

WEB OF LIFE

BENCHMARKS and TASKS

SC.B.1.2.1 The student knows how to trace the flow of energy in a system (e.g., as in an ecosystem).

SC.B.2.2.1 The student knows that some source of energy is needed for organisms to stay alive and grow.

SC.F.1.2.2 The student knows how all animals depend on plants.

SC.G.1.2.1 The student knows ways that plants, animals, and protists interact.

SC.G.1.2.5 The student knows that animals eat plants or other animals to acquire the energy they need for survival.

SC.G.2.2.3 The student understands that changes in the habitat of an organism may be beneficial or harmful.

- The student recognizes that some source of energy is needed for all organisms to stay alive and grow.
- The student identifies the major source of energy of ecosystems as sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy passes from organism to organism in food webs.
- The student categorizes populations of organisms by the function they serve in an ecosystem; plants and some microorganisms as *producers* that make their own food; animals, including humans, as *consumers*, which obtain food by eating other organisms; and *decomposers*, primarily bacteria and fungi, recyclers that break down dead plant and animal materials into elements that return to the soil, water, and air for use again.
- The student examines patterns of interdependency in ecological systems by analyzing relationships in food webs among producers, consumers, and decomposers and discovers that no matter how distant the relationship may seem, all things are connected.
- The student classifies changes in an ecosystem as either beneficial or harmful to specified organisms.

KEY QUESTION

How does energy flow through a food chain or web?

BACKGROUND INFORMATION

Every living thing, whether plant or animal, must have food **energy** to live. Plants manufacture their own food from sunlight, air (carbon dioxide) and water through a process called **photosynthesis**. Green plants are called **producers**. Since animals are not able to produce their own food energy, they must obtain it in some other way – by eating other **organisms**, plants and/or other animals. Such animals are called **consumers**. Animals that eat green plants for food are called primary consumers. **Decomposers** are always the final link in a **food chain**. **Protists**, such as fungi, slime molds, and bacteria, are decomposers, organisms that feed on the remains or wastes of other organisms and return the remains to the soil. A food chain is an arrangement of organisms in which each organism feeds on the one below it in the chain. **Food webs** are interconnected food chains.

An **energy pyramid** shows the differences in the numbers of different forms of life at the various levels of a food chain. The base of a food pyramid is the largest and is made up of green plants. The next level of the pyramid is made up of primary consumers (plant eaters). The next level consists of secondary consumers (meat eaters). Creatures at the top of the pyramid are the fewest in number. An energy pyramid also shows energy loss. As energy moves from the **sun** to plants and on to animals, the consumer gains only 10% of the energy of the food it eats.

MATERIALS

Per group

one 10 x 10 grid (size optional)
1 large piece of paper for food web

Teacher

This Is the Sea That Feeds Us, Robert F. Baldwin,
Dawn Publications

Per class

information sources: Internet, reference books

ENGAGE

1. Write *grass* \Longrightarrow *mouse* \Longrightarrow *owl* on the board. Ask: *What do we call this kind of sequence in nature?* (a food chain)
2. Write the words *cricket* and *chameleon* on the board. Ask: *How could we connect these two animals to this food chain?* (Draw an arrow from the grass to the cricket and an arrow from the cricket to the chameleon.)
3. Ask: *How is this diagram different from a food chain?* (It is a food web. Food webs are interconnected food chains showing a more complex arrangement.)
4. Ask students if they see any other connections that can be made. (e.g., Owls eat chameleons; mice eat crickets.)
5. Ask students how the grass gets its energy. Explain that the grass uses energy from the sun to make its own food, so the sun should also be added to the food web.

EXPLORE

1. Write these words on the board: *owl, mouse, flower, seeds, fruit, fox, robin, earthworm, chameleon, butterfly, cricket, leaves, and sun.*
2. Have students write the words randomly on a large sheet of paper. Students may work individually or in groups.
3. Challenge students to research to find any possible connections and to draw arrows showing all the possible connections between the plants and animals.

EXPLAIN

1. Have individual students or groups share the food webs they created.
2. Discuss:
Are all of the food webs the same? Why do you think so? (The food webs may look different depending on the connections students observed.)
What is the main source of energy for every food web? (the sun)
How can you identify the producers in the food webs? (Producers are green plants.)
How can you identify the consumers in the food webs? (Consumers eat other organisms.)

Do most animals eat one kind of food or a variety? Why do you think so? (Most animals eat a variety of organisms, because if animals depended on only one kind of food, they might starve to death.)

What will eventually happen to those organisms at the top of the food chains? (They will die and eventually decompose. Protists, such as bacteria and fungi, are decomposers that chemically break down the organic matter into nutrients such as nitrogen, phosphorus, and potassium. The nutrients are then made available to the plants growing in the soil.)

EXTEND/APPLY

1. Help students understand that an energy pyramid shows how the number of organisms decreases as well as the amount of available energy.
 - Explain that an energy pyramid shows the differences in the numbers of different forms of life at the different levels of a food chain. The base of a food pyramid is the largest and is made up of green plants. The next level of the pyramid is made up of primary consumers (plant eaters). The next level up consists of secondary consumers (meat eaters). Creatures at the top of the pyramid, such as owls, are the fewest in number.
 - An energy pyramid also shows how the amount of available energy decreases. Explain to students that when a plant uses the energy in sunlight to make its own food, most of that energy is used for the plant's life processes. Only about 10% of the energy that a plant receives from sunlight is stored in the plant. When the mouse eats the plant, it uses most of the food energy it takes in for its own life processes and stores only about 10% of the food energy in its own body. When an owl eats the mouse, the owl gets only about 10% of the food energy the mouse got.
 - Divide the class into teams of three. Give one student on each team a sheet of graph paper. Have the student cut out a 10 x 10 grid of squares. The student with the 10 x 10 grid represents the plant. That student should cut off 10% (a row of 10 squares) and give it to the second student, the mouse. The mouse should cut off 10% (one square) and give it to the third student, representing the owl. Students can see that only a small portion of the original food energy stored in the plant reaches the top consumer.
2. Have students find out more about poisons in food chains. Poisons are not used for life processes, so nearly all of the poison that an animal consumes is passed on to the next-level consumer. Poisons work their way up a food chain and harm or kill animals that were not meant to be poisoned.
3. Share the book, *This Is the Sea That Feeds Us*, by Robert F. Baldwin.