# Forest Food Webs

## LESSON

**GRADE LEVEL** 4-7

**CATEGORY** Earth, Ecosystems and Ecology

**TOPIC** Ecosystem energy flow in food webs and food chains

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**TIME**
30 -60 minutes

**MATERIALS**
- Forest Stories
- Ball of string, Food web identification cards (made by students)

**SETTING**
Indoors or outdoors

**GROUP SIZE**
Any size

**SKILLS**
Classifying, inferring, interpreting, hypothesizing, organizing, reading, writing

**SUBJECT AREAS**
Science, Language Arts

**KEYWORDS**
Abiotic, biotic, carnivore, consumer, detrivore, herbivore, food web, food chain, omnivore, producer

HCTF Education

## Overview

Students use forest stores from their ecoprovince to examine and define the elements of food chains and food webs including abiotic and biotic interactions. Students as 'food chain roles' participate in an string webbing activity that demonstrates how roles are inter-connected and the resilience of food webs to adapt to stresses.

## Objectives

The students will be able to:

- classify forest components into different ecological food web roles; and
- construct and describe food webs, including non-living aspects of a forest ecosystem

## Background

The living organisms of the world can be divided into two categories — producers and consumers — depending upon the way they nurture themselves. Producers (or autotrophs) produce their own food from inorganic compound s and a source of energy. The most common and most familiar autotrophs are green plants, which manufacture their food with energy from the sun and compound s from soil. Consumers (or heterotrophs) nourish themselves by feeding on other organisms or organic matter. There are four kinds of consumers:

- herbivores eat plants,
- carnivores eat animals,
- omnivores consume both plant and animal matter; or
- detrivores feed on dead plant and animal matter.

One kind of detrivore, the decomposer, breaks down dead organic matter into inorganic compound s that can be used again as food by plants. Familiar examples of decomposers are bacteria and fungi.

The pathway of energy and minerals from the non-living environment through producers and consumers (herbivores– carnivores – omnivores – detrivores), and eventually back to the non-living environment is called a food chain. There are many different food chains in a forest. Almost every organism eats more than one kind of food, so each is part of several different food chains. The first type of food chain begins with green plants and extends to herbivores, carnivores, and omnivores. The second type begins with a base of dead organic matter — the remains of dead plants and animals— and proceeds to a variety of other organisms including scavengers, insects, and microorganisms. All the

food chains together form a food web. All the living things in a forest are connected through the food web. A food web is a model of who eats what or, in more scientific terms, a model of the flows of energy and chemical elements through organisms in an ecosystem.

## Procedure

1. Explain that all living things need energy and minerals to live and grow. Some living things get these from the non-living environment; they are called producers. Other living things get energy from eating foods; they are called consumers. Discuss which category humans belong to.
2. Pass out one Forest Story to each student. Ask each student to identify the ecological components that are producers (mainly plants) and the kinds of things that are consumers (animals, fungi, some invertebrates, and microscopic organisms e.g. bacteria). Consumers can be further divided into herbivores, carnivores, omnivores and decomposers. Students should also list as many "non-living" components found in their Forest Story as they can.
3. Use the list produced to assign individual roles to students. Select either the types of food web roles (e.g. producer, carnivore, herbivore, etc) or specific names for each role (eg tree, grasses, huckleberries, bear, squirrels, mice, mushrooms, woodpeckers, owl, beetles) in the activity depending on learning objective. Student research and make identification cards for use in the food web activity. The card have a picture or drawing of the role and the name. Optional: on back of card list the role in food chain, what it eats, who eats it, what abiotic element it needs).
4. For a class of 30, make about 10 producers, 5 herbivores, 3 omnivores, 4 carnivores , 4 detritivores (fungus, slugs, beetles), 1 sun (energy source), 3 abiotic (water, minerals, dead animals and plants)
5. Arrange students wearing their identification cards in a circle. Note the major food web roles represented. Start the activity with the sun card and have student mention the role of energy source in ecosystems. Give the ball of string to the sun, the sun should hold onto the string end with one hand and toss the ball to another part of the food web they are connected to by calling out a specific producer name (to ready them) and state how they are connected to that role. (e.g. sun gives energy to a 'plant' so it can grow). The plant that catches the ball of string, holds onto it with one hand while identifying someone they are connected to in the food web just like the sun. The game continues until everyone is connected and holding onto the string. Bring the string back to the sun to complete the food web.
6. Without dropping the string have the students hold the food web snug, but not tight with one hand. Note the interconnectedness demonstrated by the webbing. Have students think of a stressor for ecosystems, e.g. not enough water, or a fire. Demonstrate this stress by having that stressor (if applicable) tap the string. If anyone feels the string tapping should also tap the string with their 'free' hand. Once the whole web is tapping mention that this demonstrates a stress on the ecosystem that will calm down when conditions improve. (Cue to stop tapping the string). Ask the students to return the web to normal snug position by stopping the tapping without letting go of the string.
7. Now demonstrate the loss of a food web component by asking for a condition that would eliminate one of the roles, e.g. toxins in the environment kill off all the (students choice). If the students say the particular role dies (like bear), mention that in this web activity the roles the students are playing represent the entire population of that role. And in that case, unless that bear was the last bear alive, another bear would take its place. Ask the students to brainstorm a condition that would result in the removal of the entire population of that role (e.g. hunting to extinction). Have that 'role' or the 'bear' drop their string, the remaining food web should take a small step back up to take up the slack demonstrating the capacity to handle the removal of one kind of role by the other representatives.
8. Next remove an entire role (all the producers, or all the omnivores) but because there is no other to fill the role, the ecosystem cannot adapt and therefore if another role feels the slack on the web it should also drop the string, Continue until the entire string is on the floor, this is an entire food web collapse.
9. Discuss where or under what circumstances have there may have been an entire ecosystem food web collapse, and why doesn't that happen as often as we might predict using this activity.

## Assessment

1. Students list four non-living parts of an ecosystem.
2. Students describe the ecological role of producers and the various types of consumers: herbivores, carnivores, omnivores and decomposers.
3. Students create a food chain of at least four living things.
4. Draw a food web. Research other ecosystems (e.g. aquatic or desert) and compare components in the food webs of that ecosystem to a forest ecosystem.
5. Explain any of the concepts learned while 'playing' the food web activity. E.g. Nature and ecosystems have resilience and great diversity, ecosystems and the components of them are capable of moving, growing and shrinking, importance of energy, each component of an ecosystem has a role or niche, etc.

## Extensions

Create forest community dioramas.

## References

1991 Ontario Ministry of Natural Resources. Adapted with permission from Ontario's Focus on Forests "Forest Food Webs."

1996 Northwest Territories Department of Renewable Resources. Adapted with permission from NWT's Focus on Forests "Forest Food Webs."