

Everything that organisms do in ecosystems—running, breathing, burrowing, growing—requires energy. The flow of energy is the most important factor that controls what kinds of organisms live in an ecosystem and how many organisms the ecosystem can support.

Most life on Earth depends on photosynthetic organisms, which capture some of the Sun's light energy and store it as chemical energy in organic molecules. These organic compounds are what we call food. The rate at which organic material is produced by photosynthetic organisms in an ecosystem is called primary productivity. Primary productivity determines the amount of energy available in an ecosystem. Most organisms in an ecosystem can be thought of as chemical machines driven by the energy captured in photosynthesis.

Organisms that first capture energy, the producers, include plants, some kinds of bacteria, and algae. Producers make energy-storing molecules. All other organisms in an ecosystem are consumers. Consumers are those organisms that consume plants or other organisms to obtain the energy necessary to build their molecules.

Ecologists study how energy moves through an ecosystem by assigning organisms in that ecosystem to a specific level, called a trophic level, in a graphic organizer based on the organism's source of energy. Energy moves from one trophic level to another. The path of energy through the trophic levels of an ecosystem is called a food chain. However, in most ecosystems, energy does not follow simple straight paths because individual animals often feed at several trophic levels. This creates a complicated, interconnected group of food chains called a food web.

The lowest trophic level of any ecosystem is occupied by the producers, such as plants, algae, and bacteria. Producers use the energy of the Sun to build energy-rich carbohydrates. Many producers also absorb nitrogen gas and other key substances from the environment and incorporate them into their biological molecules. At the second trophic level are herbivores, animals that eat plants or other primary producers. They are the primary consumers. Cows and horses are herbivores, as are caterpillars and some ducks. At the third trophic level are secondary consumers, animals that eat other animals. These animals are called carnivores. Tigers, wolves, and snakes are carnivores. Some animals, such as bears, are both herbivores and carnivores; they are called omnivores.

Many ecosystems contain a fourth trophic level composed of those carnivores that consume other carnivores. They are called tertiary consumers, or top carnivores. In every ecosystem there is a special class of consumers called detritivores, which include worms and fungal and bacterial decomposers. Detritivores are organisms that obtain their energy from the organic wastes and dead bodies that are produced at all trophic levels.

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Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

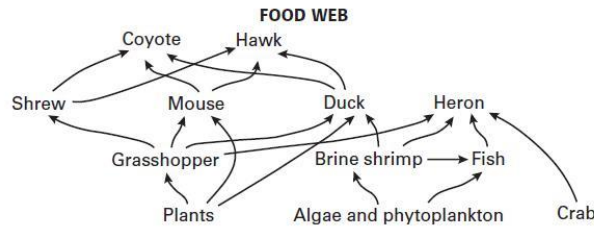
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1. **Create a vocabulary burrito** for the following terms: producers, consumers, decomposers, omnivores, herbivores, carnivores, detritivore, autotroph, heterotroph, trophic level, primary consumer, secondary consumer, tertiary consumer, primary productivity.

2. **Create your own marine food web.** You will be using the four trophic levels (producers, primary consumers, secondary consumers, and tertiary consumers). If you do not know any of the animals ask your teacher and/ or research the animal. **Make sure you show the flow of energy and matter with arrows!**

- Shrimp - Kelp - Dolphin - Tiger Shark -Dinoflagellates - Shore Crab - Diatoms -Snapper (fish)
- Algae -Sweep (fish) -Blenny (fish) -Yellow-eyed Mullet (fish) -Water flea -Octopus -Pilchard (fish) -Sea Urchin

4. The food web below represents the interactions between organisms in a salt marsh ecosystem and organisms in an old field ecosystem.

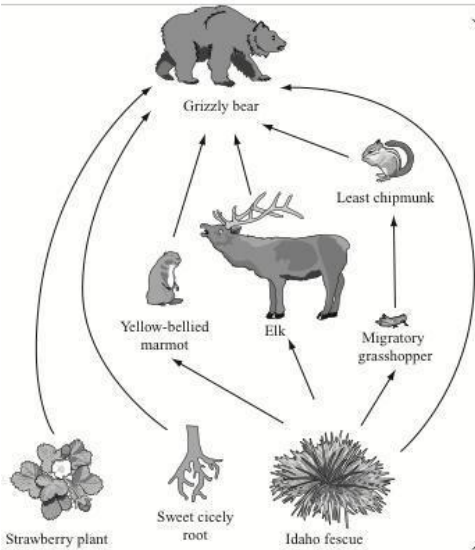


Which of the following is the correct flow of energy?

- F. The crab gets energy from eating plants.
- H. The crab gets energy from eating the heron.
- G. The heron gets energy from eating plants.
- I. The heron gets energy from eating the crab.

5. **Justify your response with an SRE.**

A partial food web for organisms in Yellowstone National Park is shown below.



Which organism, if removed, would impact the food web the most?

- A) Grizzly bear
- B) Elk
- C) Sweet cicely root
- D) Idaho fescue

Statement	
Reason	
Evidence	