22. How do food chains join to form food webs?
23. Why are food webs more accurate and complex than food chains?
24. How can human actions upset the balance of an ecosystem?

Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About…" list. It might also be helpful to review the list by marking each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Discussions that ensue from thought-provoking questions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion questions.

1. Explain the meaning of this statement: "If it weren't for the grass and all the other green plants, you wouldn't be around."
2. Discuss the fact that energy in a food chain is not created or destroyed but only transferred from organism to organism.
3. Discuss how any small change in an ecosystem will affect all the other parts of the food web.

Follow-up Activities

- It is important for students to realize the importance of every single part of a food chain. Discuss the implications of food chains whose balance has been upset. Specific examples to consider are the eradication of mosquito populations, removing top predators from an ecosystem and killing plants with pesticides.
- In small groups, have students create three-dimensional food chains by using plastic animals, modeling clay, etc. Challenge the whole class to create a food web with more than 75 organisms by linking their food chains appropriately.
- Initiate a discussion on the importance of decomposers to the environment. Have students imagine an Earth without decomposition and write a short essay depicting the problems faced in such a situation.
- Have individuals or small groups research the following concepts:
  - — Ecological energy pyramid & trophic levels.
  - — The work of decomposers.
  - — The nitrogen cycle.
  - — Photosynthesis.
  - — The role of abiotic (non-living) factors in an ecosystem.

TEACHER'S GUIDE

Internet Resources

Periodically, Internet Resources are updated on our web site at www.LibraryVideo.com

- **www.muohio.edu/dragonfly/webs/index.HTMLX**
  The "Webs of Life" pages of the Dragonfly Web site investigate the intricate network of plants & animals that depend upon one another for survival.
- **curriculum.calstatela.edu/courses/builders/lessons/less/biomes/introbiomes.html**
  This advanced site has excellent illustrated food webs and ecological pyramids for many different ecosystems.
- **ecokids.earthday.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm**
  This game by EcoKids allows students to build a food chain and then see what happens when one link is removed from that chain.

Suggested Print Resources

- Crenson, Victoria. *Horseshoe Crabs & Shorebirds: The Story of a Food Web*. Marshall Cavendish, Tarrytown, NY; 2003.
- Greenaway, Theresa. *Food Chains.* Raintree Steck-Vaughn, Austin, TX; 2000.
- Kalman, Bobbie. *Desert Food Chains*. Crabtree Publishing Company, New York, NY; 2004.

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TITLES

- AMPHIBIANS
- ANIMAL ADAPTATIONS
- ANIMAL BEHAVIOR & COMMUNICATION
- ANIMAL CLASSIFICATION
- ANIMAL INTERDEPENDENCY
- ANIMAL LIFE CYCLES
- ANIMAL NEEDS
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Food Chains

Grades 5–8

Students in grade 5-8 dassrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers for these grades need all the help they can get! This guide has been designed to help science teachers in grades 5-8 by providing a brief synopsis of the program, pre-viewing and follow-up questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create a "Everything We Think We Know About…" list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About…" list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.

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Program Summary

Every living thing uses energy that flows from the sun. When a mouse eats grass, it gets energy. Then a snake eats the mouse and gets energy. Eventually, the snake dies and its body becomes a source of energy for insects, fungi and microscopic creatures. This energy transfer from organism to organism is called a food chain.

All life is dependent on plants as the first link in the food chain. Plants, also called producers, make food and oxygen. Through a process called photosynthesis, producers trap the sun's energy and make it available to animals. Animals are called consumers because they must eat, or consume, to get energy. This energy is then transferred throughout the ecosystem in food chains. Plant-eating animals, also called herbivores, are considered primary consumers because they get their energy directly from plants. Meat-eating animals, also called carnivores, eat herbivores or other carnivores. They get their energy indirectly from plants and are known as secondary consumers. Decomposers are the insects, bacteria and fungi that break down the remains of all plants and animals, returning some of the sun's energy to the soil. In this process, carbon dioxide and nitrogen are released, and other nutrients are deposited in the soil for use by producers, starting the cycle all over again. This is called the nitrogen cycle.

We can track the flow of energy through an ecosystem by looking at food chains. The greatest concentration of energy is in the plants. Primary consumers, the herbivores, use about 10% of the energy that plants produce. Secondary consumers, the carnivores, use only about 10% of the energy in the herbivores, so they must eat more to get the same amount of energy. Because the energy flow from one level to the next is less and less, animals at the top of the food chain must eat the most. An ecological energy pyramid illustrates the fact that it takes an enormous number of small animals to sustain fewer numbers of large animals. Animals are classified into different steps on the pyramid according to their feeding behavior. These steps are called trophic levels.

Because many animals within an ecosystem share the same food, food chains connect into complex food webs. When an ecosystem is in balance, all organisms have sufficient energy and food to survive. When an imbalance occurs, every organism in the food web suffers.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

food chain — The path that energy takes as it passes from organism to organism within an eycosystem.

producers — Organisms that use the sun's energy to make food. Plants are producers.

(Continued)

photosynthesis — The process of using water, carbon dioxide and sunlight to produce sugars.

chlorophyll — The green chemical in plants that traps the sun's energy so photosynthesis can take place.

herbivores — Animals that eat only plants.

primary consumers — Herbivores; plant-eating animals that get energy from consuming plants.

carnivores — Animals that eat other animals.

secondary consumers — Animals that get the sun's energy indirectly by eating other animals.

omnivores — Animals that eat both plants and animals.

predator — An animal whose food is primarily obtained by the killing and consuming of other animals.

prey — Animals that are eaten by predators.

scavengers — Animals that feed on dead animals.

decomposers — Organisms like insects, bacteria and fungi that break down dead plants and animals, returning nutrients to the soil.

ecosystem — The relationship among all of the living and non-living elements in an environment.

phytoplankton — Tiny green plants that make up the bottom "producer" level of marine food chains.

Charles Elton — (1900-1991) The ecologist who calculated the biomass of ecosystems and, in 1927, came to the conclusion that there was far greater biomass at the lower levels of a food chain than at the top. He observed that these numbers formed an energy pyramid.

trophic levels — Different steps in a food chain of an ecosystem. The organisms of a chain are classified into these levels on the basis of their feeding behavior. The first and lowest level contains the producers, green plants. Second level organisms are the herbivores, or plant eaters. Occupying the third trophic level are the carnivores that feed on herbivores. The smallest and highest trophic level contains predators that feed on other predators. In all the trophic levels, only 10% of the energy in one level is passed to the next.

biomass — The total weight of all creatures in each trophic level of food chains.

food web — The complex feeding relationships among all the creatures in all the food chains of an ecosystem.

Pre-viewing Discussion

Before students generate their list of "Everything We Think We Know About…" for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

(Continued)

- How is the sun's energy passed along from organism to organism in an environment?
- What is a food chain? Where do humans fit into food chains?

After the class has completed their "Everything We Think We Know About…" list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. How is energy from the sun passed from one organism to another in an environment?
2. Why is photosynthesis so critical to the survival of every living thing?
3. What is chlorophyll?
4. What is the relationship between producers and consumers in a food chain?
5. What is an example of a producer in a food chain?
6. What are some examples of consumers in a food chain?
7. Why are some consumers called primary and others called secondary?
8. Are omnivores classified as primary or secondary consumers? Why?
9. Is this statement true or false: All predators are secondary consumers, while all prey are primary consumers? Explain.
10. What is the role of scavengers in an ecosystem? Give an example of a scavenger.
11. What is the role of decomposers in an ecosystem? Give an example of a decomposer.
12. What is the "nitrogen cycle"?
13. What is the definition of ecosystem?
14. Give an example of a terrestrial food chain that has at least four links.
15. Give an example of an ocean food chain with at least four links.
16. Why are tiny plankton so important to marine ecosystems?
17. What is the ecological energy pyramid?
18. What are trophic levels?
19. What did the ecologist, Charles Elton, contribute to our understanding of ecosystems?
20. What is biomass?
21. What happens to the amount of energy that is transferred from one trophic level to the next?

(Continued)