the same time, animals such as deer, rabbits, and insects may eat certain plants, greatly reducing their presence. Some insects can substantially damage a forest ecosystem if their numbers get too high. Insect-eating birds play an important role in keeping insect populations in check.

Another way that forest plants and animals are connected is through a web of eating relationships. One primary function of a forest, like any other ecosystem, is to produce and distribute energy. All life depends on the ability of green plants to use sunlight to synthesize simple sugars from carbon dioxide and water. Through this process, called ***photosynthesis***, plants take energy from sunlight and make it available to animals. Plant eaters, or herbivores, eat the plants directly; animal or flesh eaters, carnivores, in turn eat both herbivores or other carnivores, thus forming a ***food chain***. A food chain is a simplified way of showing energy relationships between plants and animals in an ecosystem.

For example, a food chain of sun-»sunflower seed-»mouse-»owl shows that a seed is eaten by a mouse, that in turn is eaten by an owl. However, rarely does an animal eat only one type of food. A food web describes the interconnection of the food chains in an ecosystem and gives a clearer picture of how plants and animals in an ecosystem are related to each other. In this activity, students will create a "web of life" to depict the relationships among members of a forest ecosystem. This web includes eating relationships (as in a food web), but also shows the various other kinds of relationships found in a forest (shelter, reproduction). The web of life suggests that all living things are connected to all others. No matter how unrelated organisms may seem, they are, in fact, connected.

BEFORE THE ACTIVITY

(Optional) For each team, begin a folder of information on a specific forest animal or plant. Folders might include pictures you cut from magazines or calendars, and articles or other information you glean from nature journals or other sources. If possible, select a variety of plants and ani- mals so folders include at least two of each type: mammal, arthropod (insect or spider), bird, reptile, amphibian, trees, and other plants (see Step 2 of the activity for specific suggestions). Students will also need access to resource materials about forest plants and animals.



ACTIVITY

1. Ask students to work in pairs or teams to brainstorm all the components they think they would need to make a healthy forest. Invite them to share their ideas with the rest of the class.

2. Afterward, make a class list of animals that live in the forest. Some examples are bark beetle, bat, beaver, bear, box turtle, butterfly, chipmunk, deer, earthworm, field mouse, red fox, tree frog

3. Make a class list of plants that live in the forest. Some examples might be azalea, clover, columbine, cottonwood, honeysuckle, lichen, maple tree, Douglas fir, paintbrush, pine tree, poison ivy, shelf fungus, or violet.

4. Divide class into teams of two to four students. (You can use the same teams as before.) Have each team select a forest organism to study. (Or choose one of the folders prepared earlier.) Make sure the groups select a variety of plants and animals. For instance, try to have at least two groups that study each of the following kinds of organisms: mammal, insect, bird, reptile, trees, and other plants.

5. Instruct groups to collect as much information as possible about their chosen organism. Animal groups should answer these questions:

- Where does the animal live? (on the ground, in trees, at the edge of the forest, in the forest)
- What does it need to survive?
- What shelter does it require? Where does it perch, hibernate, breed, and sleep?
- Does it migrate? If so, when and where?
- Where and how does it get its water?
- What animals does it prey on? How much does it eat?
- What animals prey on it?
- With what animals does it live? What plants?
- How does the animal influence its environment?

Plant groups should answer these questions;

- Where does the plant live?
- What does it need to survive?
- How does it reproduce? Does it have seeds? If so, how are they dispersed?
- How much sunlight and water does it require?
- Does it live near other plants? If so, what kinds?
- What animals live with this plant?
- What animals eat this plant?
- How does this plant influence its environment?

6. Ask groups to find photographs or drawings of their plant or animal. (They can draw their own pictures or take their own photos.) If possible, pictures should show the organism in its natural habitat.

7. Ask the class to create a forest mural on large cardboard or paper sheets. Students can use pictures from magazines or their own drawings to show hills, valleys, streams, homes, plants, animals, and other features. The mural should show important elements like sun, water, soil, and atmosphere. The mural can show various forest areas: wet, urban, young, or mature. Each team can work on a separate panel and focus on a particular type of forest area.

8. When the mural is finished, each team should send a representative to place a picture of the organism (plant or animal) they studied into its appropriate habitat. The student should explain the team's reasons for placing each organism in a particular spot. When all organisms are in place, you might discuss the following questions:

- What did you discover about your plant or animal that surprised you the most?
- Why did you select the species you did? Have you ever seen the plant or animal you selected? Would you know where and when to look for it? Did you know before you studied it?
- Is it a threatened or endangered species? If so, for what reasons is it endangered? Is anything being done to help or harm it?

9. When all animals are in place, introduce-the web of life concept

10. Place a push pin next to each plant or animal. Then use yam to connect each animal to other animals and plants with which it directly or indirectly interacts (for example, "eats," "is eaten by," or "depends on for shelter"). Students can help by acting as experts on the species they researched.

11. Ask each team to make sure that its organism is appropriately attached to other components in the ecosystem depicted on the mural. The completed mural forms a web of life for this ecosystem.

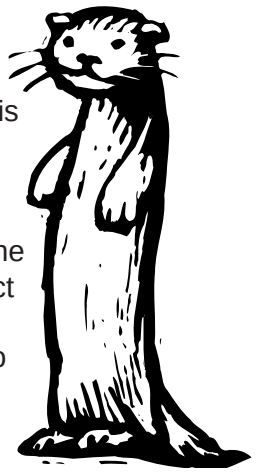
12. Discuss these questions:

- What would happen if one element of the ecosystem were missing? (You can demonstrate by removing a push pin.) What will happen to other organisms?
- What important elements are not included in our web?
- What are some webs of life within your school or community? (Students go to school -> teachers teach them -> cafeteria workers feed them -> parents pay taxes so teachers and cafeteria workers can buy food.)
- What are some global webs of life?

VARIATION -- All Tied Up!

1. After they research the organisms (in Step 5 above), have the teams each make a name tag for their forest plant or animal, including a picture. Ask one person from each group to sit on the floor in a circle. (If you have a small group, each student may research an organism, make a name tag, and sit in the circle.)

2. Starting with one "plant," ask that student to hold the end of a ball of string. Ask the team that studied the first plant to name another organism in the circle with which that plant interacts (for example, is eaten by or depends on). Pass the ball to this second student, who will wrap the string around one hand and pass the ball to the student representing an organism that the second team chooses to connect with. This process will continue until each "organism" is linked to the ecosystem, and the ball is returned to the first student.



3. Now, have students slide back 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. Through this mechanism, vibration will spread through the food web until everyone is tugging and the whole web is shaking.

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

5. Ask students to pick one organism in the system that seems less important than the others, and have it drop out. 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 that seems less important, and repeat the procedure. Continue playing 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.)
- Were the changes more dramatic when the system was composed of many parts or when it had fewer parts? (fewer)
- What can we say about the relationship between how many parts the system has (its complexity or diversity) and how stable it is? (In general, complexity makes it more stable.)

EXTENSION

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 and make a cutout of all the food web organisms from construction paper and colored markers. Using a clothes hanger and thread to hang cutouts in the proper arrangement, students can construct a mobile that represents their food web.

ASSESSMENT

Have teams of students demonstrate (by writing, drawing, or role playing) a web of life in which humans play a critical part.

CREDIT

This activity is adapted with permission from Project Learning Tree (PLT). PLT is a program of the American Forest Foundation. Go to *http://www.plt.org/* for more information about this award-winning environmental education curriculum.