

Grade 2 Science

Unit 3: Exploring Land and Water

24 lessons and a unit quiz. Use this pack with the **Exploring Land and Water Student Reader** (print it, or download it once from the course) to teach the whole unit without the internet.

What is in this pack

- A lesson plan for each chapter: the Big Question, words to know, which pages to read, questions to talk over and the activity pages.
- The unit quiz, ready to print.
- Answers for the teacher at the back: every discussion question and the quiz key.

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Lesson schedule

Two or three lessons a week, about 30 minutes each. Tick each one off as you go.

	Lesson	Reader pages	Activity pages
☐	Getting started: Meet the Big Question	PDF pages 6–11	—
☐	Lesson 1.1: What Are Hills and Mountains?	PDF pages 12–15	AP 1.1.1
☐	Lesson 1.2: What Are Weathering and Erosion?	—	AP 1.2.1
☐	Lesson 1.3: Weathering and Erosion Problems	—	AP 1.3.1
☐	Lesson 1.4: What Keeps the Water Out?	—	AP 1.4.1, AP 1.4.2
☐	Lesson 2.1: What Are Glaciers and Valleys?	PDF pages 16–23	AP 2.1.1
☐	Lesson 2.2: Let’s Map It!	—	AP 2.2.1
☐	Lesson 2.3: How Does Water Flow?	—	AP 2.3.1
☐	Lesson 2.4: What Does Water Move?	—	AP 2.4.1
☐	Lesson 2.5: Where Can We Find Water?	—	AP 2.5.1
☐	Lesson 2.6: Modeling Land and Water Features	—	AP 2.6.1, AP 2.6.2
☐	Lesson 3.1: What Is Yellowstone National Park?	PDF pages 24–31	AP 3.1.1
☐	Lesson 3.2: Geysers and Groundwater	—	AP 3.2.2
☐	Lesson 3.3: What Are Volcanoes?	—	AP 3.3.1
☐	Lesson 3.4: Modeling Volcanoes and Earthquakes	—	AP 3.4.1, AP 3.4.2
☐	Lesson 4.1: What Is Yosemite National Park?	PDF pages 32–39	AP 4.1.1
☐	Lesson 4.2: What Is a Landslide?	—	AP 4.2.1, AP 4.2.2
☐	Lesson 4.3: Preventing Landslides	—	AP 4.3.1, AP 4.3.2
☐	Lesson 5.1: What Is Arches National Park?	PDF pages 40–45	AP 5.1.1
☐	Lesson 5.2: How Can Sandstone Be Shaped?	—	AP 5.2.1, AP 5.2.2, AP 5.2.3
☐	Lesson 6.1: What Is Cape Cod National Seashore?	PDF pages 46–53	AP 6.1.1

	Lesson	Reader pages	Activity pages
☐	Lesson 6.2: Sand on the Move!	—	AP 6.2.1
☐	Lesson 6.3: Sand Dunes and Beaches	—	AP 6.3.1
☐	Lesson 6.4: Protecting Sand Dunes	PDF pages 54–64	AP 6.4.1, AP 6.4.2
☐	Unit review and assessment	—	AP UO.1
☐	Words quiz	—	—

Page numbers are the PDF page numbers of the Student Reader file, so they match what your PDF reader shows.

Getting started: Meet the Big Question

THE BIG QUESTION

How can things that happen on Earth change the land?

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 26–30: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapter 1: “America’s Amazing Landscape”: PDF pages 6–11. Look at the pictures and maps together.

Talk it over

1. Are these part of a landscape, too?
2. INFERENTIAL—What do you think the map shows?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can things that happen on Earth change the land?

Lesson 1.1: What Are Hills and Mountains?

THE BIG QUESTION

What Are Hills and Mountains?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **landscape** — an area of land that includes landforms, plants, and human elements
- **notice** — to see and pay attention to something
- **observe** — to watch something and notice details about it (observation, n. the process of noticing details or a specific detail that is noticed)

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 31–44: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapter 2: “Protecting Stone from Changes”: PDF pages 12–15. Look at the pictures and maps together.

Talk it over

1. Can you cut a rock with scissors?
2. Landforms can also change quickly by natural events, like earthquakes, volcanic eruptions, and floods. 32 EXPLORING LAND AND WATER LITERAL—Where is Logan’s family’s first stop?
3. The carved rock faces are huge! 6 INFERENTIAL—Why do you think those presidents were carved into the side of a mountain?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Are Hills and Mountains?
- Use one of today’s words in a sentence of your own.

Activity pages

- Activity Page 1.1.1: The Rock — Teacher Guide PDF page 245

Lesson 1.2: What Are Weathering and Erosion?

THE BIG QUESTION

What Are Weathering and Erosion?

Words to know

- **change** — to become different; to make something different (also n. a difference from something's former condition)
- **erosion** — the process of moving earth material from one place to another
- **shape** — the form or outline of an object

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 45-50: the steps, materials and timing for this lesson.

Talk it over

1. Distribute How Does Freezing Water Affect Rocks?
2. Use the following questions to gauge student understanding of the investigation: Ask students, What did the plaster represent?
3. Ask students What did the ice that froze inside the balloon do to the plaster?
4. Ask students, What effect would freezing water have on rocks and things made of rocks, like sidewalks and roads?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Are Weathering and Erosion?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 1.2.1: How Does Freezing Water Affect Rocks? — Teacher Guide PDF page 246

Lesson 1.3: Weathering and Erosion Problems

THE BIG QUESTION

Why would a carved stone monument need protection?

Words to know

- **change** — to become different; to make something different (also n. a difference from something's former condition)
- **erosion** — the process of moving earth material from one place to another
- **shape** — the form or outline of an object
- **weathering** — the process of rock being dissolved, worn, or broken down into smaller pieces

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 51–60: the steps, materials and timing for this lesson.

Talk it over

1. Why or why not?
2. The rock can break. 9 LITERAL—How does water ruin rock?
3. It keeps water out of the cracks. 10 LITERAL—What do workers do to the cracks in Mount Rushmore?
4. LITERAL—How does silicone work?
5. Wind has been blowing sand against it for a very long time. 11 NGSS Elements LITERAL—How can wind change a stone monument?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: Why would a carved stone monument need protection?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 1.3.1: Problem and Solution: Water — Teacher Guide PDF page 247

Lesson 1.4: What Keeps the Water Out?

THE BIG QUESTION

What Keeps the Water Out?

Words to know

- **criteria** — standards by which something is judged, evaluated, or assessed
- **erosion** — the process of moving earth material from one place to another
- **evaluate** — to examine the details of something and determine the value or effectiveness of it

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 61–65: the steps, materials and timing for this lesson.

Talk it over

1. Distribute Did the Sealing Tests Work?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Keeps the Water Out?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 1.4.1: Did the Sealing Tests Work? — Teacher Guide PDF page 248
- Activity Page 1.4.2: Scrapbook—Lesson 1 — Teacher Guide PDF page 249

Lesson 2.1: What Are Glaciers and Valleys?

THE BIG QUESTION

What Are Glaciers and Valleys?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 66–77: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapters 3–4: “Next Stop—Glacier National Park” and “Mountains, Ice, and Water”: PDF pages 16–23. Look at the pictures and maps together.

Talk it over

1. Remind students that they learned in Lesson 1 that mountains and hills are landforms. (See Know the Science.) INFERENTIAL—Why does Logan think it will be cold at Glacier National Park?
2. Some maps can tell you how deep oceans are or how tall mountains are. (See Know the Standards 2 and 3.) LITERAL—What kinds of things can you tell from this particular map?
3. DCI ESS2.C LITERAL—What words could Logan use to describe the lake?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Are Glaciers and Valleys?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 2.1.1: Water and Land — Teacher Guide PDF page 250

Lesson 2.2: Let's Map It!

THE BIG QUESTION

How do maps show different types of land and water?

Words to know

- **direction** — the path along which something moves or the point toward which something is aimed
- **elevation** — height above sea level
- **high** — elevated considerably above a point of reference; opposite of low
- **low** — a point or level that is smaller in size, degree, or elevation; opposite of high
- **topography** — the physical features of an area of land that includes landforms and their elevations and bodies of water
- **view** — all that can be seen from a certain place

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 78–83: the steps, materials and timing for this lesson.

Talk it over

1. Or is it smaller on the map?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How do maps show different types of land and water?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 2.2.1: Map It! — Teacher Guide PDF pages 251–252

Lesson 2.3: How Does Water Flow?

THE BIG QUESTION

How Does Water Flow?

Words to know

- **investigate** — to observe and study something to collect information

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 84–89: the steps, materials and timing for this lesson.

Talk it over

1. Will it flow in the same direction?
2. Was it flowing or standing still?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How Does Water Flow?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 2.3.1: How Water Flows — Teacher Guide PDF page 253

Lesson 2.4: What Does Water Move?

THE BIG QUESTION

What Does Water Move?

Words to know

- **erosion** — the process of moving earth material from one place to another
- **friction** — the resistance of motion when something rubs against something else
- **investigate** — to observe and study something to collect information
- **sediment** — tiny, broken-down particles of earth material
- **weathering** — the process of rock being dissolved, worn, or broken down into smaller pieces

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 90–95: the steps, materials and timing for this lesson.

Check for understanding

- Answer the Big Question in a sentence or two: What Does Water Move?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 2.4.1: Moving Ice — Teacher Guide PDF page 254

Lesson 2.5: Where Can We Find Water?

THE BIG QUESTION

Where Can We Find Water?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 96–106: the steps, materials and timing for this lesson.

Talk it over

1. It isn't strange because glaciers are so big and do not melt completely.
LITERAL—What keeps glaciers from melting completely?
2. Others may have experienced dry spells or flooding. • Discuss what students know about the differences among different bodies of water by asking these questions:
What is the difference between a lake and a pond?
3. CCC 1 SEP 8 What do you think is the difference between rivers and lakes?
4. What water in the picture is liquid?
5. CCC 1 SEP 8 LITERAL—Why isn't it strange to see a glacier in the summertime?
6. LITERAL—What happens when a glacier flows to a place where the land meets the water?
7. How was it formed?
8. Lakes are surrounded by higher land, so the water stays where it is. (See Know the Standards 2.) 3D Learning LITERAL—How does a glacier help form water features?
9. Use the following question prompts to monitor progress and gauge understanding: •
Where can you find water on Earth?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: Where Can We Find Water?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 2.5.1: Solve a Riddle — Teacher Guide PDF page 255

Lesson 2.6: Modeling Land and Water Features

THE BIG QUESTION

How can we model a place's land and water?

Words to know

- **represent** — to display or serve as a sign of something, such as a drawing

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 107–111: the steps, materials and timing for this lesson.

Check for understanding

- Answer the Big Question in a sentence or two: How can we model a place's land and water?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 2.6.1: Land and Water Flags — Teacher Guide PDF page 256
- Activity Page 2.6.2: Scrapbook—Lesson 2 — Teacher Guide PDF page 257

Lesson 3.1: What Is Yellowstone National Park?

THE BIG QUESTION

What Is Yellowstone National Park?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something
- **observe** — to watch something and notice details about it (observation, n. the process of noticing details or a specific detail that is noticed)

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 112–122: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapters 5–6: “Next Stop—Yellowstone National Park” and “Heat Below Earth’s Surface”: PDF pages 24–31. Look at the pictures and maps together.

Talk it over

1. Here, students review how a map can be used to find key land features that Logan and his family want to see. 112 EXPLORING LAND AND WATER INFERENTIAL—How will the map help Logan and his family?
2. Logan and his family are walking across the top of a giant volcano! 22 LITERAL—What does Logan feel as he walks across the boardwalk of the geyser?
3. The lake is formed in the low area in the center of the caldera. 23 LITERAL—What landforms do you see in the picture?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Is Yellowstone National Park?
- Use one of today’s words in a sentence of your own.

Activity pages

- Activity Page 3.1.1: Yellowstone National Park — Teacher Guide PDF page 258

Lesson 3.2: Geysers and Groundwater

THE BIG QUESTION

What happens to water that soaks into the ground?

Words to know

- **examine** — to look at something closely and carefully to learn more about it
- **investigate** — to observe and study something to collect information
- **observe** — to watch something and notice details about it (observation, n. the process of noticing details or a specific detail that is noticed)

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 123–130: the steps, materials and timing for this lesson.

Talk it over

1. Ask students, Where does the water go?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What happens to water that soaks into the ground?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 3.2.2: Geyser Go! — Teacher Guide PDF page 260

Lesson 3.3: What Are Volcanoes?

THE BIG QUESTION

What Are Volcanoes?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something
- **observe** — to watch something and notice details about it (observation, n. the process of noticing details or a specific detail that is noticed)

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 131-138: the steps, materials and timing for this lesson.

Talk it over

1. EVALUATIVE—How does a volcano compare to a geyser?
2. LITERAL—What are some different kinds of volcanoes?
3. RI.2.1 by answering questions about the nature of changes caused by volcanoes to demonstrate understanding of key details in the Student Book. 130 EXPLORING LAND AND WATER LITERAL—How does a geyser form?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Are Volcanoes?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 3.3.1: About Volcanoes — Teacher Guide PDF page 261

Lesson 3.4: Modeling Volcanoes and Earthquakes

THE BIG QUESTION

How can we model volcanoes and earthquakes?

Words to know

- **eruption** — the event that occurs when lava, rock, and ash erupt from a volcano ed words and phrases are he unit that you should model for r use in isolated drill or memorization
- **investigate** — to observe and study something to collect information
- **model** — a representation of something that can help people learn about the real thing

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 139–145: the steps, materials and timing for this lesson.

Talk it over

1. How can lava change the land when it cools?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can we model volcanoes and earthquakes?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 3.4.1: Look at an Earthquake — Teacher Guide PDF page 262
- Activity Page 3.4.2: Scrapbook—Lesson 3 — Teacher Guide PDF page 263

Lesson 4.1: What Is Yosemite National Park?

THE BIG QUESTION

What Is Yosemite National Park?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something
- **observe** — to watch something and notice details about it (observation, n. the process of noticing details or a specific detail that is noticed)

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 146–160: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapter 7: “Next Stop—Yosemite National Park”: PDF pages 32–39. Look at the pictures and maps together.

Talk it over

1. LITERAL—Where is Yosemite National Park?
2. Uluru is about as large as the mountain prominence on which Half Dome sits. 148 EXPLORING LAND AND WATER LITERAL—What does Half Dome look like?
3. DCI ESS1.C CCC 7 LITERAL—How did Half Dome go from being underground to aboveground?
4. What process took a short amount of time?
5. Differentiation INTERPRETIVE—What is the difference between a mudslide and a landslide?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Is Yosemite National Park?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 4.1.1: Yosemite National Park — Teacher Guide PDF page 264

Lesson 4.2: What Is a Landslide?

THE BIG QUESTION

What Is a Landslide?

Words to know

- **investigate** — to observe and study something to collect information
- **model** — a representation of something that can help people learn about the real thing

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 161–166: the steps, materials and timing for this lesson.

Check for understanding

- Answer the Big Question in a sentence or two: What Is a Landslide?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 4.2.1: Paper House Template — Teacher Guide PDF page 265
- Activity Page 4.2.2: Landslide Investigation — Teacher Guide PDF page 266

Lesson 4.3: Preventing Landslides

THE BIG QUESTION

How can land move quickly?

Words to know

- **analyze** — to examine, study, or look carefully to explain or describe
- **compare** — to examine characteristics of two or more things, particularly looking for similarities

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 167–172: the steps, materials and timing for this lesson.

Check for understanding

- Answer the Big Question in a sentence or two: How can land move quickly?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 4.3.1: Solution Scorecard — Teacher Guide PDF page 267
- Activity Page 4.3.2: Scrapbook—Lesson 4 — Teacher Guide PDF page 268

Lesson 5.1: What Is Arches National Park?

THE BIG QUESTION

What Is Arches National Park?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something
- **observe** — to watch something and notice details about it (observation, n. the process of noticing details or a specific detail that is noticed)

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 173–186: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapter 8: “Next Stop—Arches National Park”: PDF pages 40–45. Look at the pictures and maps together.

Talk it over

1. Deserts are usually dry and very hot and get a lot of strong sun. (See Know the Standards 1.) LITERAL—How is the landscape here different from Yellowstone National Park, Glacier National Park, and Yosemite National Park?
2. INFERENTIAL—Why do you think this park is called Arches National Park?
3. INFERENTIAL—What natural processes do you think caused the rocks to look this way in Arches National Park?
4. Logan wonders how this happens. 38 LITERAL—What are the tall columns of rock called?
5. INTERPRETIVE—In the second picture, what part of the rock is wearing away the most?
6. A storm caused the top of the arch pictured below to fall into the sea. 41 LITERAL—Where else can rock arches form, besides the desert?
7. These events happen suddenly, even if the arches have been wearing away over a long period of time. 178 EXPLORING LAND AND WATER EVALUATIVE—Along the shore, would water or wind cause more change to rocks?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Is Arches National Park?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 5.1.1: Arches National Park — Teacher Guide PDF page 269

Lesson 5.2: How Can Sandstone Be Shaped?

THE BIG QUESTION

How Can Sandstone Be Shaped?

Words to know

- **investigate** — to observe and study something to collect information
- **model** — a representation of something that can help people learn about the real thing

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 187–192: the steps, materials and timing for this lesson.

Check for understanding

- Answer the Big Question in a sentence or two: How Can Sandstone Be Shaped?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 5.2.1: Water Changes Rock — Teacher Guide PDF page 270
- Activity Page 5.2.2: Wind Changes Rock — Teacher Guide PDF page 271
- Activity Page 5.2.3: Scrapbook—Lesson 5 — Teacher Guide PDF page 272

Lesson 6.1: What Is Cape Cod National Seashore?

THE BIG QUESTION

What Is Cape Cod National Seashore?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 193-204: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapters 9-10: “Last Stop—A Day at the Beach” and “Wind, Water, and Moving Sand”: PDF pages 46-53. Look at the pictures and maps together.

Talk it over

1. Cape Cod National Seashore LITERAL—What kind of place does this look like?
2. INFERENTIAL—Do you think sand dunes like this took a long time or a short time to form?
3. Now, they learn that water can be found in the ocean at the beach. 194 EXPLORING LAND AND WATER LITERAL—What kinds of things do you notice about the landscape?
4. Up on the dunes, the grasses rustle and sway. 44 NGSS Elements INFERENTIAL—How do you think the wind impacts all the sand?
5. The rocks are arranged in a narrow pile extending from the beach out into the ocean water. 45 INFERENTIAL—What do you think the fences are for?
6. INFERENTIAL—Why is sand collecting behind the fences?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What Is Cape Cod National Seashore?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 6.1.1: Cape Cod National Seashore — Teacher Guide PDF page 273

Lesson 6.2: Sand on the Move!

THE BIG QUESTION

How can we model changing dunes and beaches?

Words to know

- **investigate** — to observe and study something to collect information
- **shoreline** — the line where a body of water and land meet

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 205–209: the steps, materials and timing for this lesson.

Check for understanding

- Answer the Big Question in a sentence or two: How can we model changing dunes and beaches?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 6.2.1: Exploring Sand — Teacher Guide PDF page 274

Lesson 6.3: Sand Dunes and Beaches

THE BIG QUESTION

How can wind and water affect sand dunes and beaches?

Words to know

- **example** — a sample of something that shows what the whole is like
- **identify** — to indicate what something is
- **notice** — to see and pay attention to something

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 210–219: the steps, materials and timing for this lesson.

Talk it over

1. LITERAL—How does a beach form?
2. LITERAL—How much sand does Cape Cod National Seashore have?
3. This usually happens in the presence of a storm, like a hurricane. 208 EXPLORING LAND AND WATER NGSS Elements LITERAL—Is it hard or easy for wind and water to move sand?
4. Why do you think it is easy for wind and water to move sand?
5. People come up with solutions for keeping sand in place as much as possible. 210 EXPLORING LAND AND WATER INFERENTIAL—What can people do if they want to protect sand dunes?
6. LESSON 6.3 | SAND DUNES AND BEACHES 211 EVALUATIVE—Why might people not want fences near the dunes?
7. If yes, how?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can wind and water affect sand dunes and beaches?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 6.3.1: Draw a Solution — Teacher Guide PDF page 275

Lesson 6.4: Protecting Sand Dunes

THE BIG QUESTION

How can people protect sand dunes from erosion?

Words to know

- **analyze** — to examine, study, or look carefully to explain or describe
- **compare** — to examine characteristics of two or more things, particularly looking for similarities
- **evaluate** — to examine the details of something and determine the value or effectiveness of it

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 220–241: the steps, materials and timing for this lesson.

Read

Read Student Book, Chapter 11: “Science in Action”: PDF pages 54–64. Look at the pictures and maps together.

Talk it over

1. Then ask students to discuss the results of the events that happen quickly or slowly.
Ask, What impact does this have on the landscape or the things around it?
2. LITERAL—Which landforms do you see in the photographs?
3. UNIT SUPPLEMENT | SCIENCE IN ACTION: MAPPING THE OCEAN FLOOR 229
INFERENTIAL—How do you think maps are different from globes?
4. What could these represent?
5. Marie Tharp helped disprove this with evidence based on her research. 232
EXPLORING LAND AND WATER LITERAL—What was Marie Tharp the first person to do?
6. INFERENTIAL—Why do you think the depth of the ocean floor changes?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can people protect sand dunes from erosion?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 6.4.1: Solution Scorecard — Teacher Guide PDF page 276
- Activity Page 6.4.2: Scrapbook—Lesson 6 — Teacher Guide PDF page 277

UNIT REVIEW

Unit review and assessment

- Activity page answer key (for the teacher): Teacher Guide PDF pages 278–281
- Activity Page UO.1 — Teacher Guide PDF page 244

WORDS QUIZ

Exploring Land and Water

Name: _____ Date: _____

Circle the letter of the best answer.

1. Which word means “a clear, tasteless, odorless liquid that covers most of Earth’s surface and on which living organisms depend”?
 - a) water
 - b) rock
 - c) high
 - d) virtual
2. Which word means “to indicate what something is”?
 - a) identify
 - b) direction
 - c) erupt
 - d) rock
3. Which word means “the line where a body of water and land meet”?
 - a) analyze
 - b) shoreline
 - c) criteria
 - d) lava
4. Which word means “a representation of something that can help people learn about the real thing”?
 - a) model
 - b) valley
 - c) analyze
 - d) solution
5. Which word means “a type of rock made of sand pressed together and hardened”?
 - a) score
 - b) sandstone
 - c) sediment
 - d) shape
6. Which word means “hot, liquid rock that flows from a volcano”?
 - a) notice
 - b) lava
 - c) crater
 - d) dune

- 7.** Which word means “a flat representation of an area that shows where things are”?
- a) sediment
 - b) valley
 - c) sandstone
 - d) map
- 8.** Which word means “a large, permanent, flowing body of water that flows across land into a lake, another river, or the ocean”?
- a) river
 - b) design
 - c) erupt
 - d) ash
- 9.** Which word means “to examine characteristics of two or more things, particularly looking for similarities”?
- a) river
 - b) notice
 - c) compare
 - d) wind
- 10.** Which word means “a large area of thick ice made from layers of snow that have never melted”?
- a) elevation
 - b) glacier
 - c) model
 - d) sandstone
- 11.** Which word means “to save from injury, loss, or destruction”?
- a) evaluate
 - b) compare
 - c) preserve
 - d) interpret
- 12.** Which word means “the resistance of motion when something rubs against something else”?
- a) friction
 - b) low
 - c) glacier
 - d) sediment

Answers

Getting started: Meet the Big Question

1. **Are these part of a landscape, too?**

Accept all reasonable answers.

2. **INFERENTIAL—What do you think the map shows?**

The map of most of the United States shows where Logan's family is going to travel.

LITERAL—What kinds of landscapes will Logan and his family see on their trip?

Lesson 1.1: What Are Hills and Mountains?

1. **Can you cut a rock with scissors?**

No Can you change the shape of a rock with an eraser?

2. **Landforms can also change quickly by natural events, like earthquakes, volcanic eruptions, and floods. 32 EXPLORING LAND AND WATER**

LITERAL—Where is Logan's family's first stop?

Mount Rushmore LITERAL—What kind of landform is Mount Rushmore?

3. **The carved rock faces are huge! 6 INFERENTIAL—Why do you think those presidents were carved into the side of a mountain?**

To honor important presidents and promote American democracy; to create a monument that people will visit

Lesson 1.2: What Are Weathering and Erosion?

1. **Distribute How Does Freezing Water Affect Rocks?**

AP 1.2.1

2. **Use the following questions to gauge student understanding of the investigation: Ask students, What did the plaster represent?**

It represents the rock.

3. **Ask students What did the ice that froze inside the balloon do to the plaster?**

The ice cracked the plaster.

4. **Ask students, What effect would freezing water have on rocks and things made of rocks, like sidewalks and roads?**

The ice can break the rocks apart, so they need to be repaired. Review student drawings on Activity Page 1.2.1, and listen for their responses to your questions to determine student understanding of the following concepts:

Lesson 1.3: Weathering and Erosion Problems

1. **Why or why not?**

Yes, cracks are bad because it can make parts of the monument break.

2. **The rock can break. 9 LITERAL—How does water ruin rock?**

It seeps into cracks, freezes, expands, and then pushes the rock apart. Differentiation

3. **It keeps water out of the cracks. 10 LITERAL—What do workers do to the cracks in Mount Rushmore?**

They fill them with silicone. LITERAL—Why do they use silicone?

4. **LITERAL—How does silicone work?**

The silicone keeps water out of the cracks and allows for the rock to move a little.

INFERENTIAL—Why is it important to keep water out of the cracks?

5. **Wind has been blowing sand against it for a very long time. 11 NGSS Elements LITERAL—How can wind change a stone monument?**

It blows sand against the monument, and that grinds away at the stone.

Lesson 1.4: What Keeps the Water Out?

1. **Distribute Did the Sealing Tests Work?**

AP 1.4.1

Lesson 2.1: What Are Glaciers and Valleys?

1. **Remind students that they learned in Lesson 1 that mountains and hills are landforms. (See Know the Science.) INFERENTIAL—Why does Logan think it will be cold at Glacier National Park?**

He thinks it will be cold because glaciers are made of ice and ice is cold. Page 13

2. **Some maps can tell you how deep oceans are or how tall mountains are. (See Know the Standards 2 and 3.) LITERAL—What kinds of things can you tell from this particular map?**

Where the mountains are, where the glaciers are, where the lakes and streams are, and where the trails are INFERENTIAL—How will the map help Logan and his family?

3. **DCI ESS2.C LITERAL—What words could Logan use to describe the lake?**

Bright turquoise blue, large, cold, clear, steep and rocky sides LITERAL—What words could Logan use to describe the stream?

Lesson 2.2: Let's Map It!

1. **Or is it smaller on the map?**

The lake is bigger in real life.

Lesson 2.3: How Does Water Flow?

1. **Will it flow in the same direction?**

Yes, the ice block will flow downhill. Step 8: Give the block of ice a little nudge so that it slowly moves down the container and collects in the water at the bottom. Relate this to how glaciers move and where they end up. (See Know the Science 2.)

2. **Was it flowing or standing still?**

The water at the bottom was standing still. It was not flowing.

Lesson 2.5: Where Can We Find Water?

1. **It isn't strange because glaciers are so big and do not melt completely. LITERAL—What keeps glaciers from melting completely?**

See Know the Science 1.

2. **Others may have experienced dry spells or flooding. • Discuss what students know about the differences among different bodies of water by asking these questions: What is the difference between a lake and a pond?**
Accept all reasonable responses. A lake is bigger than a pond. Both are contained bodies of water.
3. **CCC 1 SEP 8 What do you think is the difference between rivers and lakes?**
Accept all reasonable responses. A river is moving water. A lake is contained. Give pairs a few minutes to discuss, and call on volunteers to share their answers.
4. **What water in the picture is liquid?**
The snow on the mountains and the glacier are frozen. The lakes at the bottom of the mountain are liquid.
5. **CCC 1 SEP 8 LITERAL—Why isn't it strange to see a glacier in the summertime?**
It isn't strange because glaciers are so big and do not melt completely.
LITERAL—What keeps glaciers from melting completely? (See Know the Science 1.)
6. **LITERAL—What happens when a glacier flows to a place where the land meets the water?**
Pieces of the ice fall off into the water. Page 18
7. **How was it formed?**
The Matterhorn is a steep mountain peak. It was formed by a glacier that carved it.
8. **Lakes are surrounded by higher land, so the water stays where it is. (See Know the Standards 2.) 3D Learning LITERAL—How does a glacier help form water features?**
When glaciers melt, water can flow out of them into streams, rivers, or lakes. Also, some glaciers melt completely and leave behind areas that form lakes because they fill with melted snow and ice.
9. **Use the following question prompts to monitor progress and gauge understanding: • Where can you find water on Earth?**
Lakes, rivers, streams, glaciers

Lesson 3.1: What Is Yellowstone National Park?

1. **Here, students review how a map can be used to find key land features that Logan and his family want to see. 112 EXPLORING LAND AND WATER INFERENTIAL—How will the map help Logan and his family?**
The map will help Logan and his family find things at the park. Page 22
2. **Logan and his family are walking across the top of a giant volcano! 22 LITERAL—What does Logan feel as he walks across the boardwalk of the geyser?**
He feels heat. LITERAL—Where does the heat come from?
3. **The lake is formed in the low area in the center of the caldera. 23 LITERAL—What landforms do you see in the picture?**
Mountains with snow LITERAL—What happened here thousands of years ago?

Lesson 3.2: Geysers and Groundwater

1. **Ask students, Where does the water go?**

Accept all reasonable answers. Some may say it soaks into the ground. Others may say it flows into creeks and drains.

Lesson 3.3: What Are Volcanoes?

1. **EVALUATIVE—How does a volcano compare to a geyser?**

Both are explosions of materials that are underground. Hot water comes out of geysers. Fiery magma or hot ash comes out of volcanoes. Page 25

2. **LITERAL—What are some different kinds of volcanoes?**

Some are steep mountains. Some are hidden in the ocean. Others are underground. LITERAL—What kind of volcano is the one at Yellowstone National Park?

3. **RI.2.1 by answering questions about the nature of changes caused by volcanoes to demonstrate understanding of key details in the Student Book. 130 EXPLORING LAND AND WATER LITERAL—How does a geyser form?**

It forms when hot water bubbles up to the surface. SUPPORT—Have students recall what they learned during the demonstration with boiling water. They saw the water become hot and start to move around. Once there was enough steam and pressure, it started to spew out the top of the funnel.

Lesson 3.4: Modeling Volcanoes and Earthquakes

1. **How can lava change the land when it cools?**

It can make new, large rocky structures.

Lesson 4.1: What Is Yosemite National Park?

1. **LITERAL—Where is Yosemite National Park?**

It is in California. LITERAL—What formed the park's tall mountains?

2. **Uluru is about as large as the mountain prominence on which Half Dome sits. 148 EXPLORING LAND AND WATER LITERAL—What does Half Dome look like?**

It is tall, it is wide, and it is curved at the top. It is smooth and steep on one side. It is round on the other side. Page 32

3. **DCI ESS1.C CCC 7 LITERAL—How did Half Dome go from being underground to aboveground?**

It was pushed up to the surface. LITERAL—How did Half Dome get its steep flat wall?

4. **What process took a short amount of time?**

It took a long time for rain, wind, and ice to weaken the rocks. It took a short amount of time for the rocks to suddenly fall.

5. **Differentiation INTERPRETIVE—What is the difference between a mudslide and a landslide?**

Mudslides happen when a lot of water mixes with soil on a hill. Landslides happen when soil is dry or when plants have been destroyed by fire. INTERPRETIVE—Do mudslides, rockslides, and landslides make quick or slow changes to the land?

Lesson 5.1: What Is Arches National Park?

1. **Deserts are usually dry and very hot and get a lot of strong sun. (See Know the Standards 1.) LITERAL—How is the landscape here different from Yellowstone National Park, Glacier National Park, and Yosemite National Park?**

There are not many trees. There are a lot more visible rocks. It looks like a desert.

2. **INFERENTIAL—Why do you think this park is called Arches National Park?**

The rocks are shaped like arches. CORE VOCABULARY—Ask students to describe a rock.

3. **INFERENTIAL—What natural processes do you think caused the rocks to look this way in Arches National Park?**

Blowing wind, flowing water

4. **Logan wonders how this happens. 38 LITERAL—What are the tall columns of rock called?**

Pinnacles LITERAL—What are the areas with thick walls of standing rock called?

5. **INTERPRETIVE—In the second picture, what part of the rock is wearing away the most?**

The narrow part under the top. INTERPRETIVE—What could happen if there were a big wind storm?

6. **A storm caused the top of the arch pictured below to fall into the sea. 41 LITERAL—Where else can rock arches form, besides the desert?**

Along the shore

7. **These events happen suddenly, even if the arches have been wearing away over a long period of time. 178 EXPLORING LAND AND WATER EVALUATIVE—Along the shore, would water or wind cause more change to rocks?**

Water because the sea is constantly moving against rocks SUPPORT—Have students turn and talk with a neighbor about the three ways that arches can fall and crumble, based on this page: (1) arches becoming weaker from the wear from water and wind, (2) storms causing arches to fall, and (3) earthquakes causing arches to fall. Then ask students to talk about whether these changes happen suddenly or over a long time.

Lesson 6.1: What Is Cape Cod National Seashore?

1. **Cape Cod National Seashore LITERAL—What kind of place does this look like?**

It looks like a beach. CORE VOCABULARY—Explain that a seashore is an area that borders the sea. CORE VOCABULARY—Explain that the ocean is a large body of salt water. Most of the water on Earth is found in the ocean.

2. **INFERENTIAL—Do you think sand dunes like this took a long time or a short time to form?**

A long time

3. **Now, they learn that water can be found in the ocean at the beach. 194 EXPLORING LAND AND WATER LITERAL—What kinds of things do you notice about the landscape?**

There is a lot of sand; there is grass on the sand; there is water. INTERPRETIVE—How far does the sand stretch?

4. **Up on the dunes, the grasses rustle and sway. 44 NGSS Elements INFERENTIAL—How do you think the wind impacts all the sand?**

The wind could possibly blow the sand around on the beach.

5. **The rocks are arranged in a narrow pile extending from the beach out into the ocean water. 45 INFERENTIAL—What do you think the fences are for?**

The fences also protect the sand dunes from being walked on or blowing away.

INFERENTIAL—Why do you think there are signs telling people to keep off most parts of the dunes?

6. **INFERENTIAL—Why is sand collecting behind the fences?**

The wind blows that sand, and the fence slows it down from moving away.

Lesson 6.3: Sand Dunes and Beaches

1. **LITERAL—How does a beach form?**

Waves wash sand to the shore, where it collects. LITERAL—How does a sand dune form?

2. **LITERAL—How much sand does Cape Cod National Seashore have?**

It has 8,000 acres of sand dunes. SUPPORT—Use this opportunity to discuss just how big 8,000 acres of sand dunes is in relative terms that students can understand.

Compare this size to the average-sized schoolyard. A schoolyard is typically 1 acre for every 100 students.

3. **This usually happens in the presence of a storm, like a hurricane. 208 EXPLORING LAND AND WATER NGSS Elements LITERAL—Is it hard or easy for wind and water to move sand?**

It is easy.

4. **Why do you think it is easy for wind and water to move sand?**

Sand is small and light. EVALUATIVE—What are some advantages and disadvantages to having a house on the beach?

5. **People come up with solutions for keeping sand in place as much as possible. 210 EXPLORING LAND AND WATER INFERENTIAL—What can people do if they want to protect sand dunes?**

They can add plants to dunes. EVALUATIVE—Why might people want to protect sand dunes?

6. **LESSON 6.3 | SAND DUNES AND BEACHES 211 EVALUATIVE—Why might people not want fences near the dunes?**

They might not want the fences there because they are not natural. People might get hurt if they step on some fence a dune covered. SUPPORT—Discuss with students where you see fences in the community. Students may have seen fences around

construction sites, people's homes, apartment complexes, or dumpsters. Talk about the various uses for fences. Explain that fences are simple solutions to different kinds of problems.

7. If yes, how?

Yes, it will break up the wave so that it is not as big and strong.

Lesson 6.4: Protecting Sand Dunes

1. Then ask students to discuss the results of the events that happen quickly or slowly. Ask, What impact does this have on the landscape or the things around it?

See Know the Science.

2. LITERAL—Which landforms do you see in the photographs?

Mountains and valleys, a glacial lake, rock fins, and a landslide

**3. UNIT SUPPLEMENT | SCIENCE IN ACTION: MAPPING THE OCEAN FLOOR 229
INFERENTIAL—How do you think maps are different from globes?**

Maps are flat. Maps have scales and directions on them. LITERAL—What covers most of Earth?

4. What could these represent?

The lines go up and down to show where the land goes up and where it comes down again. These could be mountains and valleys. LITERAL—What kind of landforms can you find on the seafloor?

**5. Marie Tharp helped disprove this with evidence based on her research. 232
EXPLORING LAND AND WATER LITERAL—What was Marie Tharp the first person to do?**

Map the bottom of the Atlantic Ocean Page 55

6. INFERENTIAL—Why do you think the depth of the ocean floor changes?

Because some areas on the seafloor are taller than other areas

Unit quiz key

1. a 2. a 3. b 4. a 5. b 6. b 7. d 8. a 9. c 10. b 11. c 12. a