

# Who Eats Whom?



## An Activity on Food Webs

### Lesson Summary:

In this lesson students learn about trophic levels on a life-sized food web. Students will gain information about predator/prey dynamics, energy flow, and producers/consumers.

**Grade:** 7-9

**Est. Time:** 20-30 min

### Objectives:

- 1) Learn the following terminology; trophic level, food chain, food web, producers, decomposers, and consumers.
- 2) Understand how energy is transferred from one trophic level to another.
- 3) Understand that all animals gain energy from plants either directly or indirectly.

### Key Terms:

**Autotroph (Producer):** is an organism that can produce complex organic compounds (i.e. food) from substances in the environment.

**Consumer (Heterotroph):** an organism that cannot synthesize its own food and therefore must feed on other organisms for food.

**Decomposers:** organisms that break down dead or decaying organisms.

**Food Chain:** a linear network of links (energy transfer) between organisms in a food web (demonstrates the succession of organisms).

**Food Web:** the interconnection between food chains in an ecological community.

**Heterotroph (Consumer):** an organism that cannot synthesize its own food and therefore must feed on other organisms for food.

**Photosynthesis:** the process by which autotrophic organisms convert light energy (typically from the sun) into chemical energy (i.e. carbohydrates, proteins).

**Producers (Autotrophs):** is an organism that can produce complex organic compounds (i.e. food) from substances in the environment.

**Trophic level:** the position an organism occupies in a food chain.

**Resources:**

<http://www.nature.com/scitable/knowledge/library/food-web-concept-and-applications-84077181>

<https://www.deltacollege.edu/emp/jdebow/energytransfer.html>

**Questions:**

- 1) What is a food web? What is the difference between a food web and food chain?
- 2) How does energy flow through a food web? What is the ten percent rule?
- 3) What is photosynthesis and which trophic level utilizes photosynthesis?

**Lesson Outline:****1) Introduction**

Hi everyone, welcome to the elk country visitor center. My name is \_\_\_\_\_ and I am the/a \_\_\_\_\_ here at the center. Today we are going to talk about energy transfer within food webs.

**2) Background Information**

Every organism needs to obtain energy to survive. The sun is the primary source of energy for Earth. Plants absorb this energy from the sun and convert it into chemical energy (food in the form of carbohydrates, proteins, or lipids). Organisms that can produce their own chemical energy are called producers. Animals then consume other organisms in order to obtain energy, these animals are called consumers. Consumers are organisms that cannot synthesize their own energy and therefore must feed on other organisms for survival. Example: Sun -> Grass -> Elk -> Wolves. In this example the grass is a producer, the elk a primary consumer, and the wolf a secondary consumer. What are decomposers? Decomposers are organisms that feed on dead or decaying material.

Food chains show this transfer of energy from one organism to another. This is a linear representation. As energy is transferred from one organism to another, it is important to note that not all the energy is absorbed. Some energy is lost in the form of heat. Therefore, there is a ten percent rule that states with each succession in a food chain only about 10% is consumed. For example: Sun-> Grass (100%)->Elk (10%)->Wolf (1%).

Food webs then show the interconnection between food chains in an ecological community. This means that food webs show multiple food chains and how the food chains interact with one another.

**3) Activity**

In order to better explain this process lets do an activity.

*Get the students into groups, have them each do a simple food chain to make sure they understand how they work. Have each group explain their food chain to the rest of the class.*

*After have the students try to put the YELLOWSTONE food web in order by different trophic levels. Apex predators at the top, work down to producers. Connect with yarn or arrows.*

*Then have students walk through the food web. Have all students start at the same spot, each represents a unit of energy. Remember to leave some energy units, because not all energy is transferred. This will allow the students to physically see how energy flow works in a food web. For example if you start with ten students at wheat grass, one will stay at wheat grass and the rest can distribute themselves evenly between pronghorn, elk, and bighorn sheep.*

#### **4) Follow Up Questions**

- 1) What is the importance of decomposers in an ecological community? Where do decomposers fall in a food chain/web?

*Decomposers are important for the long-term survival of any ecosystem because, without them, dead organisms and waste products would accumulate. Decomposers would fall under the consumer trophic level because they still feed on other organisms to survive.*

- 2) Take note to how the food web looks like a pyramid, why do you think this is? Could a food web be an inverted pyramid (ex. Lots of apex predators with small numbers of producers)? Why or why not?

*It is not likely to have an inverted pyramid of energy. Energy pyramids show that most energy dissipates into the environment when going from one trophic level to the next. Less energy reaches each successive trophic level from the level beneath it because organisms at the lower level use some energy to perform work, and some is lost. Therefore if the pyramid would be inverted, consumers at the top of the food chain wouldn't be able to obtain enough energy.*

- 3) How does energy flow through a food web consisting of producers, consumers, and decomposers?

*Energy enters an ecosystem from the sun. Producers convert this energy from the sun into complex chemical substances for food. In a food chain, there is a linear succession of animals upon which one depends on another. However, simple food chains rarely occur in nature because most organisms don't solely eat just one thing. Typically, in an ecosystem of average complexity, numerous pathways are possible. For example, a consumer may consume a producer or another consumer. That consumer may be consumed by decomposers or another consumer. And so on.*

- 4) The ten percent rule states that not all energy is transferred from one trophic level to the next. As a general rule of thumb only about 10% of the energy is passed on from one organism to the next. Assuming this is accurate, complete the calculation in the food chain below. How much energy would the elk receive, how much would the wolf receive?

Grass 500Kcal -> Elk \_\_\_\_\_ -> Wolf \_\_\_\_\_  
*Elk: 50 Kcal    Wolf: 5 kcal*

### **PA Education Standards**

**2.2.8.B.**-Add, subtract, multiply and divide different kinds and forms of rational numbers including integers, decimal fractions, percents, and proper and improper fractions.

**4.1.5.C.**- Describe different food webs including a food web containing humans.

**4.1.7.C.**- Explain the flow of energy within an ecosystem. Compare and contrast the flow of energy between organisms in different habitats. Explain the concept of trophic levels.

**3.1.6.A2.**- Describe how energy is derived from the sun is used by plants to produce sugars and is transferred within a food chain from producers to consumers to decomposers.