FOCUS ON SCIENCE

Earth Science

Interactions of Air, Water, and Land

Basic Level

Slow Earth-Changing Processes

LOOK INSIDE FOR:

- Core Curriculum Covered
- Student Book
- Assessments and Reading Activities

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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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BL

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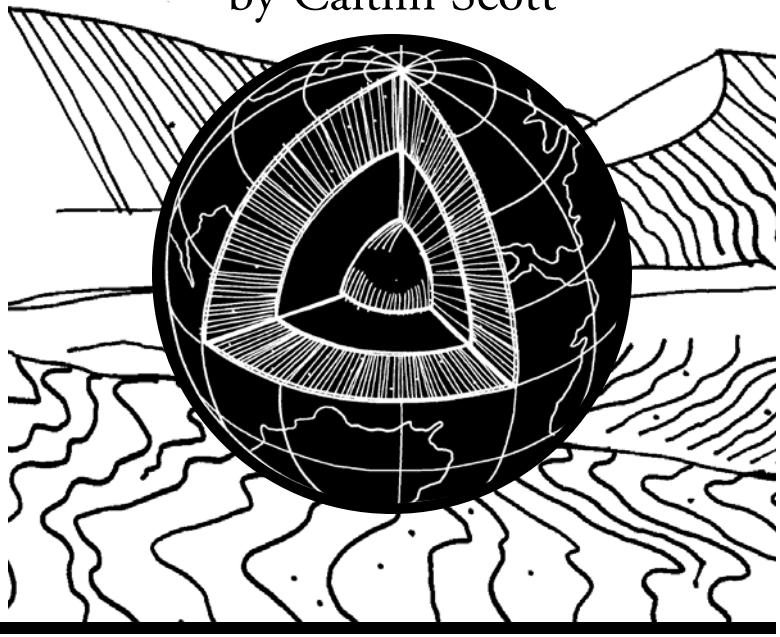
by Caitlin Scott



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Curriculum materials for **your** content standards

Table of Contents

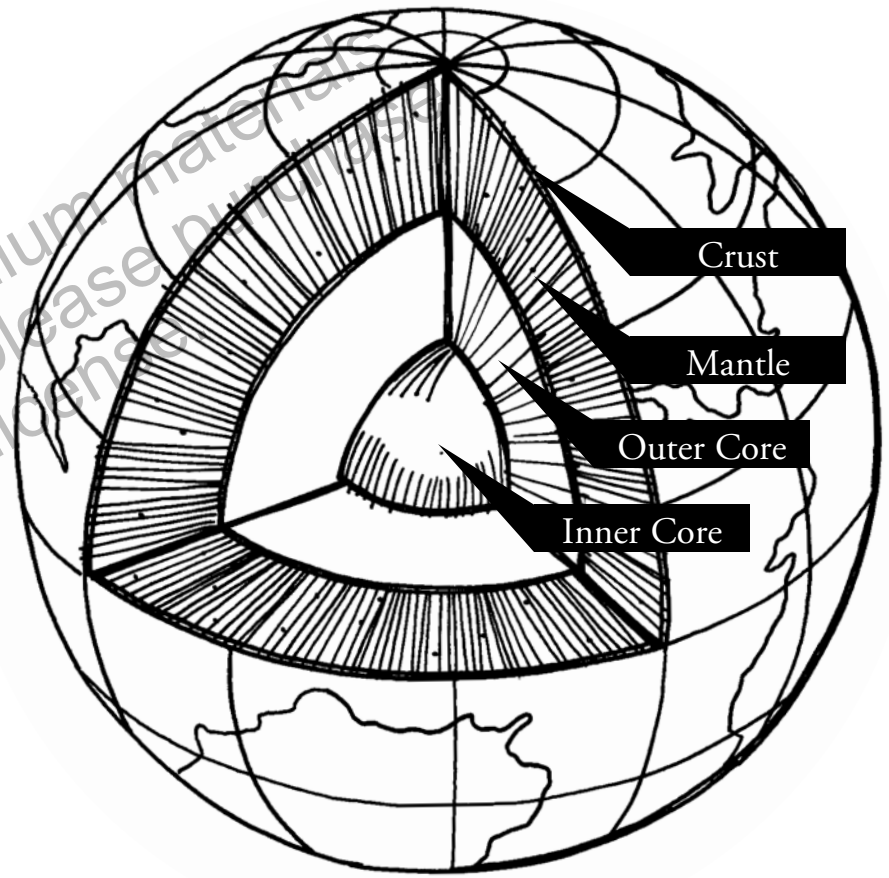
What Is Earth Made Of?

Earth has four layers. The crust is the layer we walk on. It is also under the ocean. The crust is lighter than other layers and breaks easily. Most of the slow changes on Earth occur in the crust.

The mantle is below the crust. It does not crack easily like the crust. Instead, the mantle flows like a thick liquid.

Below the mantle is the outer core. It is liquid rock called magma. Below the outer core is the inner core. It is solid.

Layers of Earth



The planet Earth is made up of four layers.

CHAPTER 1

What Causes Changes on Earth?

Earth changes slowly. Most of these changes take place on the crust, which is thin and **brittle.** These slow changes 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.

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

Wind

Have you ever seen a dust cloud? Or sand blown across a beach? This is caused by wind. Dirt and sand particles blown by the wind can change the surface of Earth. This is called weathering.

Water

Like wind, water can change Earth's surface. For example, rain on a rocky cliff can slowly erode the rock and carry it away. But, this takes thousands of years. A river can also slowly carve out the land over time.

Floods carry soil and rocks away more quickly. Floods can be dangerous. Plants and animals may be carried away by the flood. Sometimes, houses and people get caught in the flood, too.

Ice

Ice doesn't move the way water and wind do. But, ice still causes weathering.

When water freezes, it **expands**. Have you ever left a soda can in the freezer? If so, you know it swells. It looks as if the soda will break out of the can.

The same thing happens when water freezes inside the ground. The ice expands. It breaks Earth's crust. Sometimes ice can even break a rock 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. That's gravity at work. Gravity pulls things back to Earth. It also changes Earth's surface. It can slowly pull down mountains. However, this takes millions of years to happen.

There are other ways gravity changes Earth's surface. Ice breaks apart Earth's crust. Then, gravity makes the broken parts roll downhill. Or, river water carves into a hillside. Then, gravity makes that hillside fall over.

– Transfer –
Explain why erosion is a slow Earth-changing process.

Physical Weathering

You learned that weathering is the breakdown of rocks and minerals. There are two types of weathering.

Physical weathering is the breakdown of large pieces of rock into smaller ones. Heat, water, ice, and pressure are some causes.

For example, water can seep into cracks in rocks. When the water freezes, it expands. This causes the crack to widen and break the rock apart.

– Explain –
How does 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. This leads to a breakdown of the material.

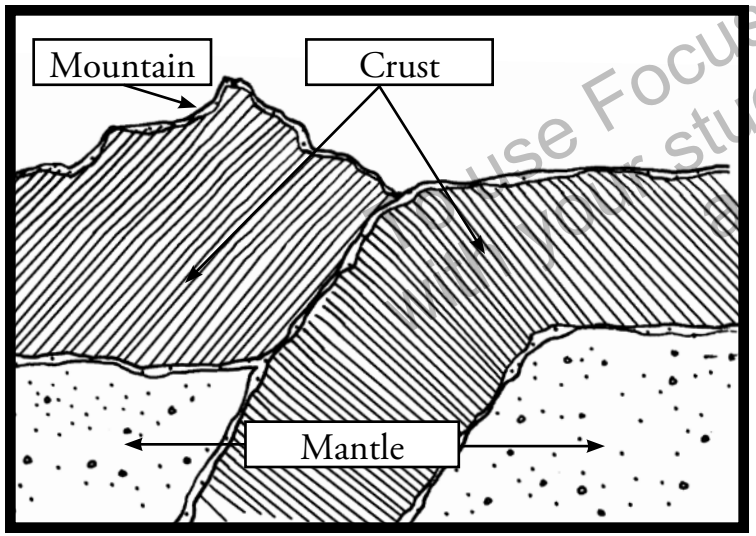
For example, when oxygen is added to iron, rust forms. The surface of the iron has changed from a solid, hard surface to a loose, crumbly surface. It is not iron anymore.

decompose: to break down into separate, basic parts

Mountain Building

Sometimes Earth's crust cracks. Large pieces of it start moving on the liquid mantle. Sometimes two large pieces of crust run into each other. The pieces fold up like a paper fan.

These folds become mountains. This is what formed the Adirondack Mountains. It 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 to another place. 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 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

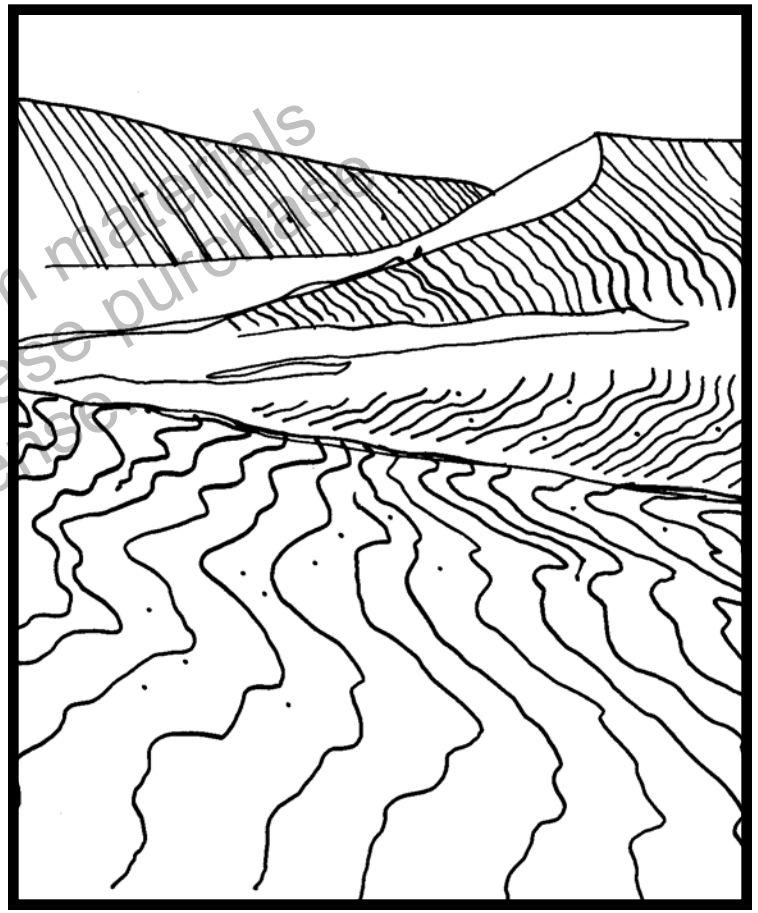
Natural erosion and deposition happen all the time. The dirt and rock are constantly being worn away and moved somewhere else.

Sand Dunes

Sand dunes are hills formed by deposition. They form on beaches and deserts. Wind blows on the sand and moves it. The sand piles up in another place. That's why a beach never looks 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

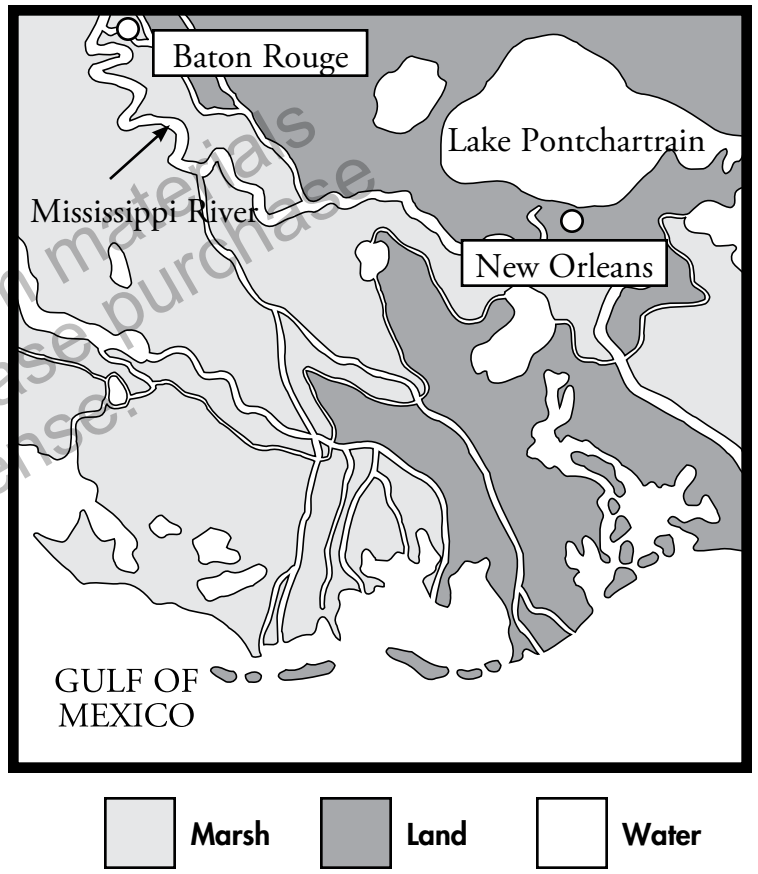
Deltas are also formed by deposition. Deltas are areas of sand and soil deposited at the mouth of a river.

Rivers slowly erode their banks. Dirt and rocks wash downstream. Some goes all the way to the ocean. Rock and dirt that goes to the ocean forms a delta.

Deltas are marshy. Often the soil is good for farming. But farming and building houses on a delta is tricky. The land is easily flooded.

– 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

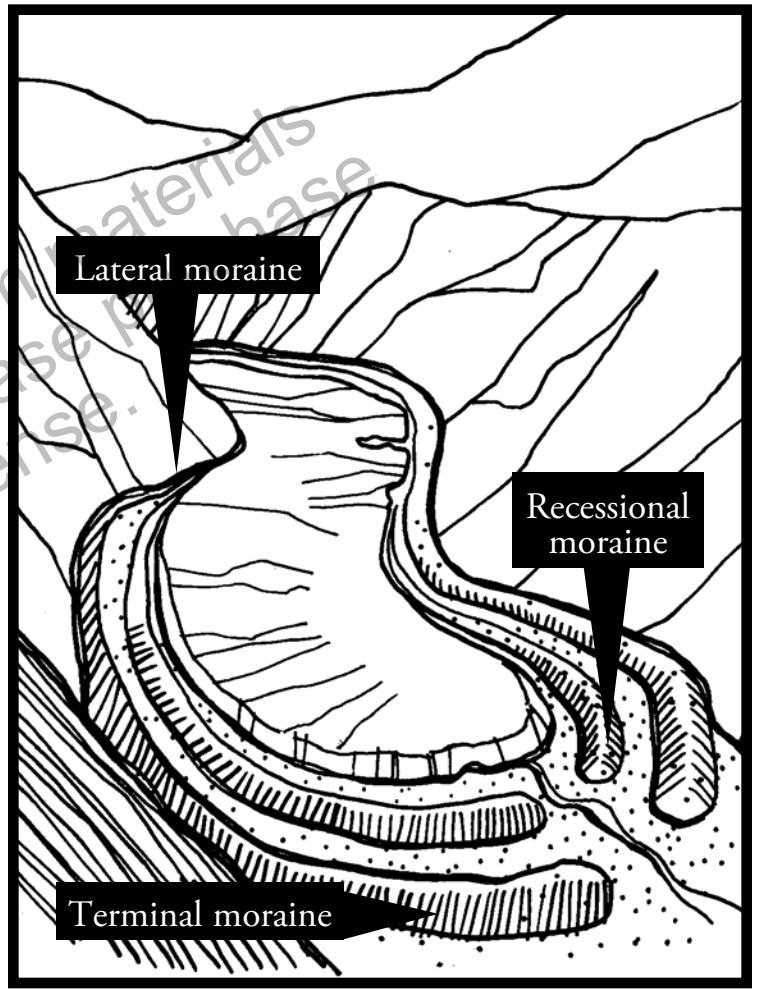
Glaciers are big slabs of ice. They melt and slide. This erodes Earth's crust. Often they carve out large valleys.

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

When the glacier stops, the **till** is left behind. This pile of rocks and dirt is the glacial moraine.

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.

CHAPTER 3

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 across the country. But very few trees were being replanted. Without trees, the land eroded rapidly. The rain and wind carried the good topsoil away. 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. 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

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Assessments

Slow Earth-Changing Processes

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

Slow Earth-Changing Processes

Check Understanding

Shade the circle next to the correct answer.

1. Wangari Maathai started a movement in Kenya. She got women to plant millions of trees. How do these trees help the land?

   Ⓐ They cause erosion of soil.

   Ⓑ They prevent erosion of soil.

   Ⓒ They cause mountain building.

   Ⓓ They prevent mountain building.

2. Which statement describes physical weathering?

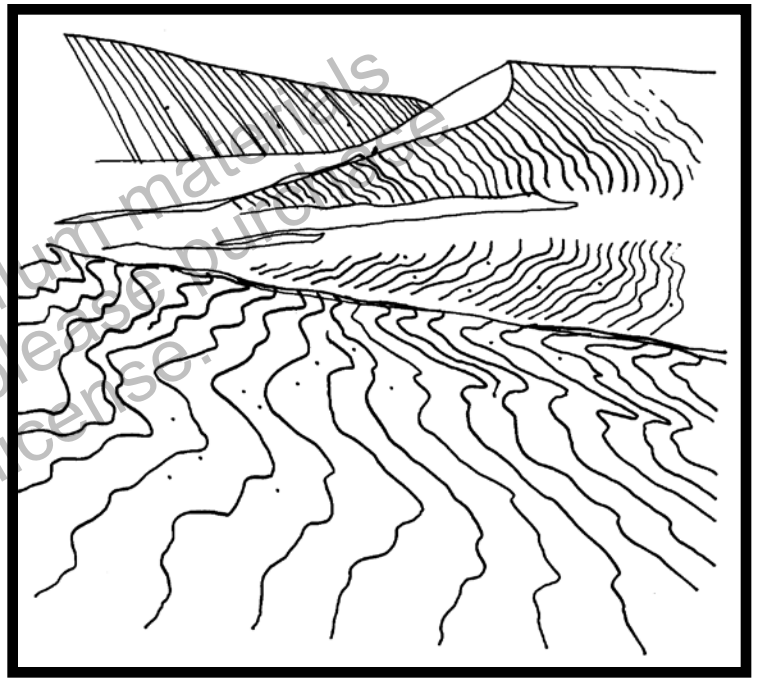
   Ⓐ the expansion of ice underground

   Ⓑ the change of earth materials by chemicals

   Ⓒ the deposition of sand and soil in a new place

   Ⓓ the breakdown of large rocks into smaller ones

3. The diagram below shows a sand dune.



Which natural force creates sand dunes?

Ⓐ wind

Ⓑ water

Ⓒ gravity

Ⓓ glaciers

Slow Earth-Changing Processes

Check Understanding

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

4. Identify **two** ways that ice causes physical weathering.

1) _____

2) _____

Explain how ice causes this physical weathering.

_____

_____

_____

_____

_____

_____

5. Which statement is an example of a slow Earth-changing process?

Ⓐ Wind and rain destroy a corn field.

Ⓑ Gravity causes acorns to fall from a tree.

Ⓒ A rainstorm causes the street to flood.

Ⓓ A river carves a valley in a mountain.

6. What is the process by which soil and weathered rock particles collect in an area?

Ⓐ erosion

Ⓑ evaporation

Ⓒ deposition

Ⓓ condensation

Slow Earth-Changing Processes

Assessment Scoring Guidelines

1. Answer B is correct.

2. Answer D is correct.

3. Answer A is correct.

4. Erosion
Glaciers erode Earth's crust as they melt, carving out large valleys.

Expansion
Water freezes inside the ground, expanding and breaking apart Earth's crust.

5. Answer D is correct.

6. Answer C 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.

Draw Conclusions

When you read, think about what you read and draw conclusions. Facts from the book should support these conclusions.

Here is a paragraph from *Slow Earth-Changing Processes*. The graphic organizer shows one conclusion you might draw. It also shows the facts that support this conclusion.

There are other ways gravity changes Earth's surface. Ice breaks apart Earth's crust. Then, gravity makes the broken parts roll downhill.

Conclusion

Gravity plays a part in other types of erosion.

Facts

- Ice breaks apart Earth's crust.
- Gravity makes the broken parts roll downhill.

TRY THE SKILL

Read this paragraph about the effects of erosion.

Without trees, the land eroded. The rain and wind carried the good soil away. Fewer plants grew. Many animals couldn't find enough to eat. People had trouble farming. They could not find enough firewood.

Now complete this graphic.

Conclusion

Facts

Make Inferences

Authors often do not tell you everything. To figure out more, you can make inferences. To infer, you think about what you read and what you already know. Then you reach a decision or answer your question. For practice, read this passage:

Rivers slowly erode their banks. Dirt and rocks wash downstream. Some goes all the way to the ocean. Rock and dirt that goes to the ocean forms a delta.

Deltas are marshy. Often the land is good for farming. But farming and building houses on a delta is tricky. The land is easily flooded.

Why are deltas good for farming?

You can infer the answer to this question. First, think about what you read: rivers wash dirt, or soil, downstream. Then think about what you already know: plants grow better in rich soil. Now you can use what you read and what you know to answer the question: A delta is made of rich soil that has washed downstream. This soil helps plants grow.

TRY THE SKILL

To practice inferring, read this passage from the book. Then answer the question.

Physical weathering is the breakdown of large pieces of rocks into smaller ones. Heat, water, ice, and pressure are some causes.

For example, water can seep into cracks in rocks. When the water freezes, it expands. This causes the crack to widen and breaks the rock apart.

1. Would a cliff weather faster in a climate that's always warm, always cold, or sometimes warm and sometimes cold? Explain your answer.

_____

_____

_____

_____

_____

Compare and Contrast

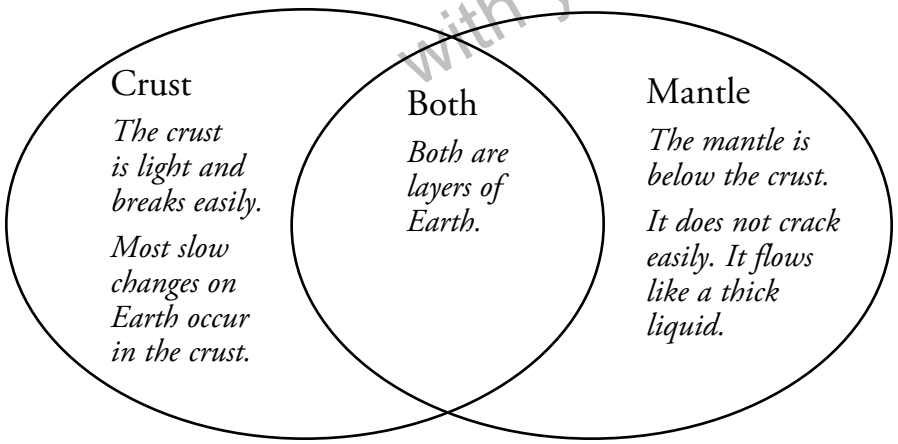
Comparing and contrasting can help you understand what you read.

- **Comparing tells how things are alike.**
- **Contrasting tells how things are different.**

Read these paragraphs from *Slow Earth-Changing Processes*. Then, read the Venn diagram that compares and contrasts.

Earth has four layers. The crust is the layer we walk on. It is light and breaks easily. Most of the slow changes on Earth occur in the crust.

The mantle is below the crust. It does not crack easily like the crust. Instead, the mantle flows like a thick liquid.

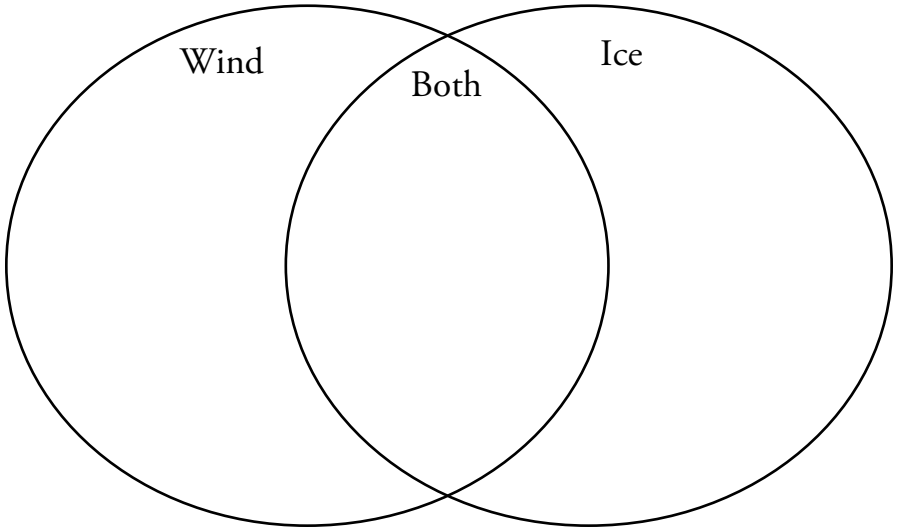


TRY THE SKILL

Read the paragraphs. Think about comparing and contrasting. Then complete the Venn diagram.

Wind
Have you seen the wind blow dirt away? Or maybe sand blown across a beach? This is weathering caused by wind. It changes the surface of Earth.

Ice
Ice doesn't move the way water and wind do. But, ice still causes erosion. When water freezes, it expands. It breaks Earth's crust. Sometimes ice can even break a rock apart.



Context Clues

To figure out the meaning of an unknown word, look for words in the same sentence or nearby sentences that give you clues.

Read this passage from *Slow Earth-Changing Processes*. Try to figure out what gravity means.

What happens when you drop something? It falls. That's gravity at work. Gravity pulls things back to Earth.

What does the word *gravity* mean?

Gravity is a force that pulls things back to Earth. The fourth sentence of the paragraph gives you the clue.

TRY THE SKILL

Read this passage from *Slow Earth-Changing Processes*. Answer the questions.

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

When the glacier stops, the till is left behind. This pile of rocks and dirt is the glacial moraine.

1. What do the words *glacial till* mean in the selection?
Ⓐ the ice that is inside of a glacier
Ⓑ the rocks and dirt in front of a glacier
Ⓒ the erosion caused by a glacier

2. The moving ice causes—
Ⓐ erosion.
Ⓑ deposition.
Ⓒ mountain building.

3. What does the word *glacial moraine* mean in the selection?
Ⓐ the ice that the glacier leaves behind
Ⓑ the same thing as the glacial till
Ⓒ the rocks and dirt left behind by a glacier

Answer Key

Draw Conclusions

Conclusion
Without trees, the land eroded.

Facts

- The rain and wind carried the good soil away.
- Fewer plants grew.
- Many animals couldn't find enough to eat.
- People had trouble farming.
- People could not find enough firewood.

Make Inferences

1. It would weather faster in a climate that's sometimes warm and sometimes cold because this climate has more changes in heat than the other climates. Also, during the cold periods, ice would crack apart the rocks.

Compare and Contrast

Wind: Wind blows dirt away. On a beach, wind moves sand.

Both: Both cause erosion.

Ice: Ice breaks Earth's crust as it expands. Ice can break rocks apart.

Context Clues

1. B

2. A

3. C