

# How a Food Web Is Formed

## Student Game

### Introduction

What are food chains and food webs? Are they related? Answer these questions by playing this engaging and informative card game.

### Concepts

- Food chain
- Food web
- Biomes
- Tropic relationships

### Background

There are many types of organisms in an ecosystem. Organisms such as plants and algae are *autotrophic*. Autotrophs, or "self-feeders" are able to produce their own food using the Sun's energy. Other animals known as *heterotrophs*, or "other feeders," cannot produce their own food. For example, deer which are heterotrophs, eat grasses which are autotrophs. Some heterotrophic animals, known as *predators*, eat other animals. Examples of predators are largemouth bass, sharks, and coyotes. The animals that are fed upon by predators are known as *prey*.

One way to study the relationships between organisms in an ecosystem is to look at their feeding habits. Trophic relationships deal with the types of food organisms eat and how organisms are dependent on one another. The word trophic is defined as "to eat" and is a root word found in both the terms autotrophic and heterotrophic. Autotrophs and heterotrophs are also respectively known as producers and consumers. See Figure 1.

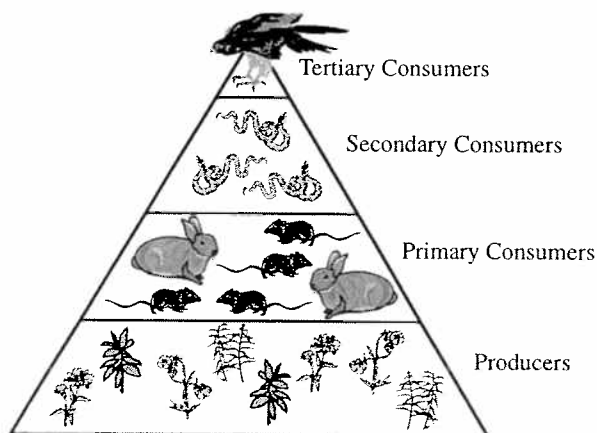


Figure 1.

Producers are autotrophic and at the bottom of the food chain. Consumers are heterotrophic and are generally classified into three other subgroups—herbivores, carnivores, and omnivores. *Herbivores* obtain energy by only eating plants. Examples of herbivores are cows, deer and rabbits. *Carnivores*, such as snakes and owls, only eat other animals. *Omnivores*, such as humans and bears, eat both plants and animals. All consumers are dependent upon producers in one way or another. Consumers may be further broken down into groups based on how far removed their food of choice is from the producers. *Primary consumers* feed directly upon producers, *secondary consumers* feed upon a primary consumers, *tertiary consumers* feed upon a secondary consumer, and so on.

Within specific ecosystems food chains are formed. A *food chain* is a direct relationship between a producer, primary consumer, secondary consumer and a tertiary consumer. In some instances, a quaternary consumer may be involved. Other organisms known as scavengers and decomposers are involved in food chains as well. *Scavengers* eat dead animal and/or plant material. They do not directly hunt or prey upon animals. Turkey vultures are classic scavengers. *Decomposers* are organisms that break down tissues of living or non-living organisms. Decomposers absorb nutrients from organisms they feed upon. Fungi and bacteria are good examples of this group.

In nature, not all feeding relationships between organisms are formed directly in a food chain. There are many individuals that may prey or be preyed upon by different types of organisms. A food web more accurately defines these types of relationships. *Food webs* are networks of complex interactions formed by the feeding relationships among the various organisms in an ecosystem.

The number and types of producers and consumers in an ecosystem depend on the region where the ecosystem exists. Earth is divided into several different areas known as *biomes*. Biomes are defined by the types of animals, flowers, and climate they contain. In general, there are five main biomes—aquatic, desert, forest, grassland, and tundra. Biomes are further divided into different habitats or areas where an organism naturally lives.

## Experiment Overview

In this activity, organisms from five different habitats—marine, desert, tropical rainforest, hardwood forest, and swamp—will be studied. Food chains and webs will be formed for each of these habitats.

## Materials

Marine habitat card set, blue	Rainforest Food Web Sheet
Desert habitat card set, yellow	Hardwood Forest Food Web Sheet
Rainforest habitat card set, green	Swamp Food Web Sheet
Hardwood forest habitat card set, red	Modeling clay, 1 stick
Swamp habitat card set, purple	Scissors
Marine Food Web Sheet	String, approximately 25 feet
Desert Food Web Sheet	

## Safety Precautions

*Wash hands thoroughly with soap and water before leaving the laboratory. Follow all normal classroom guidelines.*

## Procedure

1. Obtain one of the habitat card sets from the instructor. Each person should also obtain the appropriate Food Web Sheet from the instructor.
2. Pick one member of the group to be the dealer.
3. The dealer should shuffle the deck of habitat cards.
4. Deal five cards to each person in the group.
5. Place the remaining cards face down on the table top.
6. The person to the left of the dealer should draw a card from the top of the pile.
7. The card should be placed in the first person's hand.
8. The object of the game is to complete a food chain containing five organisms.
9. Use the appropriate Food Web Sheet to confirm whether or not a food chain of five organisms has been formed.
10. If a complete food chain of five organisms is not in the first person's hand, one of the first person's cards must be discarded face-down next to the original draw pile.

11. The next player to the left may either pick up a card from the draw pile or the discard pile.
12. Play continues clockwise until a food chain is formed.
13. If cards run out in the draw pile, reshuffle the discard pile and use that as the new draw pile.
14. When a player completes a food chain, it should be checked to make sure that it is complete and realistic.
15. Resume play until all members of the group create complete food chains.
16. When everyone in the group has a complete food chain, the first group member to complete their food chain should place their cards on the table top.
17. The first member should cut four 5" pieces of string.
18. Using clay, attach the pieces of string to the cards to form a food chain.
19. Steps 17 and 18 should then be repeated by the other members of the group.
20. Once the four food chains have been formed, determine what organisms from the different food chains may be linked together based on their trophic levels.
21. Use additional clay and pieces of string to attach these organisms and form a food web.
22. Answer the *Post-Lab Questions*.
23. If time allows, obtain a different habitat card set from another group and repeat steps 1–21.

## Disposal

All materials may be saved and reused.

## Post-Lab Questions *(Use a separate sheet of paper to answer the following questions.)*

1. What is a trophic level?
2. Are most habitats better described as a food chain or a food web? Why?
3. What roles do decomposers and scavengers play in a habitat? What would happen if these organisms were not present?
4. What would happen if a predator organism was removed from a certain habitat? Use specific examples from your group's constructed food web.
5. Can an organism be a secondary and tertiary consumer in the same ecosystem? Explain using examples from the game.
6. In general, are there more tertiary consumers or producers in a healthy habitat? Why?
7. Draw a food chain and a food web for organisms living in your area.

# Teacher's Notes

## How a Food Web Is Formed

**Materials Included in Kit** (for a class of 20 students working in groups of four or 40 students working in groups of eight)

Marine habitat card set, blue	Desert Food Web Sheet
Desert habitat card set, yellow	Rainforest Food Web Sheet
Rainforest habitat card set, green	Hardwood Forest Food Web Sheet
Hardwood forest habitat card set, red	Swamp Food Web Sheet
Swamp habitat card set, purple	Modeling clay, 5 sticks
Marine Food Web Sheet	String, 400 ft

**Additional Materials Needed** (for each lab group)

Scissors

### **Safety Precautions**

Remind students to wash their hands thoroughly with soap and water before leaving the laboratory. Follow all normal classroom guidelines.

### **Disposal**

All materials may be saved and reused.

### **Connecting to the National Standards**

This laboratory activity relates to the following National Science Education Standards (1996):

#### **Unifying Concepts and Processes: Grades K–12**

Systems, order, and organization  
Evidence, models, and explanation  
Form and function

#### **Content Standards: Grades 5–8**

Content Standard A: Science as Inquiry  
Content Standard C: Life Science, structure and function in living systems, reproduction and heredity, regulation and behavior, population and ecosystems, diversity and adaptations of organisms

#### **Content Standards: Grades 9–12**

Content Standard A: Science as Inquiry  
Content Standard C: Life Science, interdependence of organisms; matter, energy, and organization in living systems; behavior of organisms

### **Lab Hints**

- Enough materials are provided in this kit for 40 students working in groups of eight (four groups of partners) or 20 students working in groups of four. This laboratory activity can reasonably be completed in one 50-minute class period.
- Copies of the appropriate Food Web Sheets should be made for each student.
- One stick of clay should be given to each student “game.”
- Each “game” should receive one piece of string approximately 25 ft long.
- Additional games may be set up and played after the initial round and the *Post-Lab Questions* have been answered.

## Teacher's Notes *continued*

### Teaching Tips

- This is an excellent activity to have students perform during food chain and food web discussions.
- Discuss the different types of habitats within various biomes.
- Have students make their own organism cards and food web sheets for different types of habitats.

### Answers Post-Lab Questions *(Student answers will vary.)*

1. What is a trophic level?

*A trophic level is defined as a feeding level or position in a food chain or food web.*

2. Are most habitats better described as a food chain or a food web? Why?

*For most habitats, a food web is a better description of the interactions among organisms. Most organisms eat or are eaten by a variety of other organisms, forming more of a web-like food pattern.*

3. What roles do decomposers and scavengers play in a habitat? What would happen if these organisms were not present?

*Scavengers eat dead animal and/or plant material. Decomposers are organisms that break down tissues of living or non-living organisms. If scavengers and decomposers were not present, dead matter would accumulate at a fast rate in an ecosystem.*

4. What would happen if a predator organism was removed from a certain habitat? Use specific examples from your group's constructed food web.

*If a predator is removed from a habitat, lower consumers and producers may increase in numbers to a level that the habitat may not sustain. This may lead to a crash of specific lower consumers and/or producers. Specific examples will vary.*

5. Can an organism be a secondary and tertiary consumer in the same ecosystem? Explain using examples from the game.

*Yes, an organism may be a primary and secondary consumer in an ecosystem. Example, a raccoon may act as a primary consumer, eating raspberries, and also as a secondary consumer, by eating mice which in turn eat plants.*

6. In general, are there more secondary consumers or producers in a healthy habitat? Why?

*In general, there are more producers in a population than secondary consumers. An excess of producers is usually needed to allow secondary consumers and higher level consumers to survive.*

6. Draw a food chain and a food web for organisms living in your area.

*Drawings will vary depending upon location.*

### **The How a Food Web Is Formed—Student Game is available from Flinn Scientific, Inc.**

Catalog No.	Description
FB1797	How a Food Web Is Formed—Student Game

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.

