



Chapter 23 Study Guide, Ecosystems and Biomes, pages 716-727
Section 01, Energy flow in ecosystems

SOL LS.7 The student will investigate and understand that organisms within an ecosystem are dependent on one another and on nonliving components of the environment. Key concepts include interactions resulting in a flow of energy and matter throughout the system complex relationships in terrestrial, freshwater, and marine ecosystems; and energy flow in food chains, food webs, and food pyramids.

SOL LS.8 The student will investigate and understand that interactions exist among members of a population. Key concepts include competition, cooperation, social hierarchy, territorial imperative; and influence of behavior on population interactions.

SOL LS.9 The student will investigate and understand interactions among populations in a biological community. Key concepts include the relationship among producers, consumers, and decomposers in food chains and food webs; the relationship of predators and prey; competition and cooperation; symbiotic relationships and niches; and the role of parasites and their hosts.

SOL LS.10 The student will investigate and understand how organisms adapt to biotic and abiotic factors in a biome. Key concepts include differences between ecosystems and biomes; characteristics of land, marine, and freshwater biomes; and adaptations that enable organisms to survive within a specific biome.

SOL LS.11 The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and change over time (daily, seasonal, and long term). Key concepts include phototropism, hibernation, and dormancy; factors that increase or decrease population size; and eutrophication, climate change, and catastrophic disturbances.

SOL LS.12 The student will investigate and understand the relationships between ecosystem dynamics and human activity. Key concepts include food production and harvest; change in habitat size, quality, and structure; change in species competition; population disturbances and factors that threaten and enhance species survival; and environmental issues (water supply, air quality, energy production, and waste management).

Objectives: After completing the lesson, students will be able to

- Name and describe the energy roles of organisms in an ecosystem
- Explain how energy moves through an ecosystem
- Describe how much energy is available at each level of an energy pyramid



The picture to the right shows a spider camouflaged in a flower and attacking a bee.

Key terms: producer, consumer, herbivore, carnivore, omnivore, scavenger, decomposer, food chain, food web, energy pyramid

Energy roles, page 717

As a student at Moody Middle School, you have a role, a niche in the school's ecosystem. Every organism in a natural ecosystem also has a niche, a role, a job to do. All parts of an ecosystem are necessary for the ecosystem to work.

An organism's energy role in an ecosystem is determined by how it gets energy and how it interacts with other living things in its ecosystem. An organism's energy role in an ecosystem may be that of a producer, consumer, or decomposer. This role is part of its niche, its job in the ecosystem.

Producers/Autotrophs – An organism that can make its own food is a producer (mostly plants, but also algae and some bacteria). Energy enters most ecosystems as sunlight. Some organisms are able to capture the energy of sunlight and store it as food energy in a process called photosynthesis. Organisms that carry out photosynthesis are known as autotrophs. Producers are the source of all the food in an ecosystem.

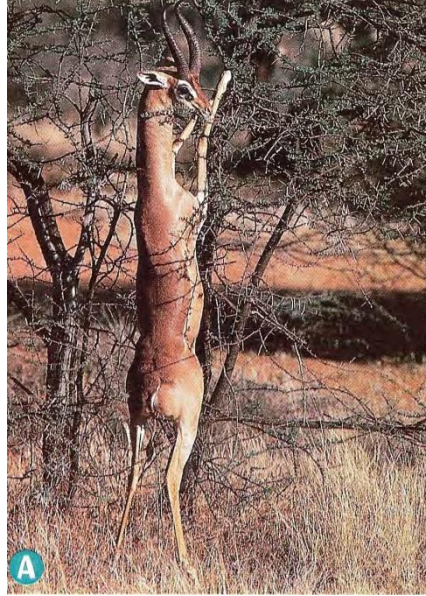
Consumers/Heterotrophs – Organisms that eat other living things and cannot make their own food are heterotrophs. Another name for heterotrophs is consumer (organisms that consume or eat food). They depend on producers for food and energy. They must consume, or eat food for energy.

Consumers are classified by what they eat. **Consumers that eat only plants are called herbivores.** Cows, horses, rabbits, and grasshoppers are all herbivores. **Consumers that eat only other animals are carnivores.** Lions, spiders, snakes, and birds of prey are all carnivores. **A consumer that eats both plants and animals is called an omnivore.** People, bears, raccoons, turtles are omnivores.

Some carnivores are scavengers. **A scavenger is a carnivore that feeds on the bodies of dead organisms.** Catfish and vultures are two types of scavengers.



Plants like this redwood tree convert the sun's energy to stored food energy through the process of photosynthesis.



A

- A) A *gerenuk* stands on its hind legs to reach leaves. Consumers that eat plants are herbivores.
- B) Carnivores like this collared lizard eat only animals, and
- C) A black vulture is a scavenger, a carnivore that feeds on the remains of dead organisms.



B



C

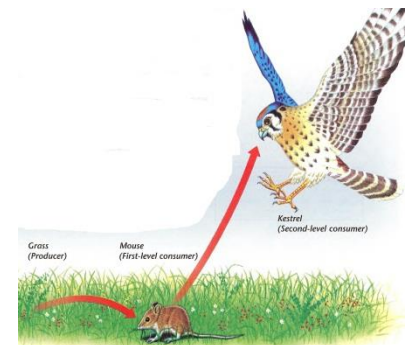
Decomposers – organisms such as bacteria and mold, which break down the tissues of dead organisms. You can think of decomposers as the cleanup crew of an ecosystem, nature's recyclers. Without decomposers to return nutrients and other products back into the soil and the environment, the earth would run low on resources and new organisms would not be able to grow. All organisms produce waste and eventually die. Without decomposers to remove wastes and break down the bodies of dead organisms, the dead organisms would pile up and eventually overwhelm the living things.



Food webs and food chains, page 719

Energy enters most ecosystems as sunlight and is converted (changed) into sugar and starch molecules by autotrophs. This energy is transferred to each organism that eats the autotroph (producer), and then to other organisms that feed on these heterotrophs (consumers). The movement of energy through an ecosystem can be shown in diagrams called food chains and food webs.

A food chain is a series of events in which one organism eats another and gets energy. **The first organism in a food chain is always a producer/autotroph.** The greatest amount of energy in organisms is always found in the producers. The second organism that eats the producer is a consumer, and it is called a first level consumer.

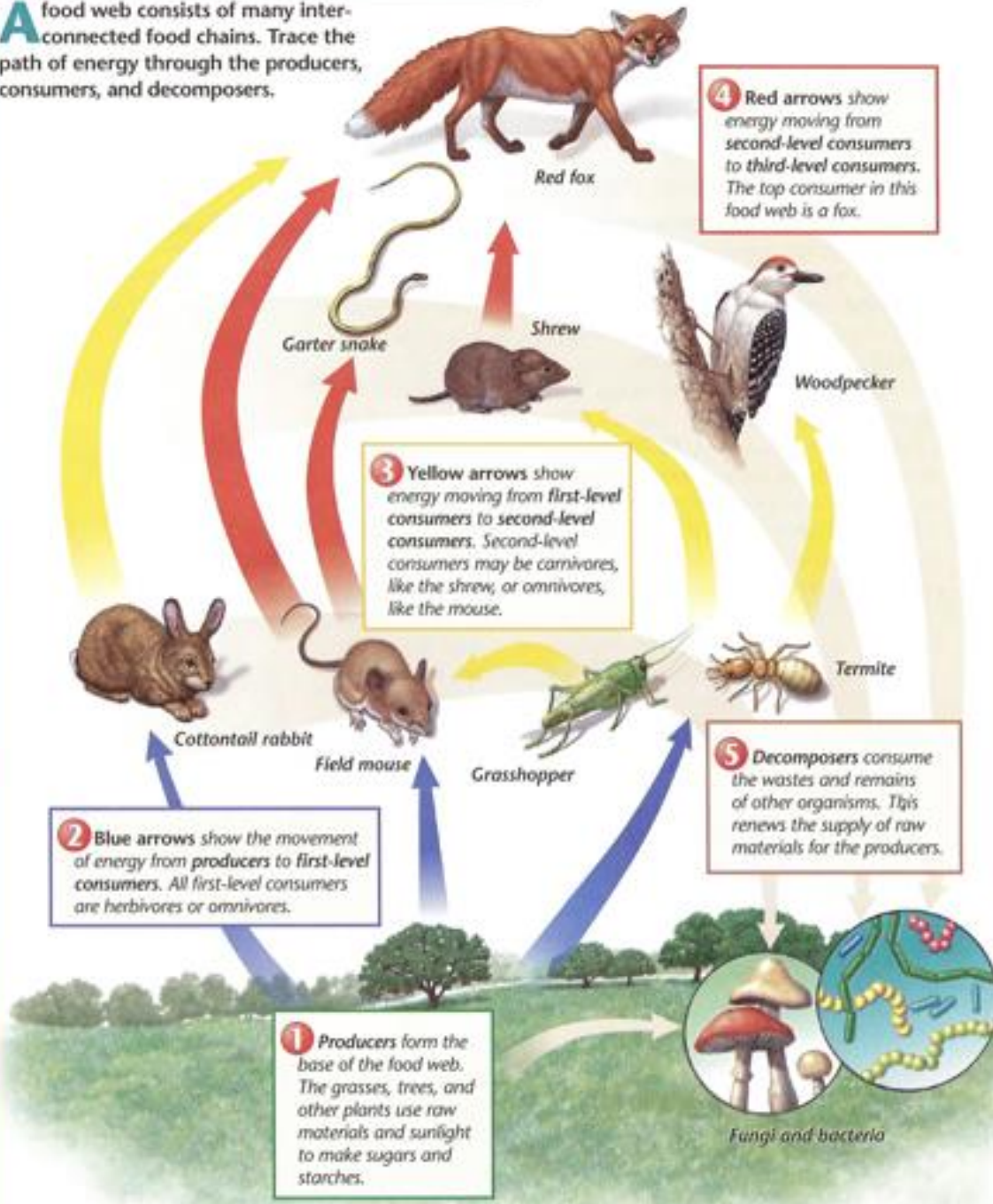


A food chain shows a possible path of food energy in an ecosystem. But just as you do not eat the same thing every day, neither do most consumers. Most producers and consumers are part of many food chains. A more realistic way to show the flow of energy through an ecosystem is a food web.



EXPLORING a Food Web

A food web consists of many inter-connected food chains. Trace the path of energy through the producers, consumers, and decomposers.



Food web – a diagram which shows many different and overlapping food chains in an ecosystem. Notice that an organism may play more than one role in an ecosystem. Consumers are classified by their position in an ecosystem. An omnivore, such as the mouse is a first level consumer when it eats grass. But when the mouse eats a grasshopper, it is a second level consumer.



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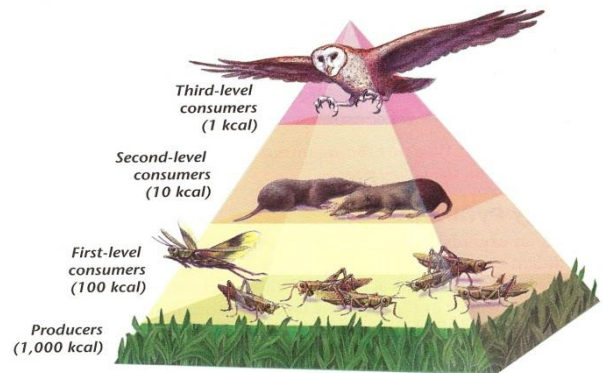
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First level consumers (primary level consumers) – consumers which eat only producers. They are primary consumers because they are the first link between the producers and the rest of the consumers in an ecosystem. Note that an organism may play more than one role in an ecosystem. For example, an omnivore, such as a mouse, is a first level consumer when it eats grass; but when the mouse eats a grasshopper, it is a second level consumer.

Second level consumers (secondary level consumers) – consumers that eat first level consumers. They may be carnivores, or omnivores.

Third level consumer (tertiary consumer) – consumers at the top of the food chain.

Energy pyramid – a diagram that shows how much energy is available at each level of the food chain. In almost all food chains, 90 percent of the energy is used in each level for the organism’s life processes, or lost as heat to the environment. Only 10 percent of the energy is transferred at every link. The greatest amount of energy is available at the producer level. At each level in the pyramid, there is less available energy than at the level below.



Organisms use energy to carry out their life activities. A lioness (the predator) uses energy to chase her zebra (the prey). The zebras use energy to run away from the lioness.



Section 1 Review (homework)

1) Name the three energy roles of organisms in an ecosystem. How does each type of organism obtain energy? Plants , Primary level consumers , secondary level consumers
2) How does the amount of available energy change from one level of an energy pyramid to the next level up? It grows in amount at you go up the energy primad
3) Name and define the four types of consumers. Lion Human Tiger and shark
4) What is the source of energy for most ecosystems? Grass or some plant

Name _____ Block _____

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5) Why are food webs a more realistic way of portraying ecosystems than food chains? Because it shows who eats who
6) How much energy is transferred to each level in an energy pyramid? 25% is lost
7) Where is the least amount of energy in an energy pyramid? At the top
8) Where is the greatest amount of energy in an energy pyramid? At the bottom
9) The organisms at the top of the energy pyramid are what type of organisms? The one that are really eaten
10) The organisms at the bottom of the energy pyramid are what type of organism? The hereborves

Write the definition of the words listed below.
Autotroph
Consumer
Decomposer
Energy pyramid
First level consumer/primary level consumer
Food chain
Food web
Herbivore
Heterotroph
Omnivore
Producer

