

Red Edition
Grade 3–4
reading level

Purple Edition
Grade 4–5
reading level

Objectives

- List four main types of landforms.
- Explore ways that rocks are broken down into smaller pieces.
- Explore ways that rock pieces are transported to new locations.
- Describe ways that water changes rocks and land.
- Describe ways that wind changes rocks and land.
- Describe ways that gravity changes rocks and land.
- Discuss some ways that human activities change the land.
- Understand how people are restoring some land to its natural state.

Reading Comprehension Skills

Preview the Book ◆ Compare and Contrast
Cause and Effect ◆ Main Idea and Details

Skillbuilders are available for this title.

Supporting English Learners

Use Photographs and Other Visuals Develop background knowledge and support the development of new concepts and science vocabulary by using the photographs in *Weathering and Erosion*. Point out and name objects in the photos, such as *plateau* (page 5) and *glacier* (page 17). Have students repeat after you.

Summary

The Delta Science Content Reader *Weathering and Erosion* begins with an overview of mountains, valleys, and other landforms that cover Earth's surface. Students then explore natural processes that constantly build up and destroy landforms through the actions of water, wind, gravity, and other forces. The book concludes with a discussion of how human activities can both accelerate and impede these processes.

Science Background

Weathering and erosion are the sculptors of Earth's constantly changing landforms, from the smallest hill to the vast Grand Canyon. Some of the natural processes that shape landforms occur gradually over millions of years. Other processes are very rapid and can occur in minutes.

Earth's landforms are composed of soil, minerals, rocks, and other materials. Minerals are solid, nonliving, naturally occurring substances. Rocks are composed of minerals. Weathering is the process by which rocks and minerals are broken down into smaller pieces called sediment. Water, wind, temperature changes, and living things all cause weathering. Physical weathering is the mechanical breaking down of rocks and minerals. Chemical weathering is the breaking down of rocks and minerals caused by chemical reactions with other substances. For example, rocks containing iron are subject to rusting, which can cause the rocks to become very soft and crumbly.

Erosion is the carrying away of sediment by water, wind, or gravity. For example, a river's rushing water can weather rock and erode loose sediment from the river's banks. Over many years, the action of rivers can carve out valleys and canyons.

When moving water or wind slows down, it deposits the sediment it is carrying. Unlike weathering and erosion, which are destructive processes, deposition is a constructive process. Deposition is responsible for the creation of many landforms, including river deltas and sand dunes.



What Are Landforms?

(pages 2–5)

Before Reading

Discuss the Cover

Cover Image Discuss the photograph on the cover of *Weathering and Erosion*. Use the information on the inside front cover to support the discussion.

Science Statement Discuss the science statement.
Ask: *What do you think a natural process is?*
(Possible answer: Something that happens in nature.)
What might be some examples of natural processes?
(Possible answers: earthquakes, rain)

Build Reading Skills (page 2)

Preview the Book Use Build Reading Skills on page 2 to review how to preview the book. Discuss the steps. Then model previewing the words in bold type.

Think Aloud *Why are some words set in bold type? I know that sometimes science vocabulary is set in bold type. Maybe that is the case here. I see the words landform, topography, mountain, valley, plain, and plateau in the Vocabulary box on page 3. Are they in bold type later in the book? Yes, I see them all on pages 4–5. I was right: the words in bold type are Vocabulary words.*

Guide students as they finish previewing *Weathering and Erosion*. Focus on nonfiction text features.

- Prompt them to look at the headings, photographs, and captions. Ask questions such as *Why do you think that feature is there? How will it help you understand what you read?*
- Prompt them to look at other bold Vocabulary words. Guide the class in looking up a Vocabulary word in the Glossary.

Students can apply the skill in the Reflect on Reading activity on page 5.

K-W-L Chart Have students begin a K-W-L chart. They should add to it after each section.

What I Know	What I Want to Learn	What I Learned
Ocean waves can wash away sand.	Where does the sand go?	

Make a Connection (page 3)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about landforms. (Possible answer: The land where I live has some hills and some flat places.)

Find Out About Read the statement to help students set a reading purpose. Explain that this is the important topic that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Landform* in the center. Have students add examples to the web as they read.

During Reading

Earth's Landforms (page 4)

- Ask: *Which landforms are likely to be near a valley? Explain.* (hills or mountains, because a valley is a landform that lies between hills or mountains)
- Discuss the photograph of the mountain on page 4 and the photograph of the plateau on page 5. Ask: *How are mountains and plateaus alike and different?* (Alike: higher than the land around them; Different: mountains have pointed or rounded tops, plateaus are flat like a plain)
- ✓ **Checkpoint** (page 5) (A landform is a natural shape or feature on Earth's surface. Possible answers: mountain, hill, valley, canyon, plain, floodplain, plateau)

After Reading

Reflect on Reading (page 5) (Possible answer: The picture and caption of the plain on page 5 helped me understand how flat plains are.)

Apply Science Concepts (page 5) This activity applies the concept from Find Out About on page 3. The United States Geological Survey (USGS) education Web site provides a variety of resources organized by grade level. Remind students to discuss the landform's name, location, and main features. Encourage them to use their own words.

What Are Weathering and Erosion? (pages 6–11)

Before Reading

Build Reading Skills (page 6)

Compare and Contrast Use Build Reading Skills on page 6 to review how to compare and contrast. Discuss the tips. Then model comparing and contrasting minerals and rocks in the first two paragraphs of the section “Weathering” on page 8.

Think Aloud *To compare minerals and rocks, I ask, How are they alike? Both are materials found in nature. Both can break down into smaller pieces called sediment. To contrast minerals and rocks, I ask, How are they different? Rocks are made of minerals.*

Students can apply the skill in the Reflect on Reading activity on page 11.

Make a Connection (page 7)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about weathering and erosion. (Possible answer: Sandstone sounds like it is made of sand. Wind can blow sand into shapes. Maybe wind helped form the arches.) The unusual erosion pattern of the arches is partly due to a thick layer of salt beneath the area, the remnants of an inland sea that evaporated over 300 million years ago. Over millions of years, rocks formed above the salt bed. Eventually, the salt started to flow due to the weight of the rocks above. Over time, this caused the rocks to shift, forming vertical cracks in some rocks. Weathering and erosion then widened and shaped these cracks, which created arches in some places.

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a T-chart on the board for causes of *weathering* and *erosion*. Have students suggest examples as they read.

During Reading

Weathering (page 8)

- Discuss that quartz, mica, halite (rock salt), graphite, and diamond are examples of minerals.
- Ask: *What other science word is part of the word weathering? (weather) What do you think weathering has to do with weather? (Possible answer: Water, wind, and temperature changes can cause weathering, and they are part of weather.)*
- Discuss the photograph of tree roots on page 8. Ask: *How is this tree causing weathering? (Its roots are splitting the rocks apart.) Is this physical weathering or chemical weathering? Explain.* (physical, because it changes the size and shape of the rocks, not what they are made of)
- ✓ **Checkpoint** (page 9) (Weathering is the breaking down of minerals and rocks into smaller pieces.)

Erosion (page 10)

- Ask: *When does deposition happen? (when water or wind that is carrying sediment slows down)*
- Explain that *weather*, *erode*, and *deposit* are the verb forms of the nouns *weathering*, *erosion*, and *deposition*. Discuss examples such as *Moving water can cause weathering. Moving water can weather rock*. Have students practice using both forms of each word. You may also wish to discuss and practice the adjective forms *weathered*, *eroded*, and *deposited*, as in *Weathered rock often gets moved*.
- Ask: *How do the kinds of rocks in a place affect its soil? (The sediment in soil comes from weathered rock. And different rocks have different minerals. So different soils have different kinds and amounts of minerals.)*
- ✓ **Checkpoint** (page 11) (Erosion is the movement of sediment. Possible answer: Strong wind can pick up and move loose sand.)

After Reading

Reflect on Reading (page 11) (Possible answer: Physical weathering: changes the size and shape of rocks by scraping, pounding, rubbing, or splitting; Chemical weathering: changes what rocks are made of, can change minerals in rocks into different minerals, which can make rocks crumble; Both: break down minerals and rocks into sediment)

Apply Science Concepts (page 11) This activity applies concepts from Find Out About on page 7. (Possible answer: This is weathering. Weathering is the breaking down of rocks into smaller pieces, and the question says that the waterfall flows over the rocks and slowly breaks them down.)

What Causes Weathering and Erosion? (pages 12–19)

Before Reading

Build Reading Skills (page 12)

Cause and Effect Use Build Reading Skills on page 12 to review cause and effect. Discuss the tips. Then read aloud the first paragraph on page 14 and model identifying cause and effect.

Think Aloud *I read that water causes most of the weathering, erosion, and deposition on Earth. What is the cause? Water. What are the effects? Weathering, erosion, and deposition.*

Have students read the last paragraph on page 14. Guide them as they identify factors that affect the amount of erosion a river causes. Students can apply the skill in the Reflect on Reading activity on page 19.

Make a Connection (page 13)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about the causes of weathering and erosion. (Possible answer: I read before that water can cause weathering. The stones are on a beach, so maybe water from the ocean changed their shape by weathering them.)

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Deposition* in the center. Have students add words and examples to the web as they read.

During Reading

Water (page 14)

- Ask: *Describe what happens during a flood.* (Runoff from melting snow or heavy rain causes a river to overflow and cover land that is usually dry. This deposits sediment.) *Why can this be good for farming?* (The sediment deposited by a flood has minerals that plants need.)
- Discuss the photograph of the barrier island on page 16. Ask: *How do barrier islands form?* (Ocean waves sometimes deposit sediment a short distance from shore. Ridges called sandbars form. If a sandbar gets large enough, it can become a barrier island.)
- Ask: *How can ice weather rocks?* (Water gets into cracks in rocks and then freezes. When water freezes, it takes up more space. The ice widens the cracks in the rocks. Over time, the rocks split.)

- ✓ **Checkpoint** (page 17) (Possible answers: Destroy: Rivers can carve valleys and canyons out of rocks and soil. Waves can erode the shoreline to form cliffs and can weather smaller rocks to form pebbles or sand. Build up: A river can deposit sediment at its mouth to form a delta. Waves can form beaches, sandbars, and barrier islands.)

Wind (page 18)

- Ask: *Think about when wind blows sand against rocks and the sand breaks tiny pieces off the rocks. Is the wind causing weathering, erosion, or both? Explain.* (Possible answer: both, because the wind is picking up and moving sand, which is erosion, and it is causing tiny pieces to break off rocks, which is weathering)

- ✓ **Checkpoint** (page 18) (Wind slows down when it hits an object such as a large rock or a clump of plants. Sand carried by the wind drops to the ground. Over time, the sand can build up and form a sand dune.)

Gravity (page 19)

- Discuss that landslides often begin because of heavy rainfall, melting snow, earthquakes, or volcanic eruptions.
- ✓ **Checkpoint** (page 19) (Possible answers: causes water to flow downhill, causes sediment to drop when moving water or wind slows, causes pieces of rock to fall and chunks of land to slide downhill)

After Reading

Reflect on Reading (page 19) (Possible answers: Causes of weathering: running water, waves, ice, wind; Causes of erosion: running water, waves, glaciers, wind, gravity)

Apply Science Concepts (page 19) This activity applies concepts from Find Out About on page 13. Assist students in finding pictures that show weathering and erosion, as needed. Picture choices may include rivers, valleys, canyons, cliffs, beaches, sandbars, barrier islands, sand dunes, glaciers, or landslides. Encourage students to compare their pictures to the pictures and descriptions in the book to help them explain the processes their pictures show.

How Do People Change the Land? (pages 20–23)

Before Reading

Build Reading Skills (page 20)

Main Idea and Details Use Build Reading Skills on page 20 to review identifying main idea and details. Then model how to identify the main idea and details in the second paragraph on page 22.

Think Aloud *To find the main idea, I ask, What is this paragraph mostly about? I think the main idea is that people have built dams across some rivers. Details can be examples, descriptions, reasons, or other facts. What kind of details does this paragraph have? One detail is that dams can help control flooding downstream. This sounds like a reason. It is a reason people build dams.*

Students can apply the skill in the Reflect on Reading activity on page 23.

Make a Connection (page 21)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about how people change the land. Before students answer, encourage them to think about how cutting down trees might affect weathering and erosion. (Possible answers: People might plant new trees to make the area look nicer or so that they have more trees to cut down for wood later on. Maybe planting new trees can also help stop soil from washing away after it rains.)

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

During Reading

People and Land (page 22)

- Hay bales, black mesh silt fences, and other erosion-control methods are commonly seen around the edges of construction sites. These devices capture sediment carried by runoff and keep it from washing onto surrounding land or into waterways. Suggest that students look for these devices wherever construction is taking place.
- ✓ **Checkpoint** (page 23) (Possible answers: Speed up erosion: remove plants from the land during building projects, fill in wetlands; Slow down erosion: leave the stalks of plants in a field after the crop is cut, plant a windbreak, return wetlands to their natural state)

After Reading

Reflect on Reading (page 23) (Possible answers: Main idea: People make changes to Earth's land. These changes can speed up or slow down natural processes such as weathering, erosion, and deposition. Details: A dam changes the amount of sediment carried by a river. The roots of plants help hold soil in place. Wetlands can help slow erosion.)

Apply Science Concepts (page 23) This activity applies a concept from Find Out About on page 21. Before students write, help them think about familiar places in the area and how those places have been changed by people. For example, ask, *What might the land have been like before our school was here?* Possible changes to the land include those brought about by farming and construction projects. Students' answers should indicate whether they think the change sped up or slowed down weathering or erosion. (Possible answer: People bulldozed a field to build a shopping mall. There are now fewer plants. This probably sped up erosion, since the roots of plants help hold soil in place.)

 **Continued on last page**

Name: _____

Date: _____

Test: Weathering and Erosion

Part A: Vocabulary

deposition	erosion	glacier	mass movement
runoff	sediment	topography	weathering

Choose the correct vocabulary word for each sentence. Write the word on the line.

1. All the mountains, plains, and other landforms in an area make up the area's _____.
2. The breaking down of minerals and rocks into smaller pieces is called _____.
3. Pieces of minerals and rocks called _____ are one part of soil.
4. One example of _____ is when waves carry sand away from the shoreline.
5. When _____ happens, it can build up landforms.
6. Water from rain can flow downhill over the land as _____.
7. An icy _____ slowly pushes soil and rocks ahead of it.
8. A landslide is one kind of _____ that gravity can cause.

Part B: Science Concepts

Mark the best answer to each question.

9. Which landform is flat and higher than the land around it?
(A) beach (B) canyon (C) delta (D) plateau
10. What deposits sediment during a flood?
(A) A river overflows onto dry land. (B) Ice widens the cracks in rocks. (C) Pieces of rock fall from a cliff. (D) A glacier slowly moves downhill.

Test: Weathering and Erosion (continued)

11. Which of these landforms can form when wind deposits sediment?

- (A) mesa
- (B) mountain
- (C) sand dune
- (D) valley

12. Why are people working to return some wetlands to their natural state?

- (A) to speed up weathering
- (B) to stop deposition
- (C) to slow erosion
- (D) to block the wind

Write the answer.

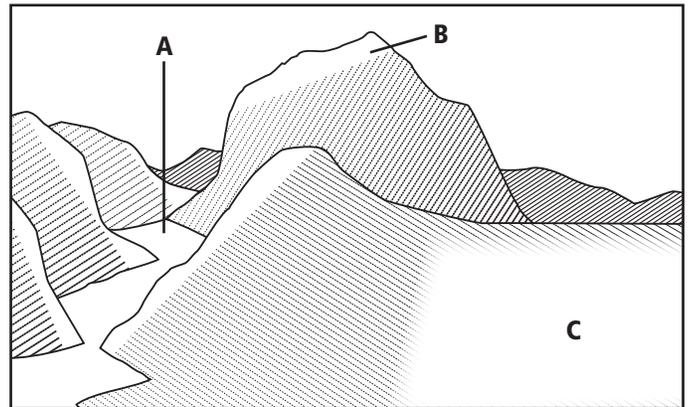
13. Label each landform with the correct word from the word box.

mountain	plain	valley
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A _____

B _____

C _____



14. Explain the difference between physical weathering and chemical weathering. Give an example of each.

15. Wind often blows soil away from a farmer's fields. What is this an example of? Describe one way the farmer could solve this problem.

Let's Review

(inside back cover)

Have students complete their K-W-L charts before answering these questions. Possible answers are shown.

- 1. Cover Connection** (Weathering and erosion are natural processes that break down landforms. Weathering is the breaking down of minerals and rocks into smaller pieces called sediment. Water, wind, temperature changes, and living things cause weathering. Erosion is the movement of sediment. Deposition is the dropping of eroded sediment in a new place. Deposition builds up landforms.)
- 2.** (Answers will vary but should name a famous landform, identify it by type, and describe its features, such as its size, shape, and height.)
- 3.** (Sand comes from rocks. Moving water grinds rocks against one another. Pieces of rock break off. Over time, rocks can become sand.)
- 4.** (A river deposits sediment at its mouth. This may make a landform called a delta. Pounding waves can weather and erode a shoreline. This may form steep walls called cliffs. Ocean waves sometimes deposit sediment a short distance from shore. Ridges called sandbars form.)
- 5.** (Plant roots help hold soil in place. A row of trees called a windbreak helps stop the wind from blowing soil away.)
- 6. Compare and Contrast** (Plains: wide, few hills or valleys; Plateaus: higher than the land around them; Both: flat)

- 7. Write** (Stories will vary but should include an accurate description of gravity affecting land through mass movement, such as a landslide, a rockfall, or creep.)

Try It! Students should be able to explain that the sugar cubes are like rocks. When they shake the jar, this is like weathering because the sugar cubes break down as they pound against the walls of the jar and one another. The smaller bits of sugar cube and sugar crystals that break off are like sediment. When students blow on the sugar, this is like erosion of sediment by wind. When they stop blowing, the sugar comes to rest in a new place, like deposition.

Science at Home Have students do this activity at home with a family member. Familiar examples of weathering include rusted metal, rounded rocks, sidewalks cracked by tree roots, and potholes.

Answers to Test

(Teacher's Guide pages 6–7)

1. topography **2.** weathering **3.** sediment **4.** erosion **5.** deposition **6.** runoff **7.** glacier **8.** mass movement **9.** D **10.** A **11.** C **12.** C **13.** A: valley; B: mountain; C: plain **14.** Physical weathering changes the size or shape of rocks by scraping, pounding, rubbing, or splitting them. Example: Tree roots can grow into small cracks in rocks and split them apart. Chemical weathering changes what rocks are made of. This can make rocks crumble into sediment. Example: Weak acids made by lichens can slowly break rocks down. **15.** erosion; The farmer could plant a row of trees near the fields called a windbreak. This would help stop the wind from blowing soil away.

ADDITIONAL ASSESSMENT OPPORTUNITIES Use the Checkpoints, Reflect on Reading, and Apply Science Concepts features and Let's Review questions as additional assessment opportunities.

Delta Science Content Readers are 24-page nonfiction student books with informative, engaging text and full-color photos and illustrations. The readers present key science content and vocabulary found on state tests, present key reading skills and strategies useful for reading informational text, support and extend the experiences and content of hands-on activities, promote scientific inquiry, and serve as a home-school link. They are available in two editions: Red Edition for Grades 3–4 and Purple Edition for Grades 4–5.

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This teacher's guide is available online at

www.deltaeducation.com
1-800-442-5444

Weathering and Erosion
Teacher's Guide
1278157



Printing 1—10/2009
Quebecor World, Leominster, MA

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