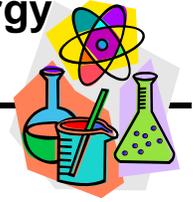


Science 10-4 Unit D: Investigating Matter and Energy in Environmental Systems



The Biosphere



Did You Know?

There are more than 50 million species of organisms on Earth.

The Biosphere

The regions of the Earth where living organisms live.



Food Chain

A food chain is a model that shows how energy is passed, in the form of food, from one living thing to another. The arrows between the organisms show the direction of energy flow. Food chains begin with plants. Energy flows because each organism has stored energy in it when it is eaten by the next organism, so its energy is passed along.

Examples of food chains:

- algae → salmon → bears
- grain → mice → cat → coyote
- flower → insect → bird → fox

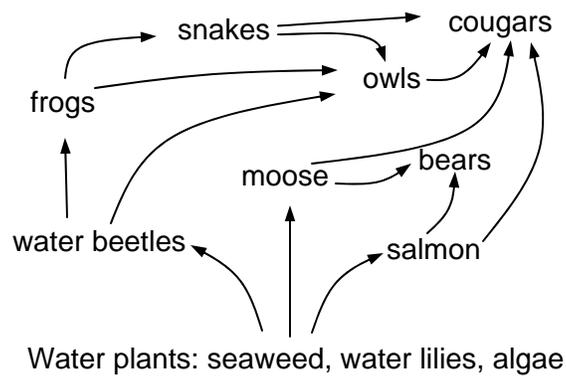


Food Web

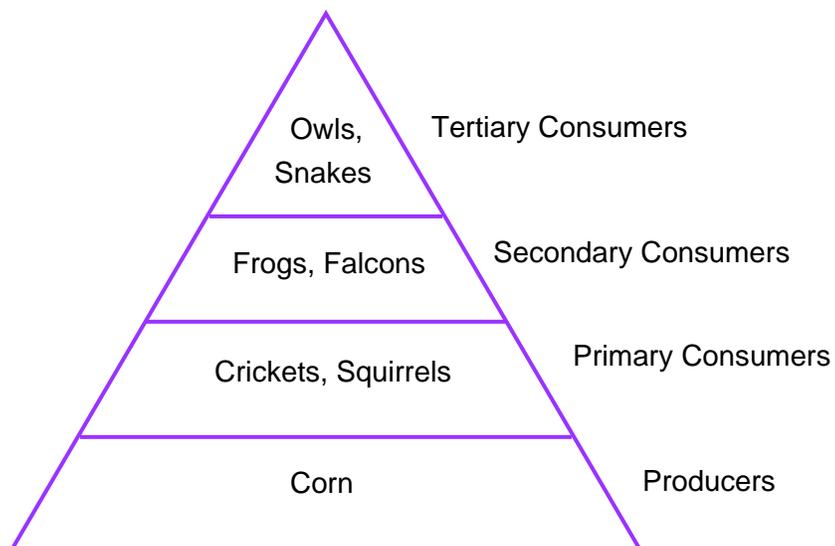
A food web is set of interconnected food chains that show how energy circulates (moves round and round) within an ecosystem.

Food Web

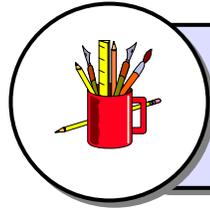
Arrows show energy flow to consumer.



Food Pyramid



1. What is the difference between a food chain and a food web? Explain why the word “chain” is used for one and “web” is used for the other. Use specific examples to support your answers.



Use Tools [Paragraph Planner I](#) or [Paragraph Planner II](#).

The organisms in food chains, food webs and energy pyramids fit into one of three categories: **producers**, **consumers** or **decomposers**.



Producers are plants that make their own food using energy from the sun in a process called photosynthesis.



Consumers are animals that cannot make their own food. They get their energy by eating plants and animals. A food chain can have several consumers.



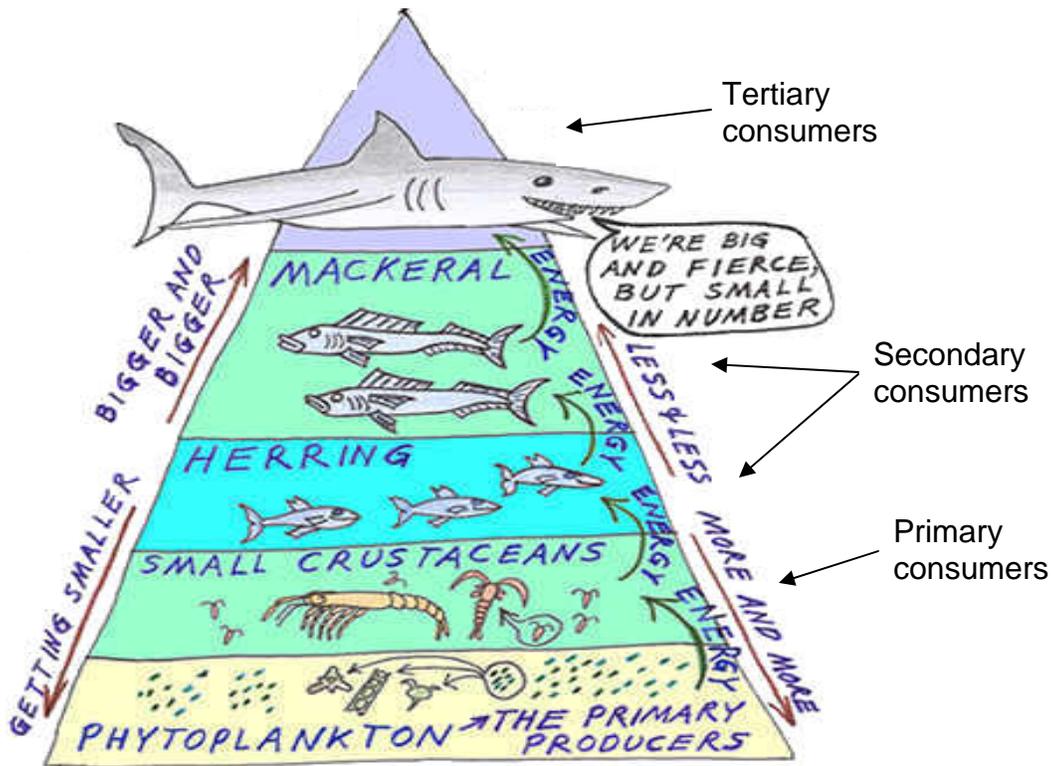
Decomposers are also unable to make their own food. Instead, they break down waste products and dead organisms for food and return them to the soil so they can be used again by plants. Decomposers can be found at every level of food chains, webs and energy pyramids.

2. Draw and label a food chain with at least four different living things. Draw the arrows to show the direction that energy flows. Label each organism as a producer, consumer or decomposer.
3. Discuss the questions below with classmates.
 - How are decomposers nature’s recyclers?
 - What would happen if there were no decomposers?



Use Tool [Discussion Notes](#).

4. With classmates, analyze the energy pyramid below and use it to help answer questions a) through e).



Graphic adapted with permission from "Energy Pyramids and Food Chains," *FT Exploring Science & Technology Education*, 2001, 2002, www.flyingturtle.org/me/pyramid.html (Accessed June 2005).

- Why do organisms get larger as you move up the energy pyramid? Hint: think about the energy that flows upward.
- Why are there more small organisms than larger ones? Hint: think about how organisms get their food and how much food different-sized organisms need to live.
- Use the food chain or web activities you've done so far to help write a definition for "energy pyramid." Check your answer in a science textbook, encyclopedia or online.
- Create an energy pyramid poster that focuses on organisms in an Alberta ecosystem.
- Discuss how toxins become increasingly concentrated in organisms moving up the pyramid.



Use Tool [Poster Planner](#).

Human Impact on the Environment

Case study: Banff, Alberta



When humans moved into the Banff area, they replaced some of the wild plants, such as grasses, shrubs and trees, with domesticated plants. Open spaces were created between bushes and trees, and land was flattened. The mountain valley forest with fallen and rotting trees, bogs and small passages, changed to flat, open fields of green grasses, and young bushes and trees.

Elk and deer are attracted to the green grasses and shrubs, and are often seen wandering through Banff. Elk and deer are also safer in the town site because their natural predators, grizzly bears, wolves and cougars, are kept away by park rangers.

5. Humans positively and negatively affect natural food chains and the cycling of matter in nature. Discuss the following question with classmates.

- How has the cycling of matter through food chains been affected by humans living in Banff?

6. Identify and discuss ways that human societies affect the cycling of matter in ecosystems such as parklands, lakes and forests in your area or elsewhere.

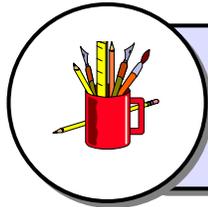
Examples:

- stocking lakes with fish
- recreation activities, such as fishing, water skiing, downhill skiing
- building dams
- farming, e.g., feedlots, automated feeding, watering and milking systems, low or no tillage
- building or expanding cities
- trapping and hunting.



Use Tool [Discussion Notes](#).

7. Compare contemporary usage of land and ecosystems to that of traditional Aboriginal societies.



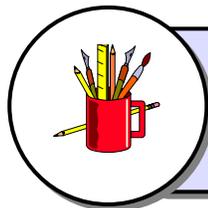
Use Tool [Venn Diagram](#).

8. Explore traditional Aboriginal use of organic materials based on understanding and respecting the natural environment.



Use Tool [KWL Chart](#).

9. Examine a variety of materials that have been developed by humans that the environment cannot absorb/recycle naturally; e.g., plastics, heavy metals. Consider their costs and benefits in a PMI (pluses, minuses and other information) chart.



Use Tool [PMI Chart](#).

Biodegradable

A biodegradable substance is something natural or man-made that can be broken down by nature and returned to the environment. If the substance does not break down it is nonbiodegradable.



10. Environmental laws, consumer concerns and disposal costs have caused many companies to create biodegradable products. Investigate how biodegradable materials reduce the impact of human-made products on the environment. For example, consider how long non-biodegradable plastic products remain in a landfill compared to alternative biodegradable products. Discuss the information with your class and brainstorm strategies for using more biodegradable products at home, in the community and at school.



Use Tool [Discussion Notes](#).



11. Compare the recycling of matter by humans in your community to the natural recycling of matter in nature. What is similar? What is different?



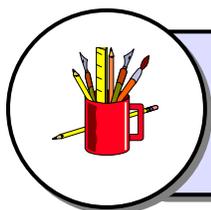
Use Tool [Venn Diagram](#).

12. Investigate and analyze the impact of modern agricultural technologies and practices on the cycling of matter through the environment. Consider the impact of the following technologies and practices:

- feedlots
- automated feeding
- watering and milking systems
- low or no tillage
- crop rotation
- others.



See [Steps for Getting Started with Research](#) and other documents in the research section of English Language Arts for help.



Use Tools [Evaluating Sources IV](#) or [Evaluating Sources V](#).

13. Examine how people can reduce the negative effects of humans on the environment, and ways that people in your school, workplace or community have already attempted to do so.

Think about environmental laws, recycling efforts, water treatment plants and environmental controls on vehicles that are already in place. See the research section of English Language Arts for help.

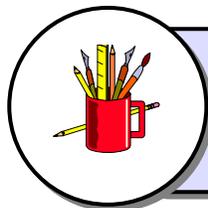
Create a presentation to inform classmates and others about these practices, e.g., a brochure, poster or computer presentation.



Use Tools [Thinking About Purpose for Presentations](#), [Thinking About Audience for Presentations](#) and [Thinking About Form for Presentations](#).

14. Find a news story (TV, Internet, magazine or newspaper) that describes a technology that has had unexpected and/or unforeseen environmental consequences; e.g.,
- fishing technologies that result in harvesting rates that are higher than reproduction rates (overfishing)
 - use of pesticides or other chemicals (e.g., DDT) that result in high death rates and low birth rates of local wildlife
 - improved auto manufacturing technology that has led to cheaper cars and therefore more cars on the road, resulting in more pollution and a greater need for fuel and roadways.

Describe the five Ws and one H of the news story.



Use Tool [5Ws and 1H](#).