

Chapter 1

Nutrient Cycles and Energy Flow

What You Will Learn

In this chapter, you will learn how to...

- **explain** that life depends on recycled matter
- **describe** the processes of photosynthesis and cellular respiration
- **explain** how humans can affect the cycles of matter and energy flow in ecosystems

Why It Matters

All living things, including humans, rely on the cycles of matter and energy on Earth. When a natural process or human activity affects one of these cycles, the balance of an ecosystem can be thrown off. This imbalance can affect all the organisms in the ecosystem.

Skills You Will Use

In this chapter, you will learn how to...

- **assess** the impact of fertilizers on aquatic ecosystems
- **observe** the chemistry of photosynthesis
- **model** acid precipitation
- **determine** the impact of excess fertilizers on plants

In 2007, four First Nations—Poplar River, Little Grand Rapids, Paunigassi, and Pikangikum—and the governments of Manitoba and Ontario began the process required to designate an area of Canada as a World Heritage Site. The area includes the territories of the four First Nations, Atikaki Provincial Park in Manitoba, and Woodland Caribou Provincial Park in Ontario, shown above. As a World Heritage Site, the sustainability of the area's forest, lake, and wetland ecosystems would be protected.



Activity 1-1

How Disturbed Is Too Disturbed?

Many different types of disturbances can affect an ecosystem. Some disturbances, such as a volcanic eruption or a flood, are natural. Other disturbances, such as water pollution or air pollution, can result from human activities. In this activity, you will model how disturbances can affect the balance of an ecosystem.



Materials

- 27 smooth building blocks, labelled with environmental disturbances

How much instability can your tower take?

Procedure

1. Work in groups of four. Build a tower with nine layers, using three blocks per layer. Place each layer at right angles to the layer below it.
2. Take turns removing blocks from the lower levels of the tower and using these blocks to make new three-block layers on top. Keep track of how many blocks you move.
3. Continue moving blocks until the tower collapses.

Questions

1. What did the tower represent in this model? What did the moved blocks represent?
2. What happened to the tower as more blocks were removed from lower levels and placed on top?
3. How does this activity model how different disturbances can affect an ecosystem?
4. How does what happened to the model in this activity differ from what could happen in a real ecosystem?

Study Toolkit

These strategies will help you use this textbook to develop your understanding of science concepts and skills. To find out more about these and other strategies, refer to the Study Toolkit Overview, which begins on page 561.

Preparing For Reading

Previewing Text Features

Before reading nonfiction text, a good strategy is to preview the *features* of the text. Text features give readers clues about the main ideas in the text and show how the writer has organized these ideas.

Look at some text features on the next page. The section heading, **1.1 Sustainability**, is a different size and colour from the body text. This heading tells you the main idea of the section. The two subheadings, **The Mystery of Easter Island** and **The Need for Sustainable Ecosystems**, are specific and signal details related to the main idea.

Use the Strategy

1. Browse through Chapter 1, paying attention to the section headings and subheadings. Predict what the main ideas in Chapter 1 will be. Record your predictions and confirm or revise them as you read the chapter.
2. Describe two ways in which colour is used in the chapter to help you navigate.

Organizing Your Learning

Comparing and Contrasting

Comparing and contrasting helps you identify how concepts are similar and how they are different. A **Venn diagram** can help you organize this information graphically. For example, the Venn diagram below shows some similarities and differences between “biotic” and “abiotic” characteristics of the environment.

Biotic **Both** **Abiotic**

Differences
organisms:
plants
animals
fungi

Similarities
part of an ecosystem
interact with each other

Differences
non-living things:
air
soil
water

Use the Strategy

1. Choose two animals, such as an owl and a turtle.
2. Make a Venn diagram to show the similarities and differences between the two animals in terms of their survival needs.

Word Study

Word Families

Drawing a word family web can help you figure out unfamiliar words. The web on the right shows words that all have the prefix *bio*, from the Greek word meaning life. *Biology*, for example, means the study of life.

Use the Strategy

1. Predict and record what you think the other words in the web mean.
2. Check your predictions as you read Chapter 1 or use the Glossary at the end of this textbook.