



Earth Science

Interactions of Air, Water, and Land

On Level

Slow Earth- Changing Processes

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INSIDE
FOR:

Core Curriculum
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•
Assessments and
Reading Activities

Slow Earth-Changing Processes

How do natural events affect our world?

CORE CURRICULUM STATEMENTS

Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

Erosion and deposition result from the interaction among air, water, and land.

- interaction between air and water breaks down earth materials
- pieces of earth material may be moved by air, water, wind, and gravity
- pieces of earth material will settle or deposit on land or in the water in different places
- soil is composed of broken-down pieces of living and nonliving earth material

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Slow Earth-Changing Processes

How do natural events affect our world?

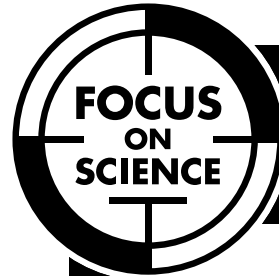
CORE CURRICULUM STATEMENTS

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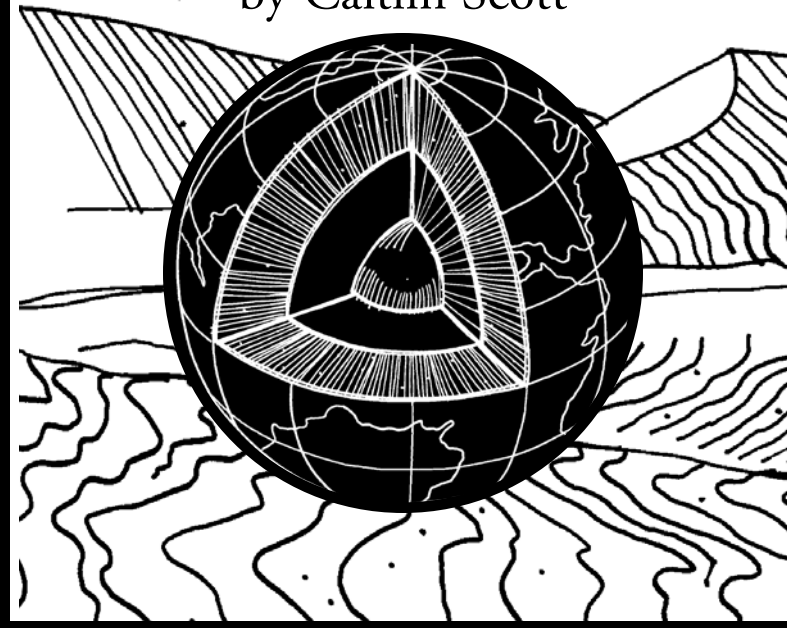


Earth Science

Interactions of Air, Water, and Land

Slow Earth-Changing Processes

by Caitlin Scott





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Curriculum materials for **your** content standards

Table of Contents

Introduction:

What Is Earth Made Of?4

Chapter 1:

What Causes Changes
on Earth?6
Weathering6
Mountain Building12
Erosion and Deposition13

Chapter 2:

Landforms Caused
by Slow Changes14
Sand Dunes14
Deltas16
Glacial Moraines18

Chapter 3:

Wangari Maathai20
Glossary22
To Find Out More23
Index24

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INTRODUCTION

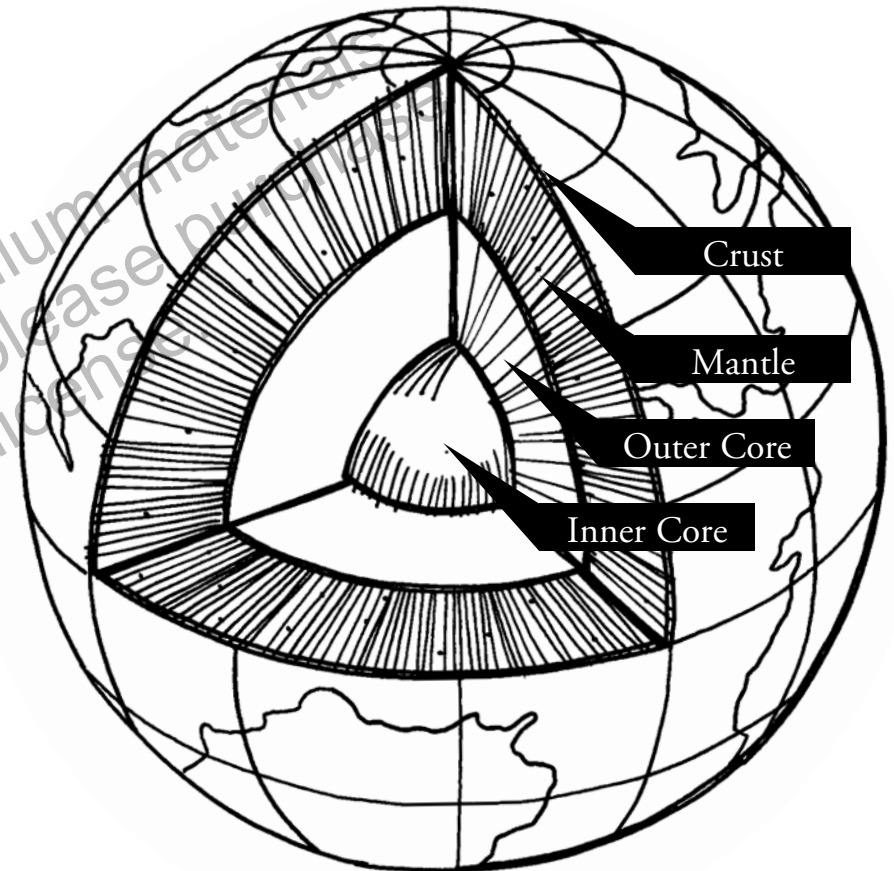
What Is Earth Made Of?

Earth is made of four different layers. The crust is the layer we walk on. It is also the layer under the ocean. It is about 25 miles thick under the land and about 6.5 miles thick under the ocean. It is lighter than the other layers and breaks easily. Most of the slow changes we see on Earth occur in the crust.

Below the crust is the mantle. It is about 1,800 miles thick. Instead of cracking easily like the crust, the mantle flows like a thick liquid.

Below the mantle is the outer core, which is made of liquid rock called magma. Below the outer core is the inner core, which is solid.

Layers of Earth



The planet Earth is made up of four layers.

What Causes Changes on Earth?

Some changes on Earth happen slowly. Most of these changes take place on the crust, which is thin and **brittle**. They can be caused by weathering, **erosion**, deposition, and mountain building.

Weathering

Weathering is the breakdown of rocks and minerals. This happens when wind, water, ice, gravity, or human actions wear away the crust.

Wind

Have you ever seen a dust storm? The wind might blow dust across a road or field. This is a type of erosion. The wind is carrying the dirt away.

brittle: easily broken

erosion: the process of slowly wearing away; a type of weathering

On a beach, the wind can move sand for several miles. On the top of a mountain, strong winds can slowly wear away the rock.

Water

Like wind, water can also erode soil and rocks and then carry them away. Most of the time water causes erosion very slowly.

For example, rain on a rocky cliff can erode the rock away over thousands of years. Or, a river can slowly carve out the land. This creates twists and turns in the river. Sometimes these twists break off and create small ponds or lakes beside the river.

Flooding can carry soil and rocks away more quickly. This type of erosion can be dangerous. Plants and animals may be carried away by the flood waters. Sometimes houses and people get caught in the flood waters, too.

Ice

Ice doesn't weather rocks and minerals the way water and wind do. You might not think ice could cause weathering, but it can.

Water freezes at 32 degrees Fahrenheit or 0 degrees Celsius. When water freezes, it **expands** rapidly. Have you ever left a soda can in the freezer by mistake? If so, you know that the soda can swells up. It looks as if the soda is about to break out of the can.

The same thing happens when water freezes inside the ground. The ice expands and breaks Earth's crust apart. Sometimes ice even breaks rocks apart.

– Recall –

Describe ways that wind, water, and ice reshape Earth's surface.

expands: gets bigger

Gravity

What happens when you drop something? It falls to the ground. That's gravity.

Gravity is a force that pulls things back to Earth. Gravity causes changes to the surface of Earth. For example, gravity can slowly pull down mountains over millions of years.

Gravity often plays a part in other types of changes to Earth's surface. For example, when ice breaks apart Earth's crust, gravity makes the broken parts roll downhill. When river water carves into a hillside, gravity makes that hillside collapse into the river.

– Transfer –

Explain why erosion is a slow Earth-changing process. What might be some fast Earth-changing processes?

Physical Weathering

You've learned that weathering is the breakdown of rocks and minerals. This breakdown can be caused by physical and chemical processes.

Physical weathering is the breakdown of large pieces of earth material into smaller ones. Changes in heat, water movement, ice formation, and pressure cause physical weathering.

For example, water can seep into cracks in rocks. When the water freezes, it expands and puts pressure on the crack. As the pressure increases, the crack widens and breaks the rock or mineral apart.

Plants also can physically weather rocks and minerals. Plant roots grow into cracks in rocks and slowly wedge the rock apart as they grow larger.

– Explain –
How does plant growth and
freezing water cause weathering?

Chemical Weathering

Physical weathering does not change the material that is being broken down. Chemical weathering does.

Chemical weathering is the process by which earth materials are **decomposed**, dissolved, or loosened by chemicals. These chemical processes lead to a breakdown of the material. Chemical weathering alters the properties of the weathered material.

For example, when oxygen is added to material with iron, the iron forms rust. The surface of the iron has changed from a solid, hard surface to a loose, crumbly surface. It is not iron anymore.

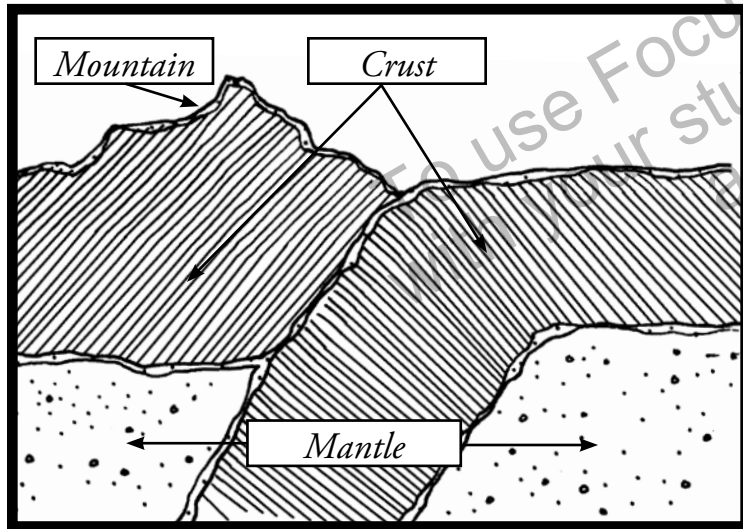
Both physical and chemical weathering lead to changes in Earth's surface.

decompose: to break down into separate, basic parts

Mountain Building

When Earth's crust cracks, large pieces of it start to float and move on the liquid mantle. When two large pieces of crust run into each other, the pieces fold up like an accordion or a paper fan.

These folds become mountains. This is how the Adirondack Mountains in upstate New York formed. The process takes millions of years.



These two pieces of crust ran into each other. One piece pushed up, creating a mountain.

Erosion and Deposition

Erosion is the process by which soil and weathered rock particles are moved from one place to another. It is often a slow process. You've learned that it can occur on sandy beaches, along rivers, and even on mountain tops.

What happens to all that dirt and rock when it is moved someplace else? It creates new landforms. This process is called deposition.

Read on to learn more about how deposition creates new landforms.

– Brainstorm –
*Think of all the ways erosion changes Earth.
Talk about it with a friend.*

CHAPTER 2

Landforms Caused by Slow Changes

Natural erosion and deposition are happening all the time. The dirt and rock of Earth's crust is constantly being worn away and moved.

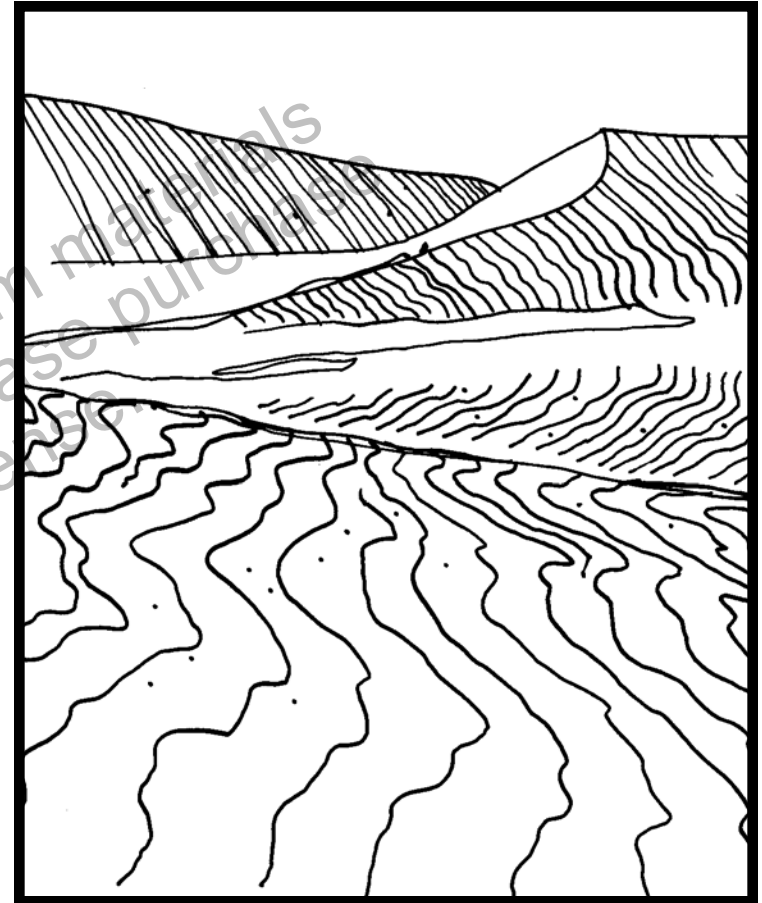
Sand Dunes

Sand dunes are hills created by deposition. They form mostly on beaches and deserts. But, they can occur anywhere that has very sandy soil. Wind blows on the sand and transports it. The sand piles up and forms hills. These hills can be a few feet high or more than one hundred feet high.

Sand dunes slowly move from place to place. That's why a beach never looks exactly the same two summers in a row.

natural: not made by humans

Sand Dunes



If you look closely at a sand dune, you can often see a pattern on the surface of the dune. This shows how the wind is slowly moving the sand.

Deltas

Deltas are areas of sand and soil deposited at the mouth of a river. Deltas are also created by deposition.

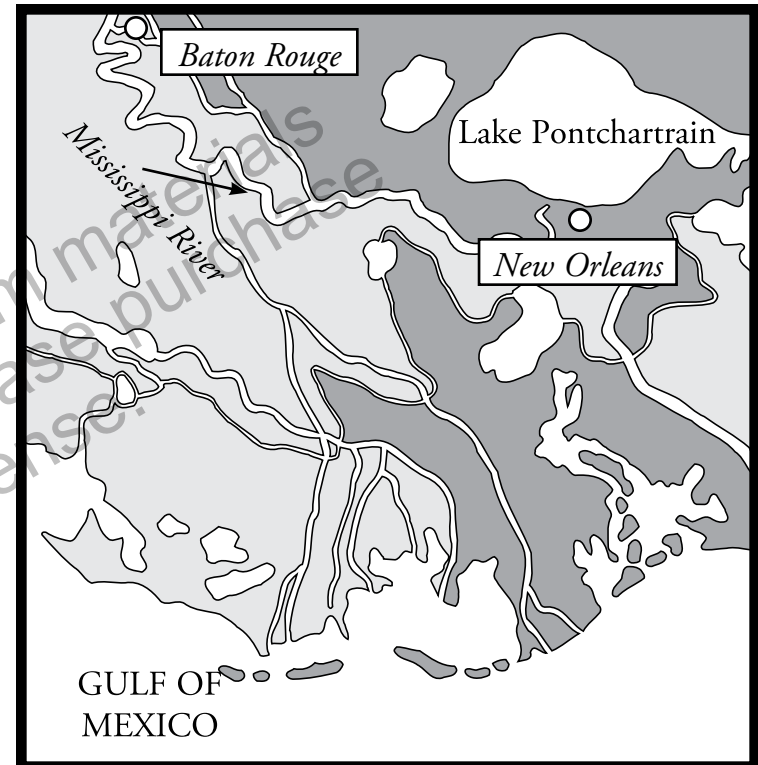
The water in rivers slowly erodes the banks of the river. Dirt and rocks from the banks are carried downstream. Some dirt and rock is deposited further down the river, but some is carried all the way to the ocean. Much of the rock and dirt that goes all the way to the ocean creates a delta.

Deltas are marshy grasslands. Often the soil is very good for farming. But farming and building houses on a delta can be tricky. The land in a delta is new and low. This land is easily flooded by the river or by ocean storms.

– Recall –

What are the landforms that are produced through deposition?

Mississippi Delta



The city of New Orleans was built on the Mississippi Delta and has flooded many times.

Glacial Moraines

Glaciers are huge slabs of ice. As they melt, they slide and erode Earth's crust. Often they carve out large valleys. The Finger Lakes in Western New York were carved out by glaciers.

As a glacier moves, it pushes a big pile of rock and dirt in front of it. This is called the glacial **till**.

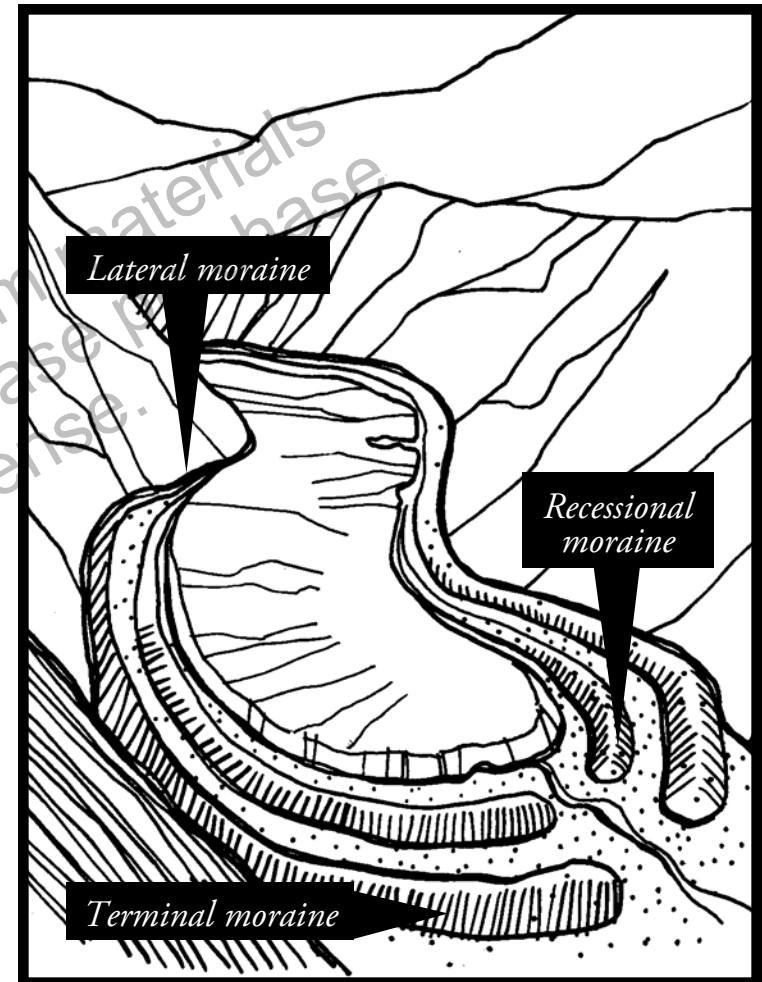
When the glacier stops moving, melts, and starts moving backwards, the glacial till is left behind. This big pile of rocks and dirt is called the glacial moraine.

Many glaciers moved over North America during the ice age, about 25,000 years ago. Scientists know how these glaciers moved because they left glacial moraines behind them.

Glaciers are still moving today. Most are melting and moving backwards because Earth is warming.

till: deposits of rock and dirt

Glacial Moraine



This is a glacial moraine. How did these mounds get to this land? They were left behind by a glacier.

Wangari Maathai

Wangari Maathai was born in Nyeri, Kenya in 1940. She went to school to study biology. She noticed that many trees were being cut down all over the country, but very few trees were being replanted. Without trees, the land eroded rapidly. The rain and wind carried the good, rich topsoil away. Eventually, people began to have trouble farming.

To help solve these problems, Wangari formed the Green Belt Movement. She got Kenyan women to plant trees.

Through Green Belt, Kenyan women have planted more than 20 million trees and much of the land has been restored. As a result of her work, Wangari won the Nobel Prize in 2004.



Glossary

brittle—easily broken

decompose—to break down into separate, basic parts

erosion—the process of slowly wearing away; a type of weathering

expands—gets bigger

natural—not made by humans

till—deposits of rock and dirt

To Find Out More . . .

Want to learn more about how Earth changes?

Try these books

Erosion by Joelle Riley. Lerner Publications, 2006.

Land Preservation by Christine Peterson. Children's Press, 2004.

Access these Web sites

U.S. Environmental Protection Agency
Land Revitalization Initiative

<http://www.epa.gov/oswer/landrevitalization/lrso.htm>

The Nature Conservancy
<http://www.nature.org/>

Write for more information

U.S. Environmental Protection Agency
Office of Solid Waste and Emergency
Response (5103-T)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

The Nature Conservancy
4245 North Fairfax Drive, Suite 100
Arlington, VA 22203-1606

Index

chemical weathering, 11

deltas, 16–17

deposition, 13, 14

erosion, 6, 9, 13

glacial moraines, 18–19

gravity, 9

ice, 8

Maathai, Wangari, 20–21

mountain building, 12

physical weathering, 10

sand dunes, 14–15

water, 7

wind, 6

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Assessments

Slow Earth-Changing Processes

Print pages 20–22 of this PDF for the assessments.

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

1. A scientist has been studying a site of physical weathering for five years. He has concluded that the river carved into a hill. The hill showed signs of erosion but it was still intact. Now, he can see where one side of the hill has collapsed into the river. What explains the recent collapse of the hillside?

- Ⓐ gravity
- Ⓑ glaciers
- Ⓒ wind erosion
- Ⓓ chemical weathering

2. Deposition creates new landforms. Which natural process is an example of deposition?

- Ⓐ iron turning to rust
- Ⓑ plant roots wedging a rock apart
- Ⓒ two large pieces of crust colliding
- Ⓓ glaciers moving a pile of rock and dirt

3. What is the force that erodes deserts?

Explain how this force creates new landforms.

4. The movement of soil by wind or water is called

- Ⓐ gravity
- Ⓑ friction
- Ⓒ erosion
- Ⓓ energy

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

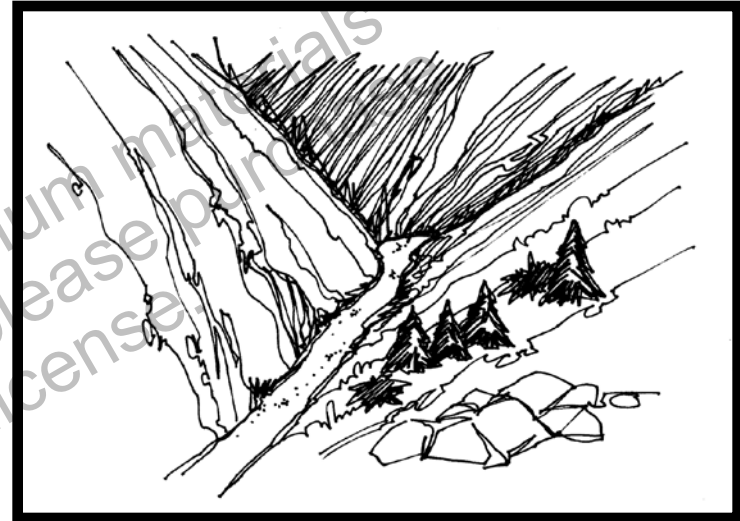
5. What are **two** ways that water can erode soil and rocks?

1) _____

2) _____

Explain how each is a slow or rapid process.

6. The diagram below shows an area of land that changed after many years.



Which process caused the valley to form?

- (A) evaporation
- (B) erosion
- (C) gravity
- (D) deposition

Assessment Scoring Guidelines

1. Answer A is correct.
2. Answer D is correct.
3. Wind
Wind transports the sand and deposits it in piles, which become sand dunes.
4. Answer C is correct.
5. Rain
Rain falling on a cliff can slowly erode the rock.

River
A river can slowly carve out the land.

Flood
A flood can quickly carry away soil and rocks.
6. Answer B is correct.

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English Language Arts Activities

Slow Earth-Changing Processes

Print pages 24–28 of this PDF for the reading activities.

Main Idea and Supporting Details

TRY THE SKILL

The main idea is the writer's main point. Supporting details give more information about this main idea.

Here is a paragraph. The graphic organizer shows the main idea and supporting details.

Erosion occurs when Earth is worn away. It is a very slow process. Erosion happens to sandy beaches, to the banks of rivers, and even to mountains. What happens to all that eroded dirt and rock? It is carried somewhere else. This process is called deposition.

Main Idea

Erosion occurs when Earth is worn away.

Supporting Details

- Erosion is a slow process.
- It happens to sandy beaches, to the banks of rivers, and even to mountains.
- Several different natural processes cause erosion.

Read this paragraph from *Slow Earth-Changing Processes*.

Gravity often plays a part in other types of changes to Earth's surface. For example, when ice breaks apart Earth's crust, gravity makes the broken parts roll downhill. When river water carves into a hillside, gravity makes that hillside collapse into the river.

Now complete this graphic.

Main Idea

Supporting Details

Suffixes

TRY THE SKILL

Suffixes are short syllables at the end of words that change the meaning of the word. Knowing suffixes can help you learn new words.

The suffixes *-tion* and *-sion* have the same sound and change a word in the same way. When you add *-tion* or *-sion* to the end of a verb it turns the verb into a noun.

Verb	Meaning
erode	To wear away

Verb+Suffix=Noun	Meaning
erosion	The act of wearing something away

Verb	Noun
erode	<u>erosion</u>

When you add *-sion* to erode it changes to a noun with a similar meaning.

Notice that when you add *-tion* or *-sion* to the end of a word the spelling of the word changes slightly.

Here are some more words from *Slow Earth-Changing Processes*. Use what you know about the suffixes *-tion* and *-sion* to match the verbs with their related nouns.

Verb	Meaning
1. deposit	To put something down
2. erode	To wear away
3. move	To travel
4. expand	To get bigger
5. pollute	To soil or dirty something

Verb+Suffix=Noun	Meaning
A. motion	The act of traveling
B. expansion	The act of getting bigger
C. pollution	The act of soiling or dirtying something
D. erosion	The act of wearing something away
E. deposition	The act of putting something down

Verb	Noun
1. deposit	_____
2. erode	_____
3. move	_____
4. expand	_____
5. pollute	_____

Question and Answer

TRY THE SKILL

You can monitor your understanding of what you read by asking questions about the topic and then reading to find the answer. Sometimes authors will even write a question in the text and then answer it. Read the paragraph.

Erosion occurs when Earth is worn away. It is a very slow process. Erosion happens to sandy beaches, to the banks of rivers, and even to mountains. What happens to all that eroded dirt and rock? It is carried somewhere else. This process is called deposition.

What question could you ask?

What is erosion?

What is the answer?

Erosion is a slow process that wears the Earth away. Erosion happens to sandy beaches, to the banks of rivers, and even to mountains.

1. Read the question. Then write an answer in your own words.

What is deposition?

2. Now think of another question you could ask based on Slow Earth-Changing Processes. Write the question. Then, write an answer in your own words.

Question:

Answer:

Sources of Information

TRY THE SKILL

The table of contents tells the reader what information is in the book and what page number the reader can start reading on to find the information.

Read the beginning of the table of contents from another book about slow changes on Earth.

Introduction:

The Parts of Earth 4

Chapter 1:

Mountain Building 7

Natural Erosion 8

Deposition 12

Chapter 2:

Dangerous Erosion 18

What page would you begin reading to find information about mountains?

Page 7, because the subheading on page 7 is “Mountain Building.”

What chapter would you read to find information about natural erosion?

Chapter 1, because the subheading “Natural Erosion” is contained in Chapter 1.

Read the beginning of the table of contents again. Answer the questions.

1. What page would you begin reading to find information about what Earth is made of?
(A) Page 4
(B) Page 14
(C) Page 17
2. Which chapter would you read to find information about deposition?
(A) Introduction
(B) Chapter 1
(C) Chapter 2
3. What page would you begin reading to find information on dangerous erosion?
(A) Page 6
(B) Page 9
(C) Page 18
4. Which two chapters would you read to find information on erosion?
(A) Introduction and Chapter 1
(B) Introduction and Chapter 2
(C) Chapter 1 and Chapter 2

Answer Key

Main Idea and Supporting Details

Main Idea

Gravity often plays a part in other types of erosion.

Supporting Details

- When ice breaks apart Earth's crust, gravity makes the broken parts of the crust roll downhill.
- When river water carves into a hillside, gravity makes that hillside collapse.

Suffixes

1. E, deposition
2. D, erosion
3. A, motion
4. B, expansion
5. C, pollution

Question and Answer

1. Answers will vary but should include the following information: After rock and dirt erode, they are carried elsewhere by the wind, water, or gravity. When the dirt and soil come to rest, this is called deposition.
2. Questions and answers will vary but should be based on information from the book.

Sources of Information

1. A
2. B
3. C
4. C