

SECTION 2 Living Things Need Energy

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- How do producers, consumers, and decomposers get energy?
- What is a food web?

National Science Education Standards

LS 4a, 4b, 4c, 4d

How Do Organisms Get Energy?

Eating gives organisms two things they cannot live without—energy and nutrients. Prairie dogs, for example, eat grasses and seeds to get their energy and nutrients. Like all organisms, prairie dogs need energy to live.

Organisms in any community can be separated into three groups based on how they get energy: producers, consumers, and decomposers.

PRODUCERS

Producers are organisms that use the energy from sunlight to make their own food. This process is called *photosynthesis*. Most producers are green plants, such as grasses on the prairie and trees in a forest. Some bacteria and algae also photosynthesize to make food. ✓



CONSUMERS

Consumers cannot make their own food. They need to eat other organisms to obtain energy and nutrients. Consumers can be put into four groups based on how they get energy: herbivores, carnivores, omnivores, and scavengers.

STUDY TIP

Circle Choose different colored pencils for producers, primary consumers, secondary consumers, and decomposers. As you read, circle these terms in the text with the colors you chose. Use the same colors to circle animals in any figures that are examples of each group.

READING CHECK

1. Explain Why is sunlight important to producers?

SECTION 2 Living Things Need Energy *continued*

Critical Thinking

2. Apply Concepts What types of consumers are the following organisms?

tigers _____

deer _____

humans _____

Herbivore



Carnivore



Omnivore



Scavenger



STANDARDS CHECK

LS 4b Populations of organisms can be categorized by the functions they serve in an ecosystem. Plants and some microorganisms are producers—they make their own food. All animals, including humans, are consumers, which obtain their food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationship among producers, consumers, and decomposers in an ecosystem.

3. Define What is the role of decomposers in an ecosystem?

An **herbivore** is a consumer that eats only plants.

Prairie dogs and bison are herbivores. A **carnivore** is a consumer that eats other animals. Eagles and cougars are carnivores. An **omnivore** is a consumer that eats both plants and animals. Bears and raccoons are omnivores.

A *scavenger* is a consumer that eats dead plants and animals. Turkey vultures are scavengers. They will eat animals and plants that have been dead for days. They will also eat what is left over after a carnivore has had a meal.

DECOMPOSERS

Decomposers recycle nature’s resources. They get energy by breaking down dead organisms into simple materials. These materials, such as carbon dioxide and water, can then be used by other organisms. Many bacteria and fungi are decomposers.

What Is a Food Chain?

When an organism eats, it gets energy from its food. If that organism is then eaten, the energy stored in its body is passed to the organism eating it. A **food chain** is the path energy takes from one organism to another. Producers form the beginning of the food chain. Energy passes through the rest of the chain as one organism eats another.

SECTION 2 Living Things Need Energy *continued*

A Prairie Ecosystem Food Chain



TAKE A LOOK

4. Identify Label the food chain diagram with the following terms: energy, producer, primary consumer, secondary consumer, tertiary consumer, decomposer.

In a food chain:

- Producers are eaten by *primary consumers*.
- Primary consumers are eaten by *secondary consumers*.
- Secondary consumers are eaten by *tertiary consumers*.

In the food chain above, the grasses are the producers. The grasses are eaten by prairie dogs, which are the primary consumers. The prairie dogs are eaten by coyotes, which are the secondary consumers. When coyotes die, they are eaten by turkey vultures, which are the tertiary consumers. The tertiary consumer is usually the end of the food chain.

What Is a Food Web?

In most ecosystems, organisms eat more than one thing. Feeding relationships in an ecosystem are shown more completely by a food web. A **food web** is a system of many connected food chains in an ecosystem. Organisms in different food chains may feed upon one another. ✓

As in a food chain, in a food web, energy moves from one organism to the next in one direction. The energy in an organism that is eaten goes into the body of the organism that eats it.

READING CHECK

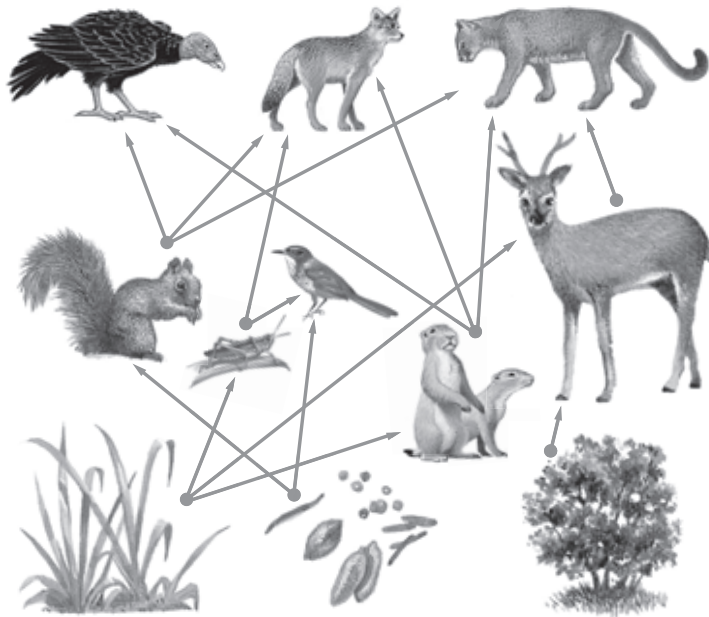
5. Explain Why does a food web show feeding relationships better than a food chain?

SECTION 2 Living Things Need Energy *continued*

Critical Thinking

6. Predict What do you think would happen if all of the plants were taken out of this food web?

Simple Food Web



MANY AT THE BASE

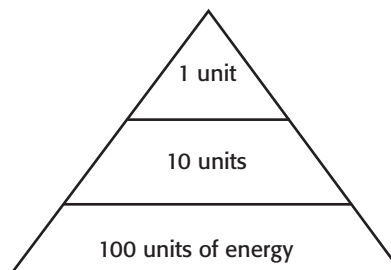
An organism uses much of the energy from its food for life processes such as growing or reproducing. When this organism is eaten, only a small amount of energy passes to the next consumer in the chain. Because of this, many more organisms have to be at the base, or bottom, of the food chain than at the top. For example, in a prairie community, there is more grass than prairie dogs. There are more prairie dogs than coyotes.

What Is an Energy Pyramid?

Energy is lost as it passes through a food chain. An **energy pyramid** is a diagram that shows this energy loss. Each level of the pyramid represents a link in the food chain. The bottom of the pyramid is larger than the top. There is less energy for use at the top of the pyramid than at the bottom. This is because most of the energy is used up at the lower levels. Only about 10% of the energy at each level of the energy pyramid passes on to the next level.

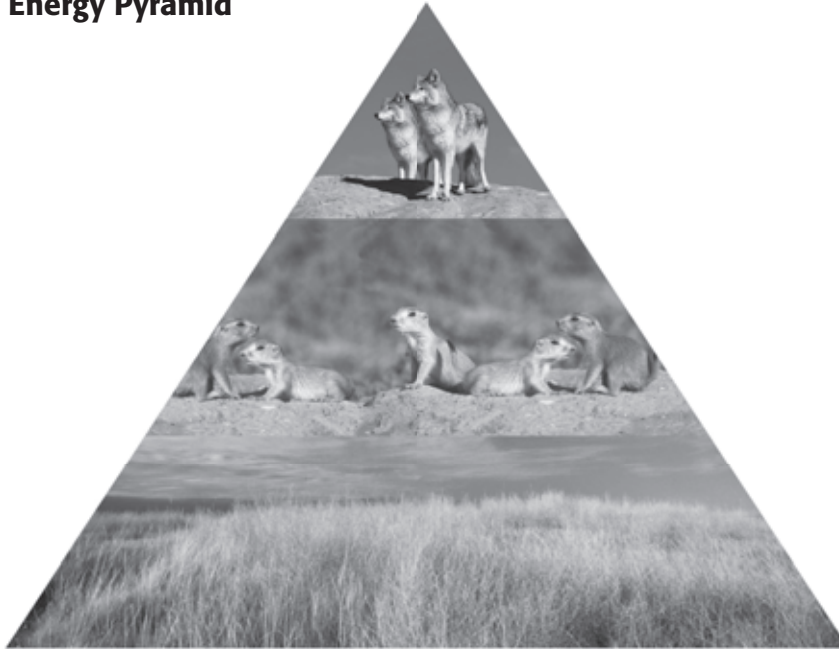
Math Focus

7. Calculate How much energy is lost at each level of the energy pyramid?



SECTION 2 Living Things Need Energy *continued*

Energy Pyramid



TAKE A LOOK

8. Explain In which level of this energy pyramid do you think deer would belong? Explain your answer.

EFFECT OF ONE SPECIES

A single species can change the flow of energy in an ecosystem. For example, gray wolves are at the top of their food chains. They eat a lot of different organisms but are usually not eaten by any other animal. By eating other organisms, wolves help control the size of those populations.

At one time, wolves were found across the United States. As settlers moved west, many wolves were killed. With few wolves left to feed on the primary consumers, such as elk, those populations began to grow. The elk ate all the grass, and there was none left for the smaller herbivores, such as hares. As these small herbivores died, there was less food for the secondary consumers. When wolves were removed from the food web, the whole ecosystem was affected. ✓



When wolves were removed from the ecosystem, other organisms were affected.

READING CHECK

9. Summarize Why did a change in the wolf population affect the other organisms in the community?

Section 2 Review

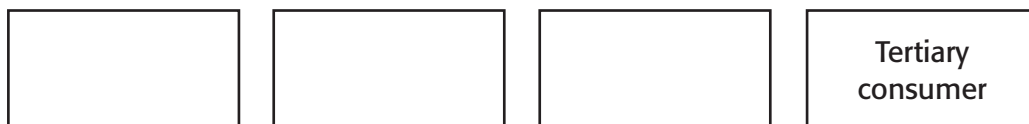
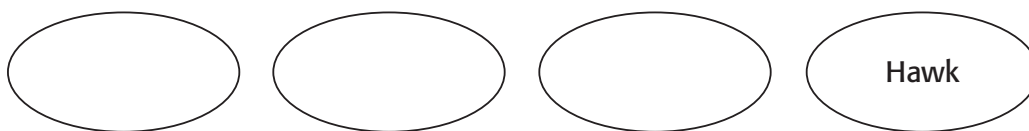
NSES LS 4a, 4b, 4c, 4d

SECTION VOCABULARY

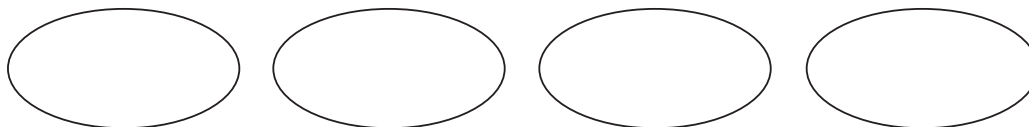
<p>carnivore an organism that eats animals</p> <p>energy pyramid a triangular diagram that shows an ecosystem's loss of energy, which results as energy passes through the ecosystem's food chain</p> <p>food chain the pathway of energy transfer through various stages as a result of the feeding patterns of a series of organisms</p>	<p>food web a diagram that shows the feeding relationships between organisms in an ecosystem</p> <p>herbivore an organism that eats only plants</p> <p>omnivore an organism that eats both plants and animals</p>
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1. Explain Why are producers important in an ecosystem?

2. Connect Make a food chain using the following organisms: mouse, snake, grass, hawk. Draw arrows showing how energy flows through the chain. Identify each organism as a producer, primary consumer, secondary consumer, or tertiary consumer.



3. Apply Concepts Organisms can be part of more than one food chain. Make a food chain that includes one of the organisms above.



4. Infer Do you think you could find a food chain that had 10 organisms? Explain.
