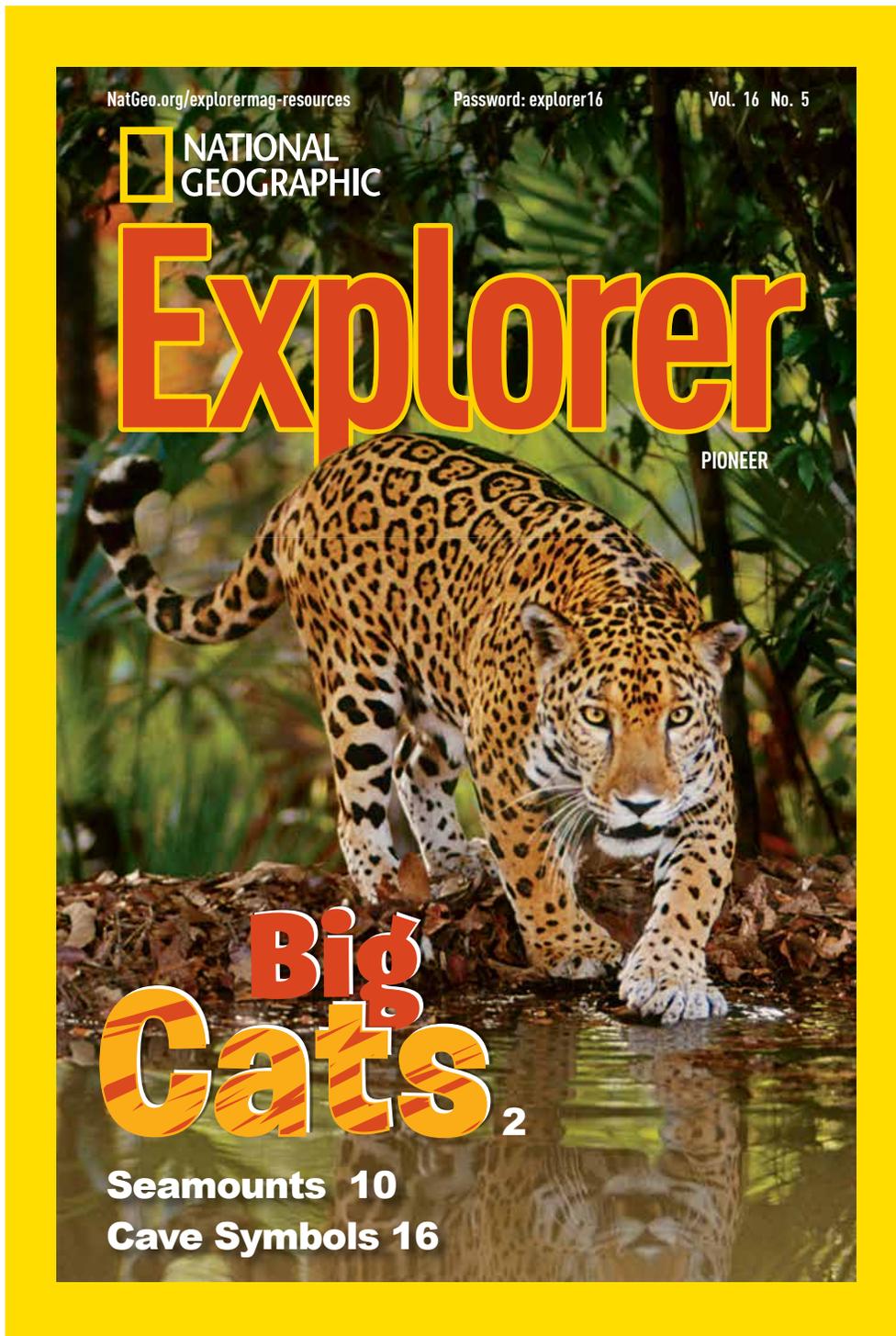


# TEACHER'S GUIDE

Pioneer (Grade 2)

Vol. 16 No. 5



## In This Guide

This guide contains language arts and science lessons for articles in this issue of EXPLORER PIONEER.

## Explorer Magazine

EXPLORER classroom magazines are specifically written for each grade, 2-5. Through great storytelling and stunning photographs, the EXPLORER magazines develop literacy skills and teach standards-based science content.

The EXPLORER magazines strive to offer a variety of reading experiences for students with different ability levels in the same class. Thus, all articles have been measured using the Lexile® Framework for Reading. Some articles will be easier to read than others, but all articles in EXPLORER PIONEER will be within the 250-550L range.

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# The Four That Roar

## LANGUAGE ARTS



### Objectives

- Students will assess their familiarity with and knowledge of vocabulary words.
- Students will use information from the text, photos, and maps to understand the four big cats that roar.
- Students will explain concepts based on information in the text.

### Resources

- Vocabulary Assessment Master (page 6)
- Language Arts Assessment Master (page 7)

### Summary

- The article “The Four That Roar” introduces students to four big cats—lion, leopard, jaguar, and tiger that share one unique trait: They roar.

## BUILD VOCABULARY AND CONCEPTS

- **carnivore**
- **conservationist**
- **reserve**

As a class, discuss the difference between familiarity and knowledge. Guide students to recognize that the more familiar you are with something, the more knowledge you have. Challenge students to explain how this concept applies to words when they read.

Display the vocabulary words on a word wall or on the whiteboard. Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write each word on their papers. Review the categories under the header “Familiarity with the Word.” Tell students to make a checkmark to indicate how well they know each word.

Instruct students to write what they think each word means on their worksheets. Then display the Wordwise feature on page 9 of the projectable magazine. Have students write those definitions on their worksheets and compare them with the definitions they wrote.

### READ

Inform students that the purpose of this article is to introduce them to four big cats that share one unique trait. They are the only cats that can roar.

Display pages 2-3 of the projectable magazine. Invite a volunteer to read aloud the headline and the text in the upper right corner of the screen. Have students raise their hands if they think they can identify the four big cats that roar. **Say:** *Neither the headline nor the text identified these four big cats.* **Ask:** *Where did you get this information?* (the photos) Point out to the class that when people read, they usually focus on the words. But words aren't the only way to get information. Photographs and other text elements can be helpful, too.

Inform the class that these photos show a lion, a tiger, a leopard, and a jaguar. **Say:** *The lion and tiger are easy to identify. But the leopard and jaguar are easy to confuse.* Point out that adding labels would have made it easy to identify these big cats, too.

**Say:** *Many times, readers can get information from photos, captions, maps, and other text elements in an article. That information can quickly answer some of the questions they have.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article in small groups. As they do, instruct them to use the text, photos, and map to learn about the four big cats that roar.

# The Four That Roar

## LANGUAGE ARTS

### TURN AND TALK

Have students turn and talk to discuss what they learned about the four big cats that roar. **Ask:** *What are the four cats that can roar?* (lion, leopard, jaguar, and tiger) *Why do they roar?* (They each have a band of stretchy tissue in their voice boxes.) Invite students to share what else they learned about the four big cats that roar.

- **Integrate Information** After reading the article, have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the information they recorded. Have students discuss how using text, photos, and the map helped them learn about the four big cats that roar. As a class, identify other sources that could help them learn even more about the big cats.

- **Explain Concepts** After reading the article, **say:** *One way to see if you understand information is to try to tell someone else about the topic. If you can't explain the concept, you might need to read the article again.* Have students turn and talk to explain to a partner why these big cats hunt. Prompt discussion with questions such as: *What do these big cats eat?* (other animals) *How do you know that?* (They're carnivores. All carnivores eat meat, which comes from other animals.) *How do they get their food?* (They hunt. This is how they find and catch their prey.)

### WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *Why is "built to hunt" a good description of the four big cats that roar?*
- *What is a conservationist? How do conservationists help big cats?*
- *What surprised you about what you read?*

# The Four That Roar

## SCIENCE

### Objectives

- Students will compare and contrast the four big cats that roar.
- Students will understand where big cats live and why habitat loss leads to conflicts between big cats and humans.
- Students will identify traits that make other cats feared hunters in their habitats.

### Resources

- Content Assessment Master (page 8)
- "The Four That Roar" poster (Teacher's Edition)
- "Know Your Cats" poster (Teacher's Edition)
- Comprehension Check (page 9)
- "The Four That Roar" Interactive Whiteboard (optional)

### Science Background

Big cats are the indisputable leaders in their domains. As apex predators, they reign at the top of the food chain. By limiting the number of plant eaters and preying on the sick, they keep their habitats healthy and their ecosystems in check.

Lions, tigers, jaguars, and leopards are four of the most fearsome predators. In addition to being outstanding hunters, they are the only four big cats that can roar. This is possible because they all have a missing a bone in their voice boxes.

Despite their status, these four big cats—like all other big cats around the world—are in danger of becoming extinct. One major problem they all face is the loss of habitat. As people clear land for new homes and businesses, big cats' habitats shrink. Their closer proximity to humans leads to inevitable conflicts between the two species.

Some people kill big cats. Farmers do this when the cats prey on their livestock. And poachers kill so they can sell the cats' body parts. But other people are trying to save big cats. They teach people how to live beside the predators. They set aside land for big cats to live on. They work to ensure that all big cats can survive.

### ENGAGE

#### Tap Prior Knowledge

Poll the class to see how many students have a pet cat. Invite a few volunteers to describe their cats. What do the cats look like? How do they behave? Challenge the class to explain how domestic cats are similar to or different from big cats that live in the wild.

### EXPLORE

#### Preview the Lesson

Display pages 2-3 of the projectable magazine. Invite volunteers to describe the big cats they see. **Ask:** *What is one way these big cats are all alike?* (Possible response: They all have fur.) **Ask:** *What are one way they all are different?* (Possible response: Their fur has different colors and patterns.) Tell students that as they read the article they will learn more about the big cats that roar.

#### Set a Purpose and Read

Have students read the article in order to compare and contrast the four big cats that roar, understand where big cats live and why habitat loss leads to conflicts between big cats and humans, and identify traits that make other cats feared hunters in their habitats.

# The Four That Roar

## SCIENCE

### EXPLAIN

#### Compare and Contrast Big Cats

Display the **"The Four That Roar" poster**. Review the poster with the class. Encourage students to identify similarities between the big cats. (Possible responses: fur, sharp teeth, claws, etc.) Challenge students to identify differences. (Possible responses: color and pattern of fur, size, and hunting habits) Then display the map on pages 6-7 of the projectable magazine. **Say:** *This map shows the big cats' approximate ranges, or the areas where they live. As you can see, their ranges are in different places.* **Ask:** *But what does the article tell you all of their habitats have in common?* (They're shrinking.) Give each student a copy of the **Content Assessment Master**. Divide the class into small groups. Instruct groups to review the article and the poster. Challenge them to compare and contrast the four big cats that roar.

#### Understanding Problems With Habitats

Display the map on pages 6-7 of the projectable magazine. As a class, identify the range where each big cat lives. **Ask:** *Who else lives in these same places?* (people) *Why is this a problem for big cats?* (As human populations grow, there are fewer places for big cats to live.) *What have people done to help big cats survive in their smaller habitats?* (created reserves; helped farmers build pens to protect livestock; paid to see big cats on photo safaris) As a class, brainstorm ideas for other things people could do to save big cats and their habitats.

#### Identify Traits in Other Cats

Display pages 4-5 of the projectable magazine. As a class, review the section "Built to Hunt." Have students identify body parts or behaviors that help big cats catch prey. (strong legs, sharp teeth and claws, stalking prey, climbing, swimming, hunting at night, attacking in groups) Then display the **"Know Your Cats" poster**. Review the poster with the class. Challenge students to identify body parts or behaviors that make these cats fearsome hunters in their own habitats.

### ELABORATE

#### Find Out More

Point out to the class that the map on pages 6-7 shows the current ranges of the four big cats that roar. It does not show what their ranges were in the past. As a class, conduct research to learn more about these shrinking habitats. How large did they used to be? What specifically caused them to shrink?

#### Extend Your Thinking About Big Cats

Remind students that people go on photo safaris to see wild animals in a safe way. Discuss reasons why people might value big cats more after seeing them in the wild. Brainstorm ideas for other ways people could get the word out that big cats are worth protecting.

### EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What is a carnivore?* (an animal that eats other animals)
- *What is a reserve?* (an area of land set apart to protect plants and animals)
- *Why do conservationists help farmers build pens for their livestock?* (The pens protect their livestock so hungry cats can't eat them.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article. You may also wish to examine the optional **Interactive Whiteboard** lesson that accompanies this article.

Name \_\_\_\_\_

Date \_\_\_\_\_

**VOCABULARY ASSESSMENT: The Four That Roar**

Record information from the article about each vocabulary word.

Word	Familiarity with the Word			Knowledge of the Word	
	I know the word very well.	I've seen or heard the word before.	I don't know the word.	What I think the word means:	How the article defines the word:

Name \_\_\_\_\_

Date \_\_\_\_\_

**LANGUAGE ARTS ASSESSMENT: The Four That Roar**

Use this organizer to record information about the four big cats that roar. Include facts from the text, photos, and map in the article.

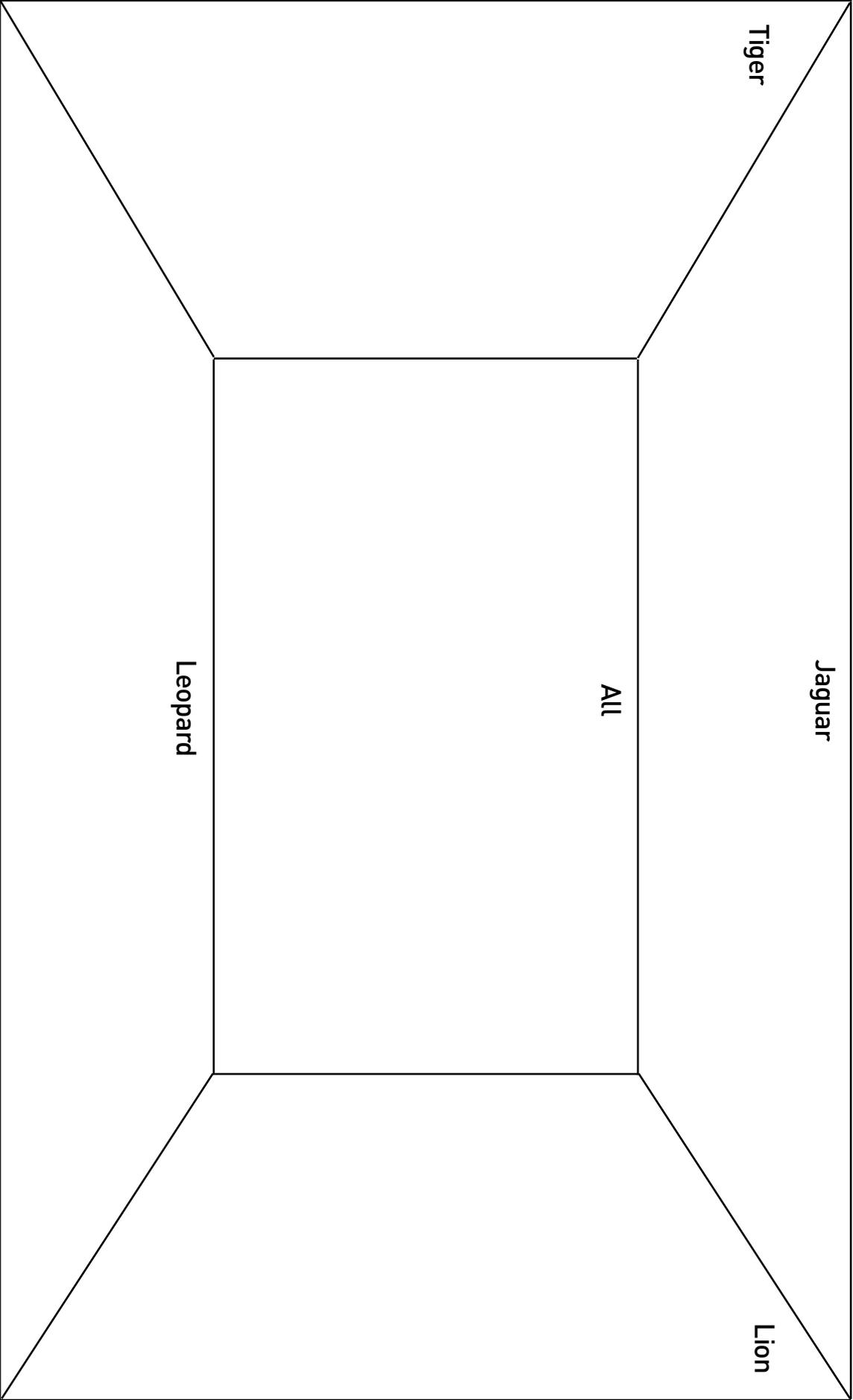
	Text	Photos	Map
Big Cat			
Tiger			
Leopard			
Jaguar			
Lion			

Name \_\_\_\_\_

Date \_\_\_\_\_

**CONTENT ASSESSMENT: The Four That Roar**

Compare and contrast the four big cats that roar.



**COMPREHENSION CHECK: The Four That Roar**

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What kind of animal are big cats?  
Ⓐ herbivores  
Ⓑ omnivores  
Ⓒ carnivores
  
2. Which big cat attacks in groups?  
Ⓐ lions  
Ⓑ tigers  
Ⓒ jaguars
  
3. What kind of habitat does a jaguar live in?  
Ⓐ desert  
Ⓑ savanna  
Ⓒ rain forest
  
4. Why do big cats have fewer places to live?  
Ⓐ Other animals are taking over the land.  
Ⓑ Human populations are growing.  
Ⓒ The continents are shrinking.
  
5. List three things people are doing to help big cats survive.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Mountains in the Sea

## LANGUAGE ARTS



### Objectives

- Students will explore the meaning of vocabulary words in a variety of different ways.
- Students will describe a seamount's life cycle.

### Resources

- Vocabulary Assessment Master (page 14)
- Language Arts Assessment Master (page 15)

### Summary

- The article "Mountains in the Sea" introduces students to seamounts, or mountains under the sea. Seamounts are one of the most common but least-known marine ecosystems in the world.

## BUILD VOCABULARY AND CONCEPTS

- **biodiversity**
- **ecosystem**
- **seamount**

Read aloud each of the vocabulary words. As you do, poll the class to see how many students are familiar with each word. Then challenge volunteers to provide a scientific definition of each term.

Point out that this task was most likely easier with some of the words than others. **Say:** *As students, your vocabulary is constantly expanding. But many of the words you learn have multiple meanings. When reading about science, it's important to understand the scientific definition. And a great way to remember that more technical definition is to study the word in multiple ways.*

Give each student a copy of the **Vocabulary Assessment Master**. Divide the class into pairs. Instruct partners use this worksheet to explore the vocabulary words in four different ways: writing definitions, restating the definition in their own words, using the term in a sentence, and then drawing a picture to help them remember what the word means.

### READ

Inform students that the purpose of this article is to introduce them to seamounts, one of the most common but least-known marine ecosystems in the world. As they read, they'll learn about how seamounts form and what it is like in a seamount ecosystem.

Display pages 10-11 of the projectable magazine. Invite a volunteer to read aloud the headline and subhead. **Ask:** *What is a seamount?* (an underwater mountain) Invite a volunteer to point out the seamount in this photo. Then encourage students to share their ideas about how a seamount might form and change over time.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article in small groups. As students read, instruct them to search for information that tells about a seamount's life cycle. Encourage group members to work together to write a full description of the process. If necessary, prompt them to focus on the information on page 14 of the article.

# Mountains in the Sea

## LANGUAGE ARTS

### TURN AND TALK

Have students turn and talk to discuss what they learned about seamounts. **Ask:** *What causes seamounts to form?* (volcanic activity) *Where are seamounts found?* (in all the world's oceans) *How tall must an underwater mountain be to be called a seamount?* (at least 1,000 meters above the seafloor) Invite students to share what else they learned about seamounts.

- **Exploring Meanings** Inform students that it's essential for readers to understand the technical definition of words when reading about science. Without that knowledge, it's very difficult to understand the text. **Say:** *If you understand what scientific words mean, you can follow along with the text. You can also use the words correctly in new sentences of your own.* Challenge students to make accurate statements using each of the vocabulary words. Encourage them to use their **Vocabulary Assessment Masters** as resources. But remind them to be original. Students shouldn't restate sentences from the article. They should create new sentences of their own.

- **Describe Connections in a Life Cycle** Remind students that this article explains how seamounts form. This is a process. In every process, there are steps. For the process to work correctly, the steps must occur in the proper order. Instruct two groups to compare the descriptions they recorded on their **Language Arts Assessment Masters**. Did they each record all of the steps? Did they record the steps in the proper order? If not, encourage students to reread the information on page 14 of the article. Once all groups are satisfied that their descriptions are accurate, review the process as a class to ensure that all students fully understand how seamounts form.

### WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *What is a seamount like?*
- *How do people explore seamounts? What can they see there?*
- *What surprised you about what you read?*

# Mountains in the Sea

## SCIENCE

### Objectives

- Students will recognize that seamounts typically form from extinct volcanoes.
- Students will understand how seamounts change.
- Students will understand how seamounts create diverse ocean ecosystems.

### Resources

- Content Assessment Master (page 16)
- Comprehension Check (page 17)

### Science Background

Seamounts are underwater mountains that rise at least 1,000 meters above the ocean floor. They are formed by volcanic activity and are often the remains of old volcanoes.

Although each seamount is an individual structure, seamounts often form in groups or long chains. This is because seamounts are found near "hotspots" in the oceanic crust. Melted rock called "magma" bubbles up through a "hotspot." When a moving tectonic plate passes over the "hotspot," a chain of volcanoes rises in its wake.

Scientists estimate that there are more than 100,000 seamounts in the world's oceans. Yet less than one-tenth of a percent of those seamounts have ever been explored. But as more explorations take place, scientists have quickly learned that seamounts are more than underwater obstacles for submarines to avoid. They are also rich, diverse habitats that cover more area than any land-based habitat on Earth.

Seamounts have tall, steep sides. This causes ocean water to flow upward, pushing nutrients toward the surface. Some organisms attach to a seamount's side where they settle and grow. Others become trapped in the spinning water at the seamount's summit. While they can feast on the nutrients that also become trapped here, they are easy prey for larger ocean predators.

### ENGAGE

#### Tap Prior Knowledge

Instruct students to think about the tallest mountain they've ever seen—either in real life or in a photograph. Now tell them to imagine that this mountain is located in the ocean. It sits on the ocean floor, well below the water's surface. Brainstorm ideas about what students might discover if they were able to explore this mountain.

### EXPLORE

#### Preview the Lesson

Display pages 10-11 of the projectable edition. Read aloud the subhead. Point out that it states that seamounts are underseas mountains that create special ecosystems in the ocean. **Ask:** *What kinds of plants and animals do you think you might find in a seamount ecosystem?* (Possible responses: fish, sharks, corals, etc.) Encourage students to examine the photo for ideas. Tell students that they'll learn more about seamounts as they read the article.

#### Set a Purpose and Read

Have students read the article to recognize that seamounts typically form from extinct volcanoes, understand how seamounts change, and understand how they create diverse ocean ecosystems.

# Mountains in the Sea

## SCIENCE

### EXPLAIN

#### Recognizing Where Seamounts Form

Display page 13 of the projectable magazine. Review the text as a class. As you do, highlight the words "hotspots" and "volcanoes." Point out that "hotspots" are places in the ocean's crust where volcanoes can form. When these volcanoes become extinct, they can form seamounts. That is how seamounts typically form. As a class, review the steps in this process, which students outlined on their **Language Arts Masters**.

#### Understand How Seamounts Change

Instruct students to think about what happens when a volcano erupts. **Say:** *Volcanoes tend to erupt abruptly. Because of this, seamounts can begin to form quickly, too. But it takes time for a seamount to grow 1,000 meters high or even taller.* Point out that once a seamount forms, it also begins to change. As a class, discuss how wind, water, and ocean currents can change a seamount over time.

#### Understanding Seamount Ecosystems

Display page 13 of the projectable magazine. Review the diagram as a class. **Say:** *Water carries nutrients from the ocean floor, up the side of the seamount, and to the surface. This provides food for plants and animals that live on or above the seamount.* Display pages 14-15 of the projectable magazine. Have students identify the three animals shown here, which all live in a seamount ecosystem. Examine the larger image. **Say:** *This photo shows the top of a seamount. There is enough sunlight here for plants to grow. Because of that, lots of animals live here, too. The deeper you go, the fewer plants and animals you'll find. And when you get deep enough that there is no sunlight, there are no plants in the seamount ecosystem. Only animals with adaptations to survive in a cold, dark environment can survive there.* Give each student a copy of the **Content Assessment Master**. Instruct students to draw a picture of a seamount. Tell them to add arrows to show how water and nutrients move up from the ocean floor. Encourage them to add drawings of plants and animals that they think might live on or above a seamount.

### ELABORATE

#### Find Out More

Display pages 14-15 of the projectable magazine. Remind students that the three animals shown here live in seamount ecosystems. As a class, conduct research to find photos of more seamount organisms. Challenge students to find photos of organisms that live in each layer of a seamount ecosystem.

#### Extend Your Thinking About Seamounts

Read aloud the final paragraph of the article: "Life at these places must be protected. We must learn more about seamounts." As a class, brainstorm ideas about why seamount ecosystems must be protected and how this could be done. Discuss reasons why it is important to learn more about seamounts.

### EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What causes seamounts to form?* (volcanic activity)
- *Why is the top of a seamount a good place for predators to hunt for food?* (Small animals get held there in the spinning water. Predators can easily catch this prey.)
- *What is a "hotspot"?* (a place in the ocean's crust where melted rock called magma bubbles)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

**VOCABULARY ASSESSMENT: Mountains in the Sea**

Use this organizer to examine each vocabulary word.

Write the definition.	Restate in your own words.
<b>What is the word?</b>	
Draw a picture.	Use the term in a sentence.

Write the definition.	Restate in your own words.
<b>What is the word?</b>	
Draw a picture.	Use the term in a sentence.

Write the definition.	Restate in your own words.
<b>What is the word?</b>	
Draw a picture.	Use the term in a sentence.

**LANGUAGE ARTS ASSESSMENT: Mountains in the Sea**

Describe how seamounts forms and changes over time.

First, \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Next, \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Then, \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Finally, \_\_\_\_\_

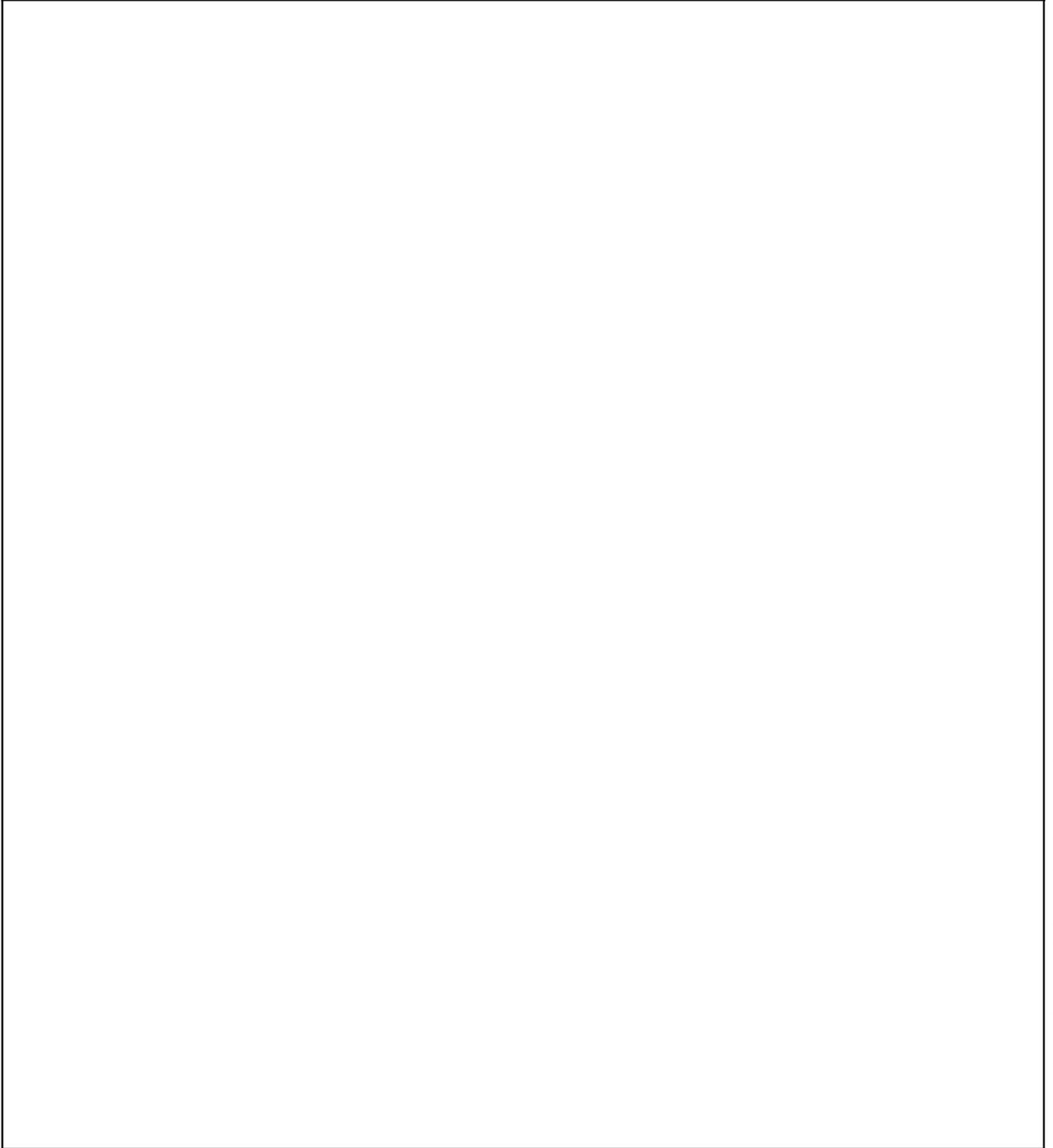
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\_\_\_\_\_

\_\_\_\_\_

## CONTENT ASSESSMENT: Mountains in the Sea

Draw a seamount. Add arrows to show how nutrients move up from the ocean floor. Then draw pictures of plants and animals that might live in this ecosystem.



**COMPREHENSION CHECK: Mountains in the Sea**

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What is a seamount?  
Ⓐ an underwater mountain  
Ⓑ an active volcano  
Ⓒ an ocean current
  
2. Where are seamounts often found?  
Ⓐ near cracks in the ocean floor  
Ⓑ near "hotspots" in the ocean's crust  
Ⓒ near the surface of the ocean
  
3. How tall must an underwater volcano be to be called a seamount?  
Ⓐ 100 meters  
Ⓑ 1,000 meters  
Ⓒ 10,000 meters
  
4. Which of these sentences is true?  
Ⓐ There is very little biodiversity in a seamount ecosystem.  
Ⓑ All seamount ecosystems are the same.  
Ⓒ Some seamounts have animals that live only in that ecosystem.

5. Describe how a seamount forms and changes over time.

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### Objectives

- Students will record, define, and sketch vocabulary words and draw a picture to show how the words are related.
- Students will explore how using the pronoun *I* impacts the telling of a story.
- Students will write a first-person letter to a friend about events described in the article.

### Resources

- Vocabulary Assessment Master (page 22)
- Language Arts Assessment Master (page 23)

### Summary

- In the article "Signs and Symbols," National Geographic Emerging Explorer Genevieve von Petzinger reveals important findings from her extensive research on paintings and engravings in ice age caves in Europe.

## BUILD VOCABULARY AND CONCEPTS

- **ancient**
- **ice age**
- **symbol**

Display the vocabulary words on a word wall or on the whiteboard. Say the words aloud and invite students to share what they know about each.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write each word and its definition on their papers. Then have students draw a picture to remind themselves of what each word means.

When students are finished drawing their interpretations of individual words, discuss with the class how the words could be related. Then challenge students to sketch a larger picture showing a potential connection between the three words. Instruct students to label each item in their drawings.

## READ

Let students know that in this article they meet National Geographic Emerging Explorer Genevieve von Petzinger and learn what she discovered after exploring paintings and engravings in ice age caves in Europe.

Display pages 16-17 of the projectable magazine. Instruct students to examine the page closely. **Ask:** *Who wrote this article?* (Genevieve von Petzinger) *How do you know?* (That's what the byline says.) Then have students examine the article's photos in their student magazines. **Ask:** *Which page shows you what Genevieve von Petzinger looks like?* (page 18) *How do you know?* (The captions use the word *I*.) Zoom in on the captions for those photos. Highlight the word *I* each time it appears. Inform students that this word is another clue that tells them who wrote the article.

**Say:** *When writers write, they often tell about their own experiences. This type of writing is easy to spot. Sentences contain the words I and we. Text like this is a direct link into the writer's thoughts. It's written this way so readers see, hear, and feel just what the writer did at this particular moment in time.*

Instruct students to read the article on their own. As they do, challenge them to identify additional sentences that contain the words *I* or *we*. Tell students to highlight each sentence in their student magazines.

## LANGUAGE ARTS

### TURN AND TALK

Have students turn and talk to discuss what they learned about Genevieve von Petzinger and her quest to understand the ancient signs and symbols on cave walls. **Ask:** *When were the signs and symbols von Petzinger studies created?* (during the last ice age; up to 40,000 years ago) *How were they discovered?* (A French teenager found them inside a cave.) *Why does von Petzinger study them?* (They hold clues to the past.) Encourage students to share other facts they learned as they read the article.

- **Exploring the Pronouns "I" and "We"** Remind students that when writers use the pronouns *I* and *we* they are telling a story about themselves. If necessary, spend more time discussing what this means. Then invite volunteers to read aloud sentences they highlighted as they read the article. As a class, revise the sentences so that rather than the pronouns *I* and *we*, they contain the words *he*, *she*, or *they*. Discuss how this changes the focus of the sentence.

- **Writing a First-Person Narrative** Inform students that one time writers almost always use the words *I* and *we* is when they write a letter to a friend. **Say:** *Letters are a great way to tell friends what you've been up to. When you write a letter, you have time to think about what you want to say. This means you can pick just the right words to describe things. And, you can review what you wrote to make sure you didn't leave out any important details.*

Give each student a copy of the **Language Arts Assessment Master**. Tell students to imagine that are searching for signs and symbols inside a cave with Genevieve von Petzinger. Instruct each student to write a letter to a friend describing what happened and what they discovered inside the cave.

### WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *What is an ice age?*
- *Why do you think ice age people left these symbols behind? What do you think they mean?*
- *What surprised you about what you read?*

# Signs and Symbols

## SOCIAL STUDIES

### Objectives

- Students will understand what happens during an ice age.
- Students will understand how the author observes and records information about the past.

### Resources

- Content Assessment Master (page 24)
- Comprehension Check (page 25)

### Social Studies Background

As a young child, National Geographic Emerging Explorer Genevieve von Petzinger loved to dig things up. And like many children, she became obsessed with dinosaurs. It wasn't until her teen years that she realized her true passion. She wanted to learn about the people who lived thousands of years ago.

Now a paleoanthropologist, von Petzinger studies our human ancestors using fossils and other remains. Her primary focus is studying the geometric signs and symbols that are painted and engraved on cave walls.

Von Petzinger says she became intrigued with the signs and symbols because nobody else in her field was studying them. Everyone else was focused on the drawings of animals and people.

Over the past few years, von Petzinger has explored more than 350 ice age sites in Europe. Her work has taken her deep into caves, often crawling through tight passages. She has recorded her findings at each site and built a database to interpret the information. It revealed a startling fact: The signs and symbols were created over a 30,000-year time period, but there were only 32 symbols in all.

Now, the challenge is to interpret what the signs and symbols mean. Von Petzinger admits that may be an impossible task. But with the help of modern technology the study of things like constellations, lunar cycles, and ancient landscape features, she hopes to find out.

### ENGAGE

#### Tap Prior Knowledge

Have each student take out a piece of paper. Then ask them to draw symbols that represent three things: a question; addition; and money. Compare students' responses. Are they all the same? {?, +, \$} Guide the class to understand that this likely happened because these are the symbols used to represent those concepts in our culture. As a class, discuss how people could learn to interpret symbols from a culture that ended 10,000 years ago.

### EXPLORE

#### Preview the Lesson

Display pages 16-17 of the projectable magazine. Instruct students to examine the image. Poll the class to see how many students think the circled symbols have a meaning? Brainstorm ideas about what those meanings could be.

#### Set a Purpose and Read

Have students read the article in order to understand what happens during an ice age and understand how the author observes and records information about the past.

### EXPLAIN

#### Understanding Ice Ages

Display page 19 of the projectable magazine. Zoom in on the sidebar about ice ages. Invite a volunteer to read the information aloud. **Ask:** *What happens during an ice age?* (Earth's climate gets very cold. Glaciers cover the land.) *What happens when an ice age ends?* (The glaciers melt.) Inform students that glaciers are huge masses of ice that flow like very slow rivers across the land. As they move, they reshape the land beneath them. Brainstorm ideas about how an ice age, which last for a very long time, could have changed Earth's surface.

### EXPLAIN

(continued)

#### Understanding How People Study the Past

Display page 18 of the projectable magazine. Invite a volunteer to read the aloud. **Say:** *When we think about studying the past, we often think about studying things like stone tools and animal bones. People from the past left these things behind. So studying them can teach us about how those people lived. But tools and bones aren't the only things they left. They also left artwork inside cave walls.* Inform students that Genevieve von Petzinger studies a specific kind of artwork: signs and symbols. **Say:** *The symbols that von Petzinger studies prove that people lived in these caves long ago. They must have had a purpose. But we don't know what they mean today because there's nobody left to tell us.* Assign each student a partner. Give each student a copy of the **Content Assessment Master**. Instruct students to draw eight symbols that have meaning today. Then have them write a short caption that tells people of the future what each symbol means.

### ELABORATE

#### Find Out More

Remind students that the last ice age ended long ago. But according to the article, people who lived then left behind artifacts including tools, clothing, shelters, and artwork on cave walls. As a class, conduct research to identify more ice age artifacts. As a class, discuss what the artifacts reveal about ice age people and their culture.

#### Extend Your Thinking About Signs and Symbols

Remind students that nobody knows what the ancient signs and symbols on cave walls mean. The writer thinks some might have represented rivers or other landmarks on a map. Display the symbols on page 23 of the article. As a class, brainstorm ideas about what each symbol might mean.

### EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What is a symbol?* (something that stands for something else)
- *How did collecting data help von Petzinger make sense of her observations?* (She collected data and put it into a database. That showed her that there were really on 32 different symbols. They were repeated over and over again.)
- *What do the signs and symbols reveal about the last ice age?* (They reveal that people lived during that time. If we understood them, they would tell us what their lives were like.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

Name \_\_\_\_\_

Date \_\_\_\_\_

## VOCABULARY ASSESSMENT: Signs and Symbols

Write each word and its definition. Draw a small picture to show what each word means. Draw a larger picture to show how the words could be related. Label each word in your sketch.

Word	Definition	Picture	Larger Picture



## CONTENT ASSESSMENT: Signs and Symbols

Draw eight symbols that people use today. Write a short caption for each so people of the future know what the symbols mean.


**COMPREHENSION CHECK: Signs and Symbols**

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. Where does Genevieve von Petzinger find signs and symbols?

- Ⓐ in caves
- Ⓑ on glaciers
- Ⓒ at the top of mountains

2. Which of these is a sign or symbol she has seen?

- Ⓐ a stop sign
- Ⓑ a smiley face
- Ⓒ red dots

3. What happens during an ice age?

- Ⓐ Glaciers freeze.
- Ⓑ Glaciers melt.
- Ⓒ Glaciers disappear.

4. Which of these statements is true?

- Ⓐ Ice age signs and symbols are artifacts.
- Ⓑ Von Petzinger knows what the signs and symbols mean.
- Ⓒ Ice age people left behind very few artifacts.

5. What did von Petzinger learn when she put her information into a database?

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## ANSWER KEY

### The Four That Roar

#### Assess Vocabulary, page 6

Students should record the vocabulary words from the Wordwise feature on page 9, make checkmarks to show how familiar they are with each word, and write definitions in their own words. Then they should record the definitions from the article.

**carnivore:** an animal that eats other animals

**conservationist:** a person who works to protect wildlife and Earth's natural resources

**reserve:** an area of land set apart to protect plants and animals

#### Assess Language Arts, page 7

Details from the text and photos will vary. Students should note that the map tells where each group of big cats lives.

#### Assess Content, page 8

Students may identify differences in fur, hunting behaviors, or habitats. Similarities include: all four roar, are carnivores, and hunt for prey. All four also have fewer places to live and problems with humans who live in the same area.

#### Comprehension Check, page 9

1. C; 2. A; 3. C; 4. B; 5: People are setting aside land for reserves, teaching farmers to build pens to protect their livestock, and going on photo safaris to see big cats.

### Mountains in the Sea

#### Assess Vocabulary, page 14

Students should record the words and definitions from the Wordwise feature on page 15.

**biodiversity:** the many different kinds of plants and animals on Earth or in a habitat or ecosystem

**ecosystem:** the plants, animals, and non-living things that make up an environment and affect each other

**seamount:** an underwater mountain formed by volcanic activity

Students should restate each definition in their own words. Sentences and drawings will vary but should accurately reflect the meaning of each word.

#### Assess Language Arts, page 15

First, a volcano erupts. Then the volcano grows as melted rock piles up and hardens. Next, the volcano stops erupting and becomes a seamount. Finally, wind, water, and ocean currents wear away the rock. The seamount begins to settle and sink.

#### Assess Content page, 16

Drawings should resemble the seamount shown in the diagram on page 13. Arrows should go up and circle above the seamount. Drawings of plants and animals will vary.

#### Comprehension Check, page 17

1. A; 2. B; 3. B; 4: C; 5: Possible response: A volcano erupts and grows. When it stops erupting, it becomes a seamount. Wind, water, and ocean currents wear away the rock. Then the seamount begins to settle and sink.

### Signs and Symbols

#### Assess Vocabulary, page 22

Students should record the words and definitions from the Wordwise feature on page 22.

**ancient:** very old

**ice age:** any of several cold periods during which glaciers covered much of Earth

**symbol:** something that stands for or represents something else

Sketches should accurately reflect the meaning of each word and how they are connected. Students should label each term in the larger drawing.

#### Assess Language Arts, page 23

Students' letters should be written from the first-person perspective, utilizing the pronouns *I* and *we*. Content should reflect information from the text.

#### Assess Content, page 24

Students should draw symbols that have meaning in today's society. Their captions should be short but make clear the meaning of each symbol.

#### Comprehension Check, page 25

1. A; 2. C; 3. A; 4: A; 5: The same 32 symbols are repeated over and over.