

# Soil Conservation

## Reading Preview

### Key Concepts

- Why is soil a valuable resource?
- How can soil lose its value?
- What are some ways that soil can be conserved?

### Key Terms

- sod • natural resource
- Dust Bowl • soil conservation
- contour plowing
- conservation plowing
- crop rotation

## Target Reading Skill

**Previewing Visuals** Before you read, preview Figure 13, The Dust Bowl. Then write two questions that you have about the photo and map in a graphic organizer like the one below. As you read, answer your questions.

The Dust Bowl

Q. Where was the Dust Bowl?
A.
Q.

Prairie grasses and wildflowers ▼

Lab  
zone

## Discover Activity

### How Can You Keep Soil From Washing Away?

1. Pour about 500 mL of soil into a pie plate, forming a pile.
2. Devise a way to keep the soil from washing away when water is poured over it. To protect the pile of soil, you may use craft sticks, paper clips, pebbles, modeling clay, strips of paper, or other materials approved by your teacher.
3. After arranging your materials to protect the soil, hold a container filled with 200 mL of water about 20 cm above the center of the soil. Slowly pour the water in a stream onto the pile of soil.
4. Compare your pan of soil with those of your classmates.



### Think It Over

**Observing** Based on your observations, what do you think is the best way to prevent soil on a slope from washing away?

Suppose you were a settler traveling west in the mid 1800s. Much of your journey would have been through vast, open grasslands called prairies. After the forests and mountains of the East, the prairies were an amazing sight. Grass taller than a person rippled and flowed in the wind like a sea of green.

The prairie soil was very fertile. It was rich with humus because of the tall grass. The **sod**—the thick mass of tough roots at the surface of the soil—kept the soil in place and held onto moisture.

The prairies covered a vast area. They included Iowa and Illinois, as well as the eastern parts of Kansas, Nebraska, and North and South Dakota. Today, farms growing crops such as corn, soybeans, and wheat have replaced the prairies. But prairie soils are still among the most fertile in the world.

## The Value of Soil

A **natural resource** is anything in the environment that humans use. **Soil is one of Earth's most valuable natural resources because everything that lives on land, including humans, depends directly or indirectly on soil.** Plants depend directly on the soil to live and grow. Humans and animals depend on plants—or on other animals that depend on plants—for food.

Fertile soil is valuable because there is a limited supply. Less than one eighth of the land on Earth has soils that are well suited for farming. Soil is also in limited supply because it takes a long time to form. It can take hundreds of years for just a few centimeters of soil to form. The thick, fertile soil of the prairies took many thousands of years to develop.



Why is fertile soil valuable?

## Soil Damage and Loss

Human activities and changes in the environment can affect the soil. **The value of soil is reduced when soil loses its fertility and when topsoil is lost due to erosion.**

**Loss of Fertility** Soil can be damaged when it loses its fertility. Soil that has lost its fertility is said to be exhausted. This type of soil loss occurred in large parts of the South in the late 1800s. Soils in which only cotton had been grown were exhausted. Many farmers abandoned their farms. Early in the 1900s in Alabama, a scientist named George Washington Carver developed new crops and farming methods that helped to restore soil fertility in the South. Peanuts were one crop that helped make the soil fertile again. Peanut plants are legumes. Legumes have small lumps on their roots that contain nitrogen-fixing bacteria. These bacteria make nitrogen, an important nutrient, available in a form that plants can use.

**FIGURE 12**  
**Restoring Soil Fertility**  
George Washington Carver (1864–1943) taught new methods of soil conservation. He also encouraged farmers to plant peanuts, which helped restore soil fertility.  
**Applying Concepts** *What nutrient do peanut plants add to the soil?*





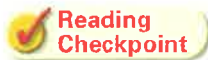
## Soil Conservation

Since the Dust Bowl, farmers have adopted modern methods of soil conservation. **Soil conservation** is the management of soil to prevent its destruction. **Soil can be conserved through contour plowing, conservation plowing, and crop rotation.**

In **contour plowing**, farmers plow their fields along the curves of a slope. This helps slow the runoff of excess rainfall and prevents it from washing the soil away.

In **conservation plowing**, farmers disturb the soil and its plant cover as little as possible. Dead weeds and stalks of the previous year's crop are left in the ground to help return soil nutrients, retain moisture, and hold soil in place. This method is also called low-till or no-till plowing.

In **crop rotation**, a farmer plants different crops in a field each year. Different types of plants absorb different amounts of nutrients from the soil. Some crops, such as corn and cotton, absorb large amounts of nutrients. The year after planting these crops, the farmer plants crops that use fewer soil nutrients, such as oats, barley, or rye. The year after that the farmer sows legumes such as alfalfa or beans to restore the nutrient supply.



**Reading  
Checkpoint**

How does conservation plowing help conserve soil?

**FIGURE 14**

### Soil Conservation Methods

This farm's fields show evidence of contour plowing and crop rotation. **Predicting** How might contour plowing affect the amount of topsoil?



## Section 3 Assessment

 **Target Reading Skill Previewing Visuals** Compare your questions and answers about Figure 13 with those of a partner.

### Reviewing Key Concepts

- Defining** What is a natural resource?
  - Explaining** Why is soil valuable as a natural resource?
- Listing** What are two ways in which the value of soil can be reduced?
  - Explaining** Explain how topsoil can be lost.
  - Relating Cause and Effect** What caused the Dust Bowl?
- Defining** What is soil conservation?
  - Listing** What are three methods by which farmers can conserve soil?
  - Problem Solving** A farmer growing corn wants to maintain soil fertility and reduce erosion. What conservation methods could the farmer try? Explain.

## Writing in Science

### Public Service Announcement

A severe drought in a farming region threatens to produce another Dust Bowl. Write a paragraph about soil conservation to be read as a public service announcement on radio stations. The announcement should identify the danger of soil loss due to erosion. It should also describe the steps farmers can take to conserve the soil.

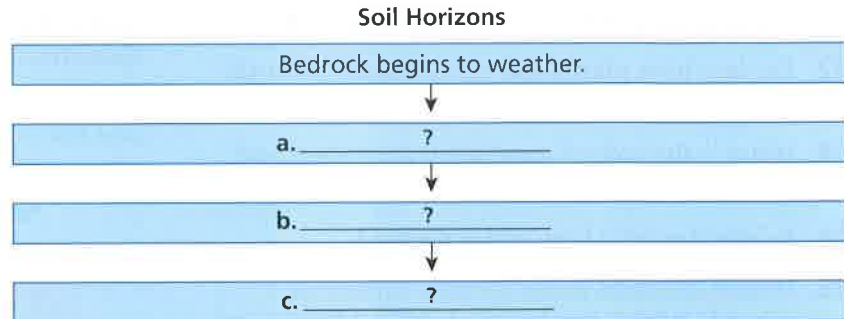
# Review and Assessment

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## Organizing Information

**Sequencing** Fill in the flowchart to show how soil horizons form. (For more information on flowcharts, see the Skills Handbook.)



## Reviewing Key Terms

Choose the letter of the best answer.

- The process that splits rock through freezing and thawing is called
  - erosion.
  - chemical weathering.
  - ice wedging.
  - abrasion.
- Acid rain results in
  - chemical weathering.
  - abrasion.
  - oxidation.
  - mechanical weathering.
- Soil that is made up of roughly equal parts of clay, sand, and silt is called
  - sod.
  - loam.
  - tropical soil.
  - subsoil.
- The B horizon consists of
  - subsoil.
  - topsoil.
  - litter.
  - bedrock.
- The humus in soil is produced by
  - mechanical weathering.
  - bedrock.
  - chemical weathering.
  - decomposers.

If the statement is true, write *true*. If it is false, change the underlined word or words to make the statement true.

- Mechanical weathering is the removal of rock particles by gravity, wind, water, or ice.
- Rock that is permeable weathers easily because it is full of tiny air spaces.
- The decayed organic material in soil is called loam.
- The layer of plant remains at the surface of the soil is called litter.
- In contour plowing, farmers conserve soil fertility by leaving dead stalks and weeds in the ground.

## Writing in Science

**Journal Entry** You are a farmer on the tall grass prairie in the midwestern United States. Write a journal entry describing prairie soil. Include the soil's composition, how it formed, and how animals helped it develop.

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## Test-Taking Tip

### Reading All the Answer Choices

Always read every answer choice in a multiple-choice question before selecting the answer you think is correct. There may be more than one correct response, but one choice will be more complete and precise than the others. Or "all of the above" may be a possible answer. If you stop reading as soon as you find an answer that seems correct, you won't notice that "all of the above" is an option.

### Sample Question

What is the term for the process that breaks down rock through chemical changes?

- A acid rain
- B ice wedging
- C chemical weathering
- D all of the above

### Answer

The correct answer is C. A is an agent of chemical weathering, but it is not the term for the process. B is a type of mechanical weathering.

## Choose the letter of the best answer.

1. Which of the following is a type of mechanical weathering?
  - A abrasion
  - B freezing and thawing
  - C plant growth
  - D all of the above
2. You are designing an experiment to test the resistance to weathering of various types of materials. What weathering process could be modeled using sandpaper?
  - A acid rain
  - B freezing and thawing
  - C abrasion
  - D all of the above
3. In what type of climate would soil form fastest from limestone bedrock?
  - A a cold, dry climate
  - B a cold, wet climate
  - C a hot, dry climate
  - D a hot, wet climate

Use the data table below and your knowledge of science to answer Questions 4–5.

Soil Erosion by State			
State	tons/acre/year		
	Water Erosion	Wind Erosion	Total Erosion
Montana	1.08	3.8	4.9
Wyoming	1.57	2.4	3.97
Texas	3.47	14.9	18.4
New Mexico	2.00	11.5	13.5
Colorado	2.5	8.9	11.4
Tennessee	14.12	0.0	14.12
Hawaii	13.71	0.0	13.71

4. Of the states listed in the table, which two have the greatest amount of erosion by water?
  - A Texas and Tennessee
  - B Texas and Hawaii
  - C New Mexico and Colorado
  - D Tennessee and Hawaii
5. What state in the table has the greatest soil erosion?
  - A Texas
  - B Hawaii
  - C Tennessee
  - D New Mexico

## Constructed Response

6. Two rocks, each in a different location, have been weathering for the same amount of time. Mature soil has formed from one rock, but only immature soil has formed from the other. What factors might have caused this difference in rate of soil formation? In your answer, include examples of both mechanical and chemical weathering.