Lesson 4.1
Exploring How Landforms Erode Quickly
Lesson Overview

Students are introduced to the final chapter of the unit. They will now consider the cliff near Oceanside Recreation Center that eroded significantly overnight. This fast change to the nearby cliff prompts students to begin investigating how landforms can erode quickly. Students share initial ideas and record them on a new Anticipatory Chart. Then students diagram what they think may have happened to the nearby cliff to cause it to erode so quickly. Students read Handbook of Land and Water to discover that landforms with cracks and landforms made of loose materials can erode quickly. The purpose of this lesson is for students to generate ideas about how landforms erode quickly.

**Anchor Phenomenon:** A cliff has eroded overnight.

**Investigative Phenomenon:** Landforms can change quickly.

**Students learn:**

- Some landforms are made of loose materials.
- Landforms with cracks and landforms made of loose materials are less stable than landforms made of solid rock.
Reading About How Landforms Erode Quickly

Students read from *Handbook of Land and Water* to learn about what could make fast erosion possible.

**Instructional Guide**

1. **Hold up one copy of *Handbook of Land and Water***.

   We have brainstormed and diagrammed our ideas about how a landform can erode quickly. Since we want to locate information about a specific question, we can also use our reference books.

   Let’s use *Handbook of Land and Water* to investigate how landforms erode quickly.

2. **Project notebook**. Have students turn to page 61, Ways Landforms Can Erode Quickly, in the notebook. Review the directions and explain that partners will gather ideas from *Handbook of Land and Water* about how landforms can erode quickly and record their ideas in the table. Let students know they might not find evidence about landforms eroding quickly for every landform in the reference book. Leave this notebook page projected for the rest of this activity.

3. **Designate partners and distribute books**.

4. **Remind students of the table of contents and page 10, Landforms and Bodies of Water**. Point out that students should use one or both of these pages to help them locate the different landforms to read about.

5. **Model recording and visualizing ideas about caves**. Let students know you will record information about caves. Have students follow along in their books as you model.

   - Turn to page 15 of *Handbook of Land and Water*. Point out that pages 15 and 16 are about caves but do not contain information about how caves erode quickly.
   
   - Turn to page 17 and remind students that they have already read this page, or a page like it about another landform, during a previous lesson. This page explains how caves change slowly. Explain that this page will not help them gather ideas about how caves erode quickly.
• Turn to page 18 and read the heading aloud. Let students know this page should be helpful as they think about how landforms can erode quickly.

• Read page 18 aloud and model visualizing caves eroding quickly.

This page talks about cave-ins happening when the rock is weak or cracked. I am visualizing rock that can break easily, and is not as strong as other rocks I’ve observed. What I am visualizing helps me understand why the cave suddenly fell apart and a cave-in happened.

Using what I visualized and the information about cave-ins on page 18 will help me complete the table in the notebook.

• In the “Landform” column of the projected table, write “cave.”

• In the “How the landform erodes quickly” column, write “when the rock of a cave is weak or cracked, it is less stable. Less stable rock can fall down.”

6. On-the-Fly Assessment: Pairs read about landforms and complete notebook page 61. Remind students to visualize the information they read before recording their ideas in their notebooks. As students read, circulate and ask students to share what they are visualizing about how landforms can erode quickly.

7. Have each pair join another pair to discuss. Ask pairs to join another pair to discuss one landform they read about and explain how it eroded quickly. Encourage pairs to share about different landforms.

Embedded Formative Assessment

On-the-Fly Assessment 9: Visualizing How Landforms Can Erode Quickly

Look for: At this point, students are beginning to gather evidence of how landforms can erode quickly by visualizing processes described in the reference book. Students are asked to use the strategy of visualizing to support their comprehension of landforms eroding quickly. As you circulate, ask students to explain what they are visualizing as they read about a specific landform. Take note of whether they are using visualizing to help them understand the information in the book.

Now what? As you circulate and discuss what pairs are visualizing, share several examples with the class. For example, you could say, “I heard a student describe a picture he created in his mind when he was reading about beaches. This student remembered to use the information in the book to help him visualize how a landform can erode quickly.” You can also ask students to share what they visualized after all students have read from the book. Sharing aloud allows other students to hear examples of what it means to visualize during reading.
Teacher Support

Instructional Suggestion

_Literacy Note: Choosing Landforms in the Reference Book_
Students have been introduced to the idea that reference books are not intended to be read cover to cover. Rather, people search for the information they need and then read the relevant sections carefully. In this lesson, students are responsible for choosing landforms to read about. Some students may record information about islands in their notebooks. The island example is not an example of how landforms erode quickly, rather, it is an example of how landforms change quickly. It is fine if students list an island as an example in their notebooks. There is an opportunity to discuss the island example in the next activity.

Possible Responses

Investigation Notebook
_Ways Landforms Can Erode Quickly_ (page 61)

Answers will vary. Examples:

**Landform:** beach
**How the landform erodes quickly:** A beach is made of sand, which is not a very stable. When there is a storm, it can erode a lot of sand quickly.

**Landform:** mountain
**How the landform erodes quickly:** A rock with cracks is unstable. When lots of rain hits unstable rock, it can cause a landslide to happen quickly.

**Landform:** valley/canyon
**How the landform erodes quickly:** Parts of a valley are made of loose sand and soil, which are not very stable. When flood water hits these things, it erodes a lot of the sand and soil quickly.
Discussing Landforms That Erode Quickly

The class discusses ideas about cracks and loose materials as causes of fast erosion.

Instructional Guide

1. **Discuss landforms that erode quickly.** Use the following questions to guide a whole-class discussion about what can cause landforms to erode quickly.

   - *What can cause landforms to be less stable?* [Loose materials or cracks in the rock.]
   - *What is an example of a landform that can erode quickly because of cracks in the rock?* [A cave. A mountain.]
   - *What is an example of a landform that can erode quickly because it is made of loose materials?* [A beach. A valley.]

2. **Discuss the island example.** Discuss how the example of the island on page 22 in the book is not an example of erosion. It is an example of how an island can change quickly, but it does not help students investigate the question *How do landforms erode quickly?* Offer students who read about islands a chance to share what they learned about how they change quickly and, as needed, clarify how this is different from erosion.

3. **Collect all copies of *Handbook of Land and Water.***

4. **Conclude the lesson.** Let students know that in the next lesson, they will have the opportunity to use models to investigate landforms made of loose materials.

In this lesson, we observed a pattern that landforms with cracks or landforms made of loose materials can erode quickly. Tomorrow, we will investigate the idea that loose materials affects how fast a landform erodes, using models.
Teacher Support

Rationale

Science Note: Cracks and Loose Materials
Some landforms can erode quickly because of significant cracks in the rock. When a crack reaches a certain size, a large piece of rock may break off suddenly. Other landforms erode quickly because they are made of loose materials—for example, packed soil or sand. It takes much less force to cause a piece of loose material to break off a landform than it does for a small piece of solid rock to break off a landform; therefore, a landform made of loose material can erode significantly in a short amount of time. Students are exposed to both of these possibilities in this lesson, but the rest of the chapter focuses on landforms made of loose materials, rather than landforms with significant cracks. This is because there is no clear way to tell which cracks will cause landforms to erode quickly and which will not. Almost all rock has some cracks, but not all cracks are significant enough to cause a landform to erode quickly. This chapter focuses on distinguishing landforms made of solid rock from landforms made of loose materials—a more clear-cut distinction.
Ways Landforms Can Erode Quickly

Directions:
1. Read about at least two landforms in Handbook of Land and Water.
2. List each landform on the left side of the table.
3. On the right side of the table, explain how the landform can erode quickly.

Question: How can landforms erode quickly?

<table>
<thead>
<tr>
<th>Landform</th>
<th>How the landform erodes quickly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reading About How Landforms Erode Quickly

Students read from *Handbook of Land and Water* to learn about what could make fast erosion possible.

**Instructional Guide**

1. Hold up one copy of *Handbook of Land and Water*.

   Hemos intercambiado ideas y hemos diagramado nuestras ideas sobre cómo se puede erosionar rápidamente un accidente geográfico. Como queremos localizar información sobre una pregunta específica, también podemos usar nuestros libros de referencia.

   Usemos el *Manual de la tierra y el agua* para investigar cómo se erosionan rápidamente los accidentes geográficos.

2. **Project notebook.** Have students turn to page 61, Ways Landforms Can Erode Quickly, in the notebook. Review the directions and explain that partners will gather ideas from *Handbook of Land and Water* about how landforms can erode quickly and record their ideas in the table. Let students know they might not find evidence about landforms eroding quickly for every landform in the reference book. Leave this notebook page projected for the rest of this activity.

3. **Designate partners and distribute books.**

4. **Remind students of the table of contents and page 10, Landforms and Bodies of Water.** Point out that students should use one or both of these pages to help them locate the different landforms to read about.

5. **Model recording and visualizing ideas about caves.** Let students know you will record information about caves. Have students follow along in their books as you model.

   - Turn to page 15 of *Handbook of Land and Water*. Point out that pages 15 and 16 are about caves but do not contain information about how caves erode quickly.
• Turn to page 17 and remind students that they have already read this page, or a page like it about another landform, during a previous lesson. This page explains how caves change slowly. Explain that this page will not help them gather ideas about how caves erode quickly.

• Turn to page 18 and read the heading aloud. Let students know this page should be helpful as they think about how landforms can erode quickly.

• Read page 18 aloud and model visualizing caves eroding quickly.

6. **On-the-Fly Assessment: Pairs read about landforms and complete notebook page 61.** Remind students to visualize the information they read before recording their ideas in their notebooks. As students read, circulate and ask students to share what they are visualizing about how landforms can erode quickly.

7. **Have each pair join another pair to discuss.** Ask pairs to join another pair to discuss one landform they read about and explain how it eroded quickly. Encourage pairs to share about different landforms.

---

**Embedded Formative Assessment**

**On-the-Fly Assessment 9: Visualizing How Landforms Can Erode Quickly**

**Look for:** At this point, students are beginning to gather evidence of how landforms can erode quickly by visualizing processes described in the reference book. Students are asked to use the strategy of visualizing to support their comprehension of landforms eroding quickly. As you circulate, ask students to explain what they are visualizing as they read about a specific landform. Take note of whether they are using visualizing to help them understand the information in the book.

**Now what?** As you circulate and discuss what pairs are visualizing, share several examples with the class. For example, you could say, “I heard a student describe a picture he created in his mind when he was reading about beaches. This student remembered to use the information in the book to help him visualize how a landform can erode quickly.” You can also ask students to share what they visualized after all students have read from the book. Sharing aloud allows other students to hear examples of what it means to visualize during reading.
Teacher Support

Instructional Suggestion

**Literacy Note: Choosing Landforms in the Reference Book**
Students have been introduced to the idea that reference books are not intended to be read cover to cover. Rather, people search for the information they need and then read the relevant sections carefully. In this lesson, students are responsible for choosing landforms to read about. Some students may record information about islands in their notebooks. The island example is not an example of how landforms erode quickly, rather, it is an example of how landforms change quickly. It is fine if students list an island as an example in their notebooks. There is an opportunity to discuss the island example in the next activity.

Possible Responses

**Investigation Notebook**
Ways Landforms Can Erode Quickly (page 61)

Answers will vary. Examples:

- **Landform:** beach  
  **How the landform erodes quickly:** A beach is made of sand, which is not a very stable. When there is a storm, it can erode a lot of sand quickly.

- **Landform:** mountain  
  **How the landform erodes quickly:** A rock with cracks is unstable. When lots of rain hits unstable rock, it can cause a landslide to happen quickly.

- **Landform:** valley/canyon  
  **How the landform erodes quickly:** Parts of a valley are made of loose sand and soil, which are not very stable. When flood water hits these things, it erodes a lot of the sand and soil quickly.
The class discusses ideas about cracks and loose materials as causes of fast erosion.

**Instructional Guide**

1. **Discuss landforms that erode quickly.** Use the following questions to guide a whole-class discussion about what can cause landforms to erode quickly.

   - *What can cause landforms to be less stable?* [Loose materials or cracks in the rock.]
   - *What is an example of a landform that can erode quickly because of cracks in the rock?* [A cave. A mountain.]
   - *What is an example of a landform that can erode quickly because it is made of loose materials?* [A beach. A valley.]

2. **Discuss the island example.** Discuss how the example of the island on page 22 in the book is not an example of erosion. It is an example of how an island can change quickly, but it does not help students investigate the question *How do landforms erode quickly?* Offer students who read about islands a chance to share what they learned about how they change quickly and, as needed, clarify how this is different from erosion.

3. **Collect all copies of Handbook of Land and Water.**

4. **Conclude the lesson.** Let students know that in the next lesson, they will have the opportunity to use models to investigate landforms made of loose materials.

En esta lección, observamos un patrón de que los accidentes geográficos con grietas o los accidentes geográficos hechos de materiales sueltos pueden erosionarse rápidamente. Usando modelos, mañana investigaremos la idea de que los materiales sueltos afectan qué tan rápido se erosiona un accidente geográfico.
Teacher Support

Rationale

Science Note: Cracks and Loose Materials
Some landforms can erode quickly because of significant cracks in the rock. When a crack reaches a certain size, a large piece of rock may break off suddenly. Other landforms erode quickly because they are made of loose materials—for example, packed soil or sand. It takes much less force to cause a piece of loose material to break off a landform than it does for a small piece of solid rock to break off a landform; therefore, a landform made of loose material can erode significantly in a short amount of time. Students are exposed to both of these possibilities in this lesson, but the rest of the chapter focuses on landforms made of loose materials, rather than landforms with significant cracks. This is because there is no clear way to tell which cracks will cause landforms to erode quickly and which will not. Almost all rock has some cracks, but not all cracks are significant enough to cause a landform to erode quickly. This chapter focuses on distinguishing landforms made of solid rock from landforms made of loose materials—a more clear-cut distinction.
**Maneras en las que los accidentes geográficos se pueden erosionar rápidamente**

**Instrucciones:**
1. Lee acerca de por lo menos dos accidentes geográficos en el *Manual de la tierra y el agua*.
2. Enumera cada accidente geográfico en el lado izquierdo de la tabla.
3. En el lado derecho de la tabla, explica cómo se puede erosionar rápidamente el accidente geográfico.

**Pregunta:** ¿Cómo se pueden erosionar rápidamente los accidentes geográficos?

<table>
<thead>
<tr>
<th>Accidente geográfico</th>
<th>Cómo se erosiona rápidamente el accidente geográfico</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© 2018 The Regents of the University of California. All rights reserved.