

In This Guide

This guide contains language arts and science or social studies lessons for articles in this issue of EXPLORER TRAILBLAZER.

Explorer Magazine

EXPLORER classroom magazines are written for each grade, 2-5. Through great storytelling and stunning photographs, the magazines develop literacy skills and teach standards-based content aligned with the Common Core State Standards (CCSS), Next Generation Science Standards (NGSS), or National Council for the Social Studies (NCSS). The activity on the magazine's back cover is tailored to the NG Learning Framework (see page 2).

EXPLORER magazines offer engaging reading opportunities for students with different ability levels in the same class. All articles have been measured using the Lexile® Framework for Reading. Articles in EXPLORER TRAILBLAZER will be within the 350-750L range.

For additional resources to extend your students' learning, visit EXPLORER's website, natgeo.org/explorermag-resources.



Your Subscription Includes:

- Magazines • Classroom Posters • Projectables
- Teacher's Guides • Digital Magazines (additional subscription required)

INTRODUCTION

BACKGROUND

Since 1888, the National Geographic Society has funded scientists and explorers and shared their findings with the world. To support educators who use our resources, we have created a Learning Framework, which lays out what we believe students should learn from their experiences with the Society.

PURPOSE

The Learning Framework was designed to convey the Society's core beliefs and values. It is built around a set of attitudes, skills, and knowledge that embody the explorer mindset.

To determine the learning outcomes within the Learning Framework, we dug deep into national standards in key subject areas. We also sought advice from subject matter and child development experts, along with the combined expertise of NG instructional designers, researchers, and content developers. To learn more, go to: <https://www.nationalgeographic.org/education/learningframework/>.

IMPLEMENTATION

Each article in this magazine has a knowledge-based link to the Learning Framework. Students will use the skills and attitudes as they do the activity on the back cover. The activity relates to the article "In Search of the Lost City."

MINDSET OF AN EXPLORER

KEY FOCUS AREAS

A — Attitudes

National Geographic kids are:

CURIOS about how the world works, seeking out new and challenging experiences throughout their lives.

RESPONSIBLE, with concern for the welfare of other people, cultural resources, and the natural world. NG kids are respectful, considering multiple perspectives, and honoring others regardless of differences.

EMPOWERED to make a difference. NG kids act on curiosity, respect, and responsibility. They are adventurous and persist in the face of challenges.

S — Skills

National Geographic kids can:

OBSERVE and document the world around them and make sense of those observations.

COMMUNICATE experiences and ideas effectively through language and media. They are storytellers!

COLLABORATE with others to achieve goals.

SOLVE PROBLEMS by generating, evaluating, and implementing solutions after identifying alternatives, weighing trade-offs, and making well-reasoned decisions.

K — Knowledge

National Geographic kids understand:

THE HUMAN JOURNEY is all about where we have been, where we live now (and why), and where we are going.

OUR CHANGING PLANET encompasses all that coexists on our planet—interconnected through systems that generate and nurture each other.

WILDLIFE AND WILD PLACES inhabit our planet—from the butterflies in our backyards to the lions in Africa.

Standard Supported

- Determine the main idea of a text; recount the key details and explain how they support the main idea. [CCSS.RI.3.2]

Resources

- Vocabulary Assessment Master (page 7)
- Language Arts Assessment Master (page 8)

Summary

- The article "Sailing With the Blue Fleet" introduces readers to a variety of creatures known as the "Blue Fleet" that spend their entire lives drifting on the surface of the ocean.

BUILD VOCABULARY AND CONCEPTS

- **countershading**
- **pleustal zone**
- **polyp**
- **tentacle**

Display the vocabulary words on a word wall or on a whiteboard. Inform students that when they read they will encounter words they don't know. Remind them that using context clues such as the sentences before or after an unknown word and visuals such as photographs or illustrations can help them figure out what an unfamiliar word means.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each vocabulary word from the article. With a partner, have them scan the article to locate each bold word in the text.

Instruct partners to find and record text and visual clues in the article related to each vocabulary word. Then instruct each student record his or her own idea about what each word means. Invite volunteers to read aloud the definitions from the Wordwise feature on page 9 of their student magazines. Have students record the definitions on their worksheets. Encourage them to compare the definitions they wrote with the definitions from the text.

READ

Give students a few minutes to scan the article in their magazines. **Then ask:** *What do you think this article is about? Why?* Encourage students to share their ideas.

Explain to students that what they just attempted to identify was the main idea or overall topic of the article. Everything in the article is connected to the main idea. Point out that paragraphs have a main idea, too. Everything in a paragraph is connected to its main idea.

Display pages 2-3 of the projectable magazine. Model how to identify the main idea of the article. **Say:** *When I look at these pages, the first thing I notice is the photo. I see a strange-looking animal floating on top of the water. But then I see the headline, "Sailing With the Blue Fleet." I wonder what that means?*

Explain to students that the headline and photo are often great clues that can help readers figure out what an article is about. **Say:** *But sometimes clues that aren't so obvious are even more helpful, particularly if you aren't sure what something in the headline—like Blue Fleet—means. Zoom in on the deck and read it aloud. Say: Now I know what this article is about. It is going to explain how animals like the one in the photograph survive as they spend their entire lives drifting on the open sea.*

Have students read the article in small groups. As they read, encourage student to search for details that support the main idea of the article.

The Blue Fleet

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about the "Blue Fleet." **Ask:** *What is the "Blue Fleet?"* (animals that live their entire lives on the ocean's surface) *How do blue button jellyfish move?* (They are carried by wind and waves.) *How can they become a fleet?* (They can be pushed together by currents.) Invite students to share what else they learned about the "Blue Fleet."

- **Strengthen Understanding** Inform students that combining what you already know with what you learn can help readers understand new words. **Say:** *Once you understand what a word means, it's easier to use it correctly in a sentence.* Challenge students to make accurate statements using each of the vocabulary words. Encourage them to use their **Vocabulary Assessment Masters** as a resource. Remind students to be original. They shouldn't restate sentences from the article. They should create new sentences of their own.

- **Identify Main Ideas** Remind students that the article has a main idea. (Some animals, known as the "Blue Fleet," spend their entire lives drifting on the open sea.) But paragraphs have main ideas, too. Explain that they can find the main idea of a paragraph the same way they found the main idea of the article. They must search for important clues. Give each student a copy of the **Language Arts Assessment Master**. Instruct students to write the main idea of the article in the middle circle. Then have them select four paragraphs in the article. Challenge them to write the main idea of each. Encourage students to turn and talk to analyze and compare results. Challenge them to recognize how the main idea of each paragraph ultimately supports the main idea of the text.

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.

- *How did the "Blue Fleet" get its name?*
- *Do you think the "Blue Fleet" is a good name for this group of animals? Why or why not?*
- *What surprised you about what you read?*

Standard Supported

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (NGSS.3-LS4-3)

Resources

- Content Assessment Master (page 9)
- Comprehension Check (page 10)

Science Background

Many animals live in the ocean. Some thrive in the shallows and others flourish in the deepest seas. A few spend their entire lives on the surface of Earth's warmer oceans. They live in the pleustal zone, the thin space between seawater and air. These animals are known as the "Blue Fleet."

The "Blue Fleet," a name coined by British marine biologist Sir Alister Hardy, is an assortment of strange creatures. As the name suggests, many of these animals are blue. And sometimes, fueled by wind and ocean currents, they are pushed together into large groups.

Some members of the "Blue Fleet" are not singular creatures but colonies of smaller animals. Good examples are the blue button jellyfish and the Portuguese man-of-war. Both are groups of smaller animals that live together but could not survive on their own.

Most "Blue Fleet" members are immobile. They just drift on the water. But each has found a way to get food and defend itself. The blue button jellyfish, Portuguese man-of-war, and by-the-wind sailor all have stinging tentacles. So does the blue dragon sea slug. But the poison in this mobile creature's tentacles comes from the man-of-war, which it eats.

The violet sea snail doesn't have tentacles. It has color. Its shell is dark on the bottom and lighter on top. This helps the snail blend in and hide from predators searching for prey above and below.

ENGAGE

Tap Prior Knowledge

Invite students to imagine that they are tiny animals living on the surface of the sea. They can float, but they can't move by themselves. They can eat, but they can't pursue food. And since they're always on top of the water, there is no place they can go to hide from predators. Brainstorm ideas about how a simple animal like this could survive.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Read aloud the headline and deck. Then invite students to examine the photo. **Say:** *According to the text, this animal drifts on the open sea.* **Ask:** *Why do you think that is? (It can't move on its own.) What do you think causes it to drift? (wind and water currents) Look at the animal's body. Which part do you think helps the animal drift? (The thin part at the top.) Why? (Possible response: When the wind blows on the part, it makes the animal move—just like a boat sail.)* Have students examine the long, thin parts hanging from the bottom of the animal's body. Brainstorm ideas about what those parts do. Tell students that they will learn more about this creature and other members of a group called the "Blue Fleet" as they read the article.

Set a Purpose and Read

Have students read the article in order to understand what the "Blue Fleet" is, identify adaptations of "Blue Fleet" members, and understand how being part of a group helps some "Blue Fleet" animals survive.

EXPLAIN

Understanding the "Blue Fleet"

Display page 4 of the projectable magazine. Zoom in on the last two paragraphs in the second column. Read the paragraphs aloud. **Ask:** *What is the "Blue Fleet?"* (mostly blue animals that live their entire lives on the ocean's surface) Have students examine the photos in their student magazines to note the blue coloring on each animal. **Say:** *These animals live in the pleustal zone, or the region where seawater meets air.* Have students look at the photos again to identify the waterline, or the ocean's surface, whenever possible. Have students scan the article to find more facts about the "Blue Fleet." Invite them to share what they learned with the class.

Identifying Adaptations

Remind students that many of the "Blue Fleet" animals are blue. **Say:** *Color is one adaptation that "Blue Fleet" animals survive. Being blue helps them blend in with the ocean and hide from predators. It also protects them from the sun's harmful rays.* Point out that countershading is another color adaptation. Discuss how countershading works. Encourage students to scan the article to identify more adaptations. Discuss how each one helps the animals survive. Then divide the class into pairs. Give each student a copy of the **Content Assessment Master**. Tell pairs to name and draw each animal in the article. Have them identify each animal's adaptations. Challenge them explain how the adaptations help the animals survive.

Recognizing the Advantages of Groups

Display page 5 of the projectable magazine. **Say:** *The Portuguese-man-of-war might look like one animal, but it's actually a group of tiny animals that live together.* Review the diagram and the section "To Battle!" as a class. Identify each animal that is part of a man-of-war. Guide the class to understand that none of these animals could survive on its own. **Ask:** *What other "Blue Fleet" animals are actually groups of animals living together?* (blue button jellyfish and by-the-wind sailor) Discuss how living as a group helps these "Blue Fleet" creatures survive.

ELABORATE

Find Out More

Remind students that countershading helps several members of the "Blue Fleet" survive. But these organisms are not the only ones that have this adaptation. Divide the class into small groups. Instruct groups to conduct research to identify other organisms that use countershading. Challenge them to find photographs of these organisms and then write a description telling how countershading helps each organism survive. Invite groups to share what they learned with the class.

Extend Your Thinking About the "Blue Fleet"

Remind the class that several members of the "Blue Fleet" are actually groups of animals that live together in order to survive. As a class, discuss what would happen to animals like these if one organism in the colony disappeared. Then discuss what would happen to the "Blue Fleet" as a whole, given that some members eat others to survive.

EVALUATE

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

- *How is a blue dragon sea slug different from other "Blue Fleet" animals?* (It can move on its own.)
- *What does a violet sea snail do so it can float?* (It builds a bubble raft.)
- *What is the pleustal zone?* (the region between water and air where some animals live)

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

Name _____

Date _____

VOCABULARY ASSESSMENT: Sailing With the Blue Fleet

Record information from the article about each vocabulary word.

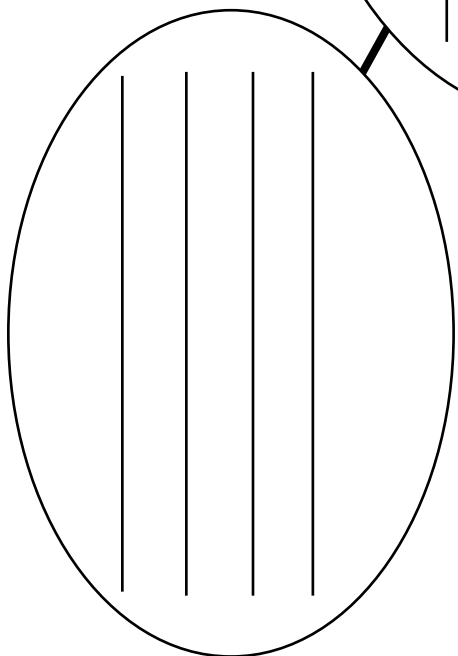
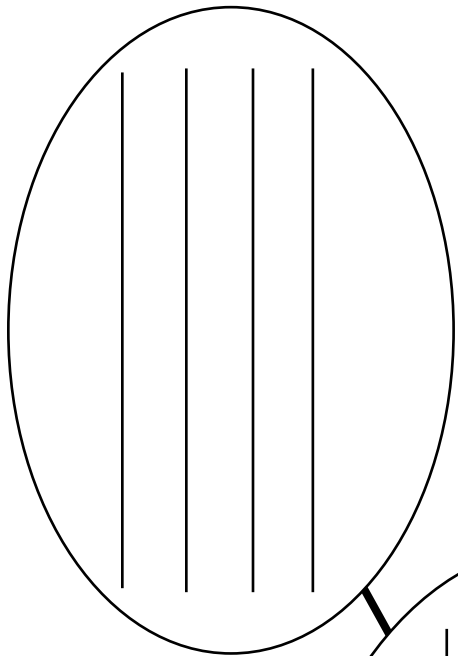
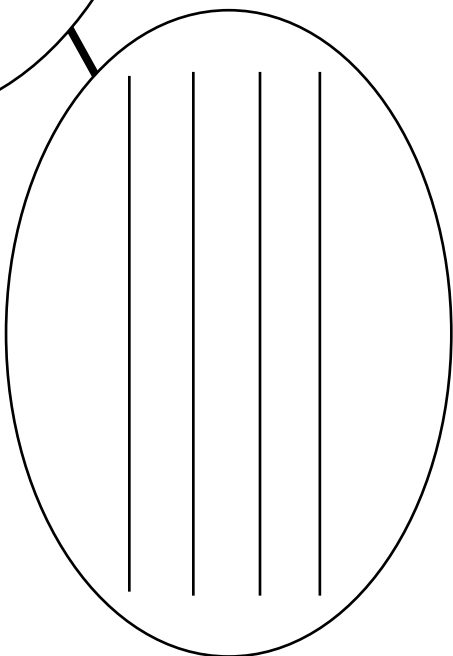
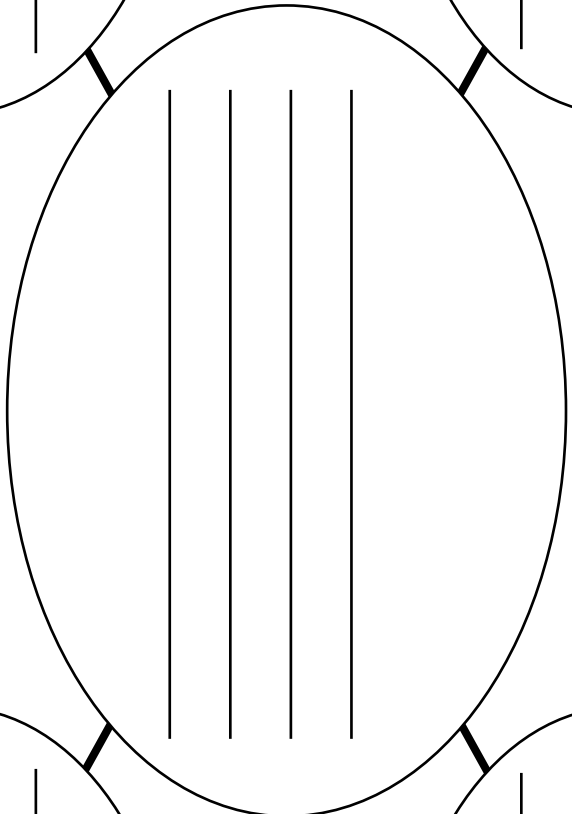
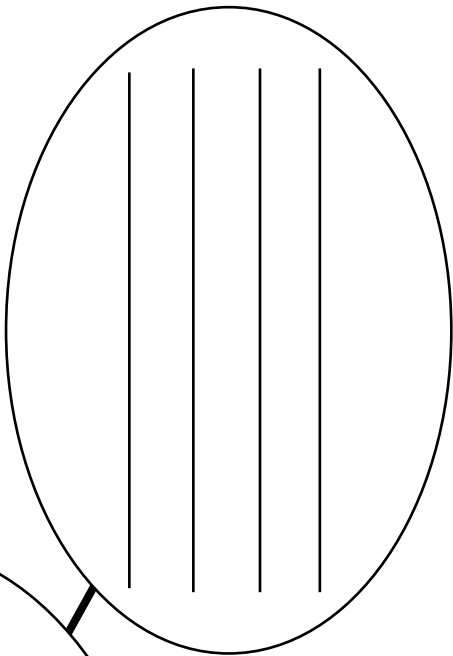
Word				
Text Clues				
Visual Clues				
What I Think the Word Means				
Definition				

Name _____

Date _____

LANGUAGE ARTS ASSESSMENT: Sailing With the Blue Fleet

Write the main idea of the article in the middle circle. Pick four paragraphs. Write the main idea of each.



Name _____

Date _____

CONTENT ASSESSMENT: Sailing With the Blue Fleet

Name and draw each animal in the article. Identify each animal's adaptations. Explain how they help the animal survive.

Name	Draw	Identify	Explain

COMPREHENSION CHECK: Sailing With the Blue Fleet

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

1. Where do "Blue Fleet" animals live?
Ⓐ near the shore
Ⓑ deep in the ocean
Ⓒ on the ocean's surface

2. Which of these "Blue Fleet" animals has cerata?
Ⓐ violet sea snail
Ⓑ Portuguese man-of-war
Ⓒ blue dragon sea slug

3. How are the Portuguese man-of-war and blue button jellyfish alike?
Ⓐ Both are protected by countershading.
Ⓑ Both have tentacles.
Ⓒ Both hang upside down.

4. Which of these statements is true?
Ⓐ The blue button jellyfish is a jellyfish.
Ⓑ The blue dragon sea slug can move on its own.
Ⓒ The by-the-wind sailor has a hard shell.

5. Explain how countershading helps some "Blue Fleet" animals survive.

Standard Supported

- Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. [CCSS.RI.3.1]

Resources

- Vocabulary Assessment Master (page 15)
- Language Arts Assessment Master (page 16)

Summary

- The article "In Search of the Lost City" relates how archaeologists used new technology to locate ancient ruins in the rain forests of Honduras and Nicaragua.

BUILD VOCABULARY AND CONCEPTS

- **archaeologist**
- **culture**
- **excavation**

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each vocabulary word as you read it aloud from the Wordwise feature on page 15.

Divide the class into pairs. Point out to students that they may have heard some or all of these words before. Using that background knowledge as a base, instruct partners to predict and write a definition for each word. Then have them write a sentence for each word, based on the definitions they wrote.

Display the Wordwise feature on page 15 of the projectable magazine. First, instruct students to make sure they spelled each word correctly. Then review the definitions as a class. Have students add these definitions to their worksheets. With their partners, have students write a new sentence for each word that accurately reflects how it was defined in the article.

READ

Inform students that the purpose of this article is to learn about how archaeologists used modern technology to find the ruins of ancient cities.

Tell students that the best way to learn more about topics like this is to ask themselves questions as they read the article. **Say:** *Good readers always ask questions as they read. It helps them learn more about the topic. And asking questions isn't as hard as you might think. Many questions begin with the same six question words: Who? What? Where? When? Why? and How?*

Display pages 10-11 of the projectable magazine. Model how to ask and answer questions. **Say:** *When I look at this page, the first thing I notice is the photo. The second thing I see is the headline. Together, they make me ask a lot of questions. Where is this place? How can a city become lost? And how would anyone ever find a lost city in a place like this?* Encourage students to introduce new questions of their own.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to write at least one question related to the article that begins with each question word. Challenge them to find answers to their questions in the text. Instruct students to record the answers on their worksheets.

In Search of the Lost City

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about the search for the lost city. **Ask:** *What does an archaeologist do?* (study the things people left behind such as artifacts and monuments) *Where did the archaeologists in this article go?* (the Mosquitia region of Honduras and Nicaragua) *What is this area like?* (It's a rain forest.) *What happened to the city they're searching for?* (It was abandoned. The jungle grew over its ruins.) Invite students to share what else they learned about the search for the lost city.

- **Predicting Definitions** Have students turn and talk to discuss what they learned about the article's vocabulary words. Encourage them to compare the before and after sentences they wrote for each word. As a class, examine how new knowledge contributes to students' understanding of each word.

- **Ask and Answer Questions** Remind students that asking and answering questions is a strategy that can help them understand what they are reading.

Say: *Even the best readers come across words or ideas they don't understand. Asking questions is the first step toward figuring those things out. If you ask questions, you know which answers to search for as you read the text.* Have students share and compare their **Language Arts Assessment Masters** in small groups. Do they have the same questions? Did they find the same answers? If not, encourage them to identify where in the text they found the answer and make any necessary corrections.

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.

- *Who were the Mosquitia people?*
- *What is the legend of "Ciudad Blanca" and how did it begin?*
- *What surprised you about what you read?*

Standard Supported

- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (NGSS.3-5-ETS1-2)

Resources

- Content Assessment Master (page 17)
- Comprehension Check (page 18)

Science Background

The story of the White City, or "Ciudad Blanca," started when the Spanish first came to Central America. They told of a city with white walls that was filled with treasure, hidden deep in the jungle. Over time, it became a legend.

People have searched for the White City. But in the past, that was no easy task. The rain forests in the Mosquitia region of Honduras and Nicaragua are filled with dense vegetation, dangerous animals, and deadly diseases. But now, thanks to modern technology, the ruins of real lost cities have been discovered.

Archaeologist Chris Fisher had a site in mind. So he used a new technology called lidar, which stands for "light detection and ranging," to search. Lidar sends pulses of light toward the ground. Most reflect off of the treetops. But some make it to the ground before they bounce back up. The time it takes for the light to return creates a "point cloud" that helps make a picture of what lies below the canopy.

In this case, lidar revealed the ruins of two ancient sites. There were roads, farming terraces, canals, and a reservoir. The jungle had revealed its secrets.

Fisher and filmmaker Steve Elkins trekked through the jungle to their target sites. When they got there, they found the outlines of buildings and an assortment of carved stone objects. Their discovery will help them learn about the ancient people who once lived here.

ENGAGE

Tap Prior Knowledge

Prior to conducting this activity, write the following words on notecards: *legend*, *rain forest*, *treasure*, *hidden*, *lost*, *city*, and *explore*. Display the cards one at a time. Invite students to share what they know about each word. As a class, brainstorm ideas for a legend that features all of the other words.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Read aloud the headline and deck as students examine the photo. **Ask:** *How would you even begin to search for a lost city in a place like this?* Encourage students to share their ideas. As a class, discuss reasons why archaeologists would want to search for a lost city. Brainstorm ideas about what they might see if they found one.

Set a Purpose and Read

Have students read the article in order to recognize who the Mosquitia people were and understand how scientists are using new technology to collect information about their lost cities.

EXPLAIN

Recognizing the Mosquitia people

Poll the class to see how many students have heard of the Maya, an ancient people who lived in Central America. (Most, if not all, students are likely to raise their hands.) Take a second poll to see how many students have heard of the Mosquitia, another ancient Central American group. (Few, if any, hands are likely to go up.) Brainstorm ideas about why people know so much more about the Maya. Then display pages 14-15 of the projectable magazine. As a class, read and review the sidebar to learn about the Mosquitia people. Invite students to examine the photos and describe what they see. **Say:** *Today, we learn about ancient cultures through artifacts, or the objects people left behind. If nearly everything the people built disappears, it is easy for that culture to be forgotten.* As a class, discuss reasons why it would particularly difficult to find the few remaining artifacts of the Mosquitia people in this rain forest.

Understanding New Technology

Display pages 12-13 of the projectable magazine. As a class, review the feature "Archaeology From Above." Guide students to recognize that the numbered steps explain how new lidar technology helps archaeologists find ancient ruins. The lettered items identify different structures they have found in a valley in Mosquitia. Challenge students to identify the outlines of those structures in Steps 4 and 5. Then give each student a copy of the **Content Assessment Master**. Instruct students to draw their own pictures of a rain forest canopy. Then encourage them to add layers to show the ground below the canopy, traces of buildings, and the remains of a lost city. (Students may find it easier to start with the image of the lost city and work backward.) Remind students that any features they draw on the ground must match up with the structural outlines in their lost cities. When students are finished drawing, instruct them to add a map key to identify key structures in their lost cities.

ELABORATE

Find Out More

Point out to students that excavation, or digging, has traditionally been how archaeologists made new discoveries. But now, with lidar technology, they have a new tool that makes the search for the past easier, safer, and more precise. Divide the class into small groups. Instruct groups to conduct research to learn more about lidar technology and how it's helping archaeologists make new discoveries. Invite groups to share what they learned with the class.

Extend Your Thinking About Observation

Display the National Geographic Learning Framework feature on the magazine's back cover. Discuss what observation is. Tell students that when people observe, they notice things. When scientists observe, they document what they see. Studying these notes helps scientists understand their observations. Take the class outside. Instruct students to pick a plant or animal and observe it for a while. Encourage students to take notes and draw pictures of what they see. Invite students to share their observations with the class. As a class, discuss what students' observations reveal about the area.

EVALUATE

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

- *What is culture?* (the customs, arts, beliefs, and achievements of a particular nation, people, or other social group)
- *Where did the archaeologists in the article search for lost cities?* (the Mosquitia region of Central America)
- *What helped them find lost cities?* (lidar technology)

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

Name _____

Date _____

VOCABULARY ASSESSMENT: In Search of the Lost City

Use this organizer to study each vocabulary word in the article.

Word			
Predicted Definition			
Sentence			
Definition from the Article			
Sentence			

LANGUAGE ARTS ASSESSMENT: In Search of the Lost City

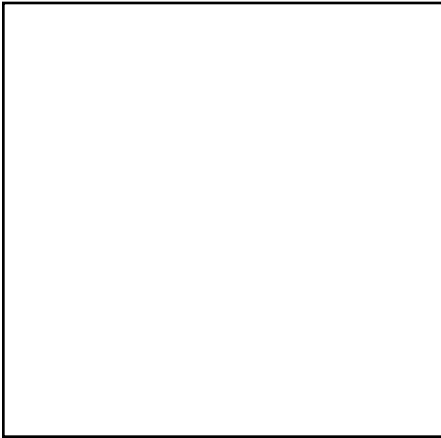
Use these question words to ask and answer questions about the search for the lost city.

Question Word	My Question	My Answer
Who?		
What?		
Where?		
When?		
Why?		
How?		

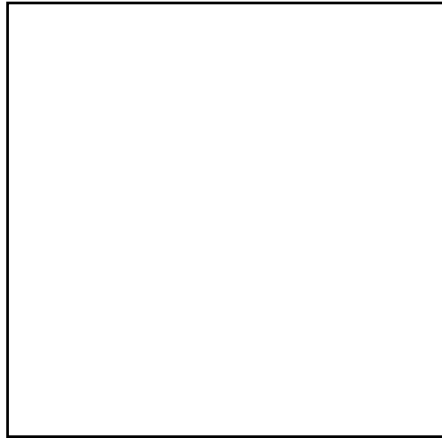
CONTENT ASSESSMENT: In Search of the Lost City

Use pictures to show how lidar technology works. Draw a rain forest canopy, the ground below it, signs of life, and a lost city. Add a map key to identify structures in your lost city.

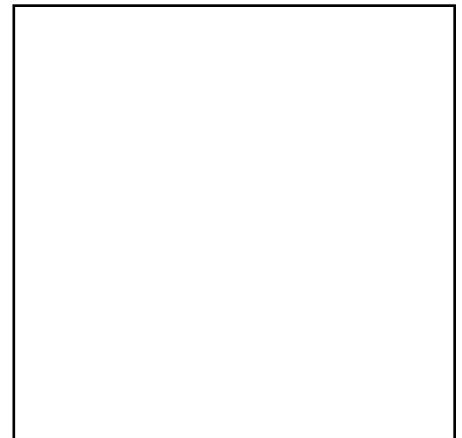
Canopy



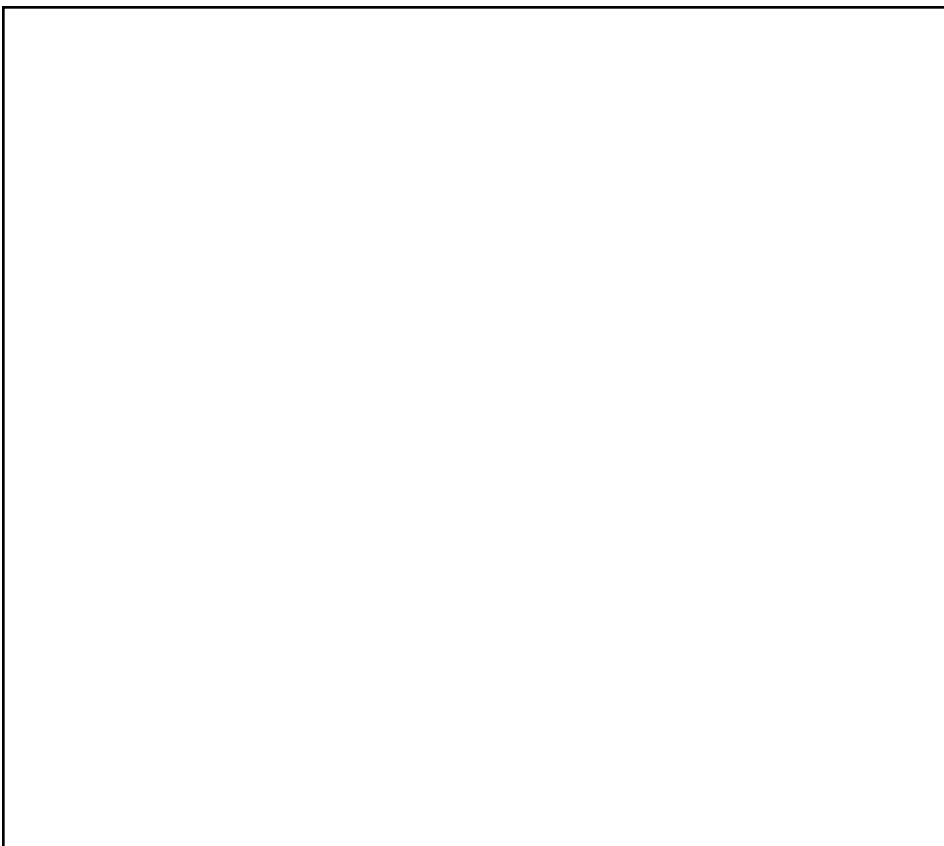
Ground



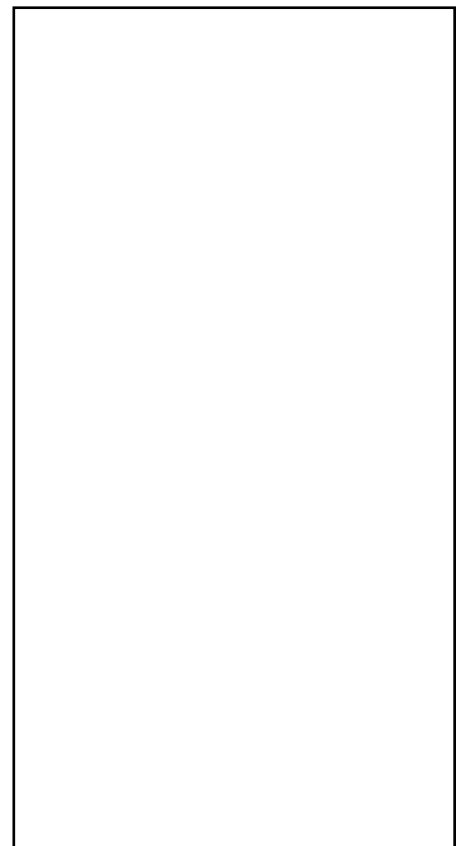
Signs of Life



Lost City



Map Key



COMPREHENSION CHECK: In Search of the Lost City

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

1. Where is the Mosquitia region?
 Ⓐ Africa
 Ⓑ Asia
 Ⓒ Central America

2. What is the Mosquitia region like?
 Ⓐ desert
 Ⓑ rain forest
 Ⓒ grassland

3. What did lidar technology help archaeologists find in Mosquitia?
 Ⓐ canals
 Ⓑ white walls
 Ⓒ a rain forest canopy

4. What did archaeologists find when they went to the site?
 Ⓐ stone sculptures
 Ⓑ Mosquitia people
 Ⓒ wooden buildings

5. What does lidar show? What does it help scientists find?

Standard Supported

- Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (CCSS.RI.3.7)

Resources

- Vocabulary Assessment Master (page 23)
- Language Arts Assessment Master (page 24)

Summary

- The article "The Ups and Downs of Ramps" introduces readers to ramps, a type of simple machine, and explores how ramps help people do work more easily.

BUILD VOCABULARY AND CONCEPTS

- **effort**
- **inclined plane**
- **load**
- **simple machine**

Display the Wordwise feature on page 21 of the projectable magazine. Invite volunteers to read aloud the words and their definitions. Encourage students to share what they know about each word.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each word and its definition. As a class, discuss how the vocabulary words are related. Then divide the class into pairs. Challenge partners to create a diagram that illustrates how the words are connected. Have students label each word in their diagrams. Then invite pairs to share their ideas with the class.

READ

Inform students that the purpose of this article is to introduce them to inclined planes, or ramps, which are a type of simple machine.

Display pages 16-17 of the projectable magazine.

Say: *When people read, they usually focus on the words. But photos can tell you a lot, too. For example, when I look at these pages, the first thing I notice is the roller coaster. The roller coaster is going downhill.*

Ask: *Do you notice anything else in the photo?*

Encourage students to share their ideas.

Invite a volunteer to read aloud the headline and deck. **Say:** *Articles are full of information. Sometimes, it's words, like the headline and deck. The main thing I notice about the headline and deck for this article is that they don't talk about roller coasters. But they do contain the words "ramp" and "inclined plane." It says an inclined plane makes work easier. So why is there a picture of a roller coaster? What does a roller coaster have to do with work? To figure this out, we could read the entire article. But we might find the answers to these questions quicker if we looked at the photos, captions, illustration, and other features in the article.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to write four questions they have about key concepts in the text. Tell them to record each answer and tell where they found it in the article.

Ramps

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about ramps. **Ask:** *What is another word for ramp?* (inclined plane) *How is an inclined plane different from other simple machines?* (It doesn't move.) *How do people get things to move with an inclined plane?* (They have to use force.) Encourage students to share other interesting facts they learned about ramps, or inclined planes.

- **Finding Connections** Explain to students that a word's definition tells you what the word means. But readers can get a more thorough understanding if they recognize how important words are connected. Point out that this is exactly what they did when they drew their diagrams. Instruct students to turn and share the diagrams they drew on their **Vocabulary Assessment Masters** with a partner. Encourage them to compare how they illustrated each word to show an overall relationship between each of the vocabulary words.

- **Interpreting Information** After reading the article, have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the questions they came up with and the answers they recorded for each. Have students discuss how using text, photos, and the diagrams helped them answer their questions more quickly than if they had searched through the text. As a class, identify other types of resources that could help them quickly learn even more about inclined planes.

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 a roller coaster considered to be an inclined plane? What are some other examples of inclined planes?*
- *Identify one ramp you have used. How did it help you do work more easily?*
- *What surprised you about what you read?*

Standard Supported

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specific criteria for success or how well each takes the constraints into account. (NGSS.3-5-ETS1-1)

Resources

- Content Assessment Master (page 25)
- Comprehension Check (page 26)

Science Background

When people think of machines, they generally picture complicated gadgets with lots of moving parts. But not all machines are this complex. Some, called "simple machines," only have a few parts. And they are extremely helpful when you want to get work done.

In this article, the second of a six-part series about simple machines, students will learn about inclined planes. An inclined plane is a ramp. It is, quite simply, just a sloping surface.

Inclined planes make it easier for people to move things from one level to another. If a ramp is long and the slope is gentle, less force is needed to move a load. But it takes more force if the ramp is short and the slope is steep.

People use inclined planes every day. A ladder is an inclined plane. So are stairs. If a driveway goes up a hill, it's an inclined plane, too.

Inclined planes make it easier to lift and load things. But sometimes, they just let you have fun. Slides are inclined planes. Roller coasters are one inclined plane after another. And many sports, such as skiing, snowboarding, and skateboarding, use inclined planes to help people gain speed so they can zip along or fly through the air.

ENGAGE

Tap Prior Knowledge

As a class, pick one place in the school where there are stairs. Tell students to imagine that same place without stairs. Brainstorm ideas about how people could now get from one level of the building to another. Discuss the pros and cons of each option.

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable magazine. Read aloud the headline and deck. Inform students that this article is about ramps, or inclined planes.

Ask: *What clues show or tell you what a ramp is?*

(The headline says ramps go up and down. The diagram shows what an inclined plane looks like. The diagram's header says an inclined plane is a simple machine. The deck says a ramp, or inclined plane, makes work easier to do.) Challenge students to identify the ramp in the photo (roller coaster). Brainstorm ideas about how roller coasters make it easier to do work.

Set a Purpose and Read

Have students read the article in order to recognize that inclined planes are simple machines and to understand the relationship between inclined planes, effort, and load. Students will also do an experiment to see how inclined planes make it easier to do work.

EXPLAIN

Recognizing Ramps as Simple Machines

Display the Wordwise feature on page 21 of the projectable magazine. Review the definitions of *inclined plane* and *simple machine*. Remind students that an inclined plane and a ramp are the same thing. **Say:** *According to the article, an inclined plane is actually the simplest of simple machines.* **Ask:** *Why do you think that is?* (Possible response: An inclined plane only has one part, whatever is used to create the ramp.) As a class, review the photos on pages 20-21. Challenge students to identify the inclined plane in each.

EXPLAIN

(continued)

Understanding Relationships

Display the Wordwise feature on page 21 of the projectable magazine. Review the definitions of *inclined plane*, *effort* and *load*. Then display pages 18-19. Challenge students to identify the inclined plane (board), effort or force (people pushing and pulling), and load (piano) in the illustration. Brainstorm ideas about why the illustration also has an arrow for distance. Invite volunteers to read aloud the problem and solution in the yellow box. Encourage students to summarize what they learned. **Then say:** *Just because you have an inclined plane, it doesn't mean that inclined plane will solve the problem. You need the right tool for the job. Stairs are an inclined plane. But you can't lift a piano up stairs. You need a ramp. And in this case, the longer ramp did the trick. It took less effort to move the piano because the piano was moving up over a longer distance.* Guide students to recognize that there is an inverse relationship between effort and distance when using an inclined plane.

Putting Ramps to Work

Prior to conducting this activity, gather the supplies noted on page 22 of the article. Divide the class into small groups. Provide each group with the necessary supplies. Give each student a copy of the **Content Assessment Master**. Then inform students that they are going to conduct an experiment to see how using a ramp makes it easier to do work. Instruct groups to follow the instructions on pages 22-23 of their student magazines. As they complete each step, instruct students to record data on their worksheets. When all groups are finished, encourage them to share and compare their results with the class.

ELABORATE

Find Out More

Display the "Thinking Like an Engineer" sidebar on page 19. Review the sidebar with the class. Then point out that engineers solve many problems with ramps. Divide the class into small groups. Challenge each group to find photographs of a variety of different ramps. Encourage them to write a brief explanation telling how each ramp helps people lift and load things or how it helps people have fun. Invite groups to share their work with the class.

Extend Your Thinking About Ramps

Point out to students that they use ramps, or inclined planes, every day. As a class, brainstorm a list of inclined planes in and around your school. Discuss how these ramps help people in the school move things faster, farther, and more easily.

EVALUATE

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

- *What is a simple machine?* (a machine with only a few parts)
- *What is a load?* (an object that is to be moved or the work that is to be done)
- *Does effort increase or decrease when you use a longer ramp?* (decrease) *Why?* (You are moving the load up over a longer distance so you don't need to push as hard.)

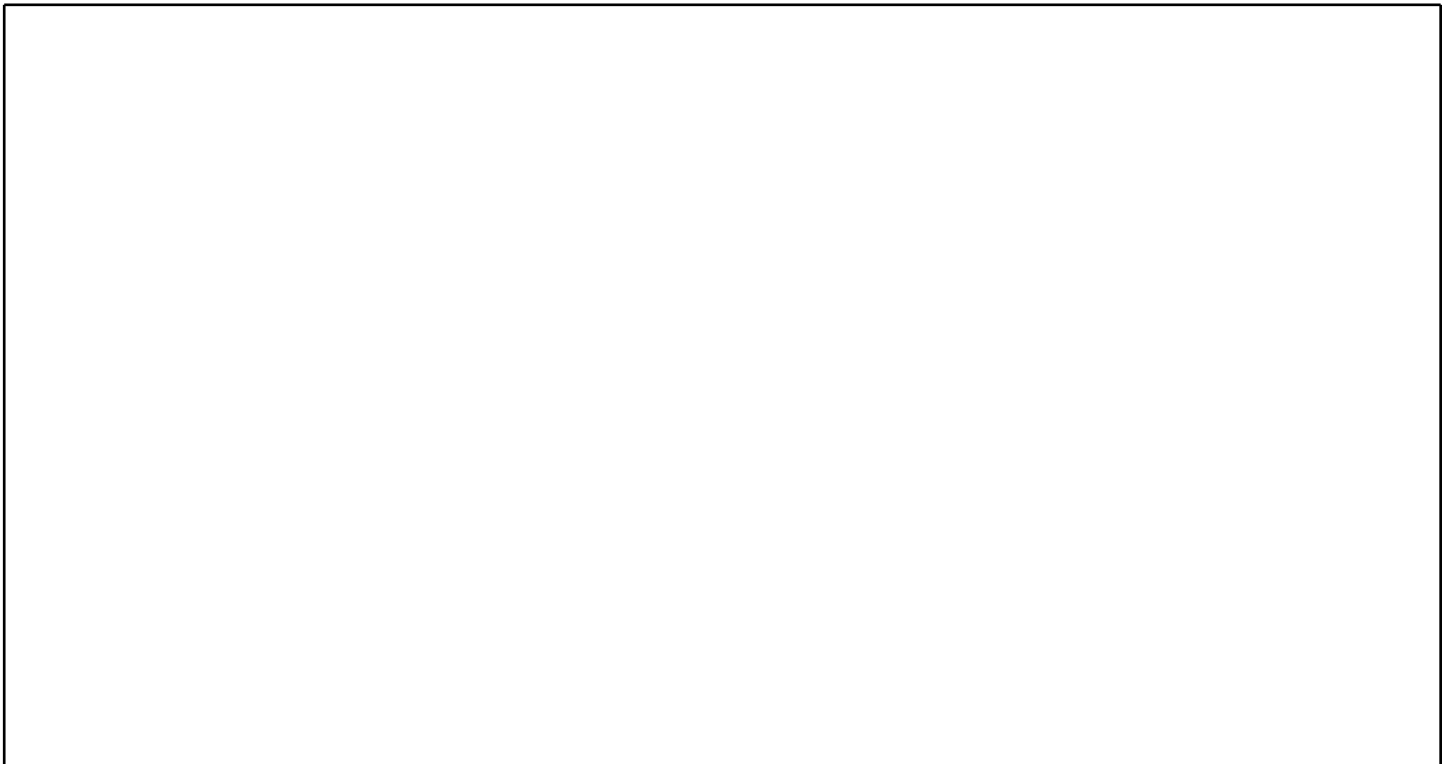
If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

VOCABULARY ASSESSMENT: The Ups and Downs of Ramps

Record each vocabulary word and its definition.

Word	Definition

Draw a diagram that shows how the vocabulary words are connected.
Label each part of your drawing.



Name _____

Date _____

LANGUAGE ARTS ASSESSMENT: The Ups and Downs of Ramps

Write four questions you have about the article. Record the answers. Tell where you found each answer in the article.

Question	Answer	Source

CONTENT ASSESSMENT: The Ups and Downs of Ramps

Use this organizer to record data as you complete the experiment on pages 22-23 of your student magazine.

1. What problem are you are trying to solve in this experiment?

2. Which supply is the load? _____

3. Which supply is the ramp, or inclined plane? _____

4. Where is the effort coming from? _____

5. In Step 5, how far did the rubber band stretch? _____

6. In Step 7, how far did the rubber band stretch? _____

7. Which way of lifting the object required less effort? Why?

8. Imagine that you did this experiment again with a shorter ramp. Would the rubber band stretch more or less than it did in Step 7? Why?

COMPREHENSION CHECK: The Ups and Downs of Ramps

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

1. What do you need to make a simple machine do work?

- Ⓐ effort
- Ⓑ a load
- Ⓒ a ramp

2. Which of these objects can be an inclined plane?

- Ⓐ a board
- Ⓑ a shovel
- Ⓒ a wheelbarrow

3. What do all inclined planes have in common?

- Ⓐ They are steep.
- Ⓑ They are long.
- Ⓒ They are slanted.

4. What do inclined planes help you do?

- Ⓐ open, close, and stick
- Ⓑ lift, load, and have fun
- Ⓒ loosen, tighten, and separate

5. Explain how ramps, or inclined planes, make it easier to do work.

Understanding Maps

AUSTRALIA AND OCEANIA

Standard Supported

- Use maps of different scales to describe the locations of cultural and environmental characteristics. (NCSS.D2.Geo.3.3-5)

Resources

- Content Assessment Master (page 28)
- Comprehension Check (page 29)
- Australia and Oceania Physical Map poster (teacher's edition)
- Australia and Oceania Political Map poster (teacher's edition)

Social Studies Background

Spatial thinking is an essential skill for students to develop as they learn about geography and Earth and environmental sciences. Developing spatial concepts takes time and practice. Recognizing that, each month Explorer magazine will introduce students to a new set of physical and political maps. Use the accompanying lessons to guide students as they learn to recognize spaces and places in the natural world.

ENGAGE

Tap Prior Knowledge

Have students list three things they would expect to see in Australia and Oceania—besides kangaroos and koala bears. Review the lists. Invite students to share what they know about Australia and Oceania.

EXPLORE

Preview the Lesson

Display the **Australia and Oceania Physical Map poster** and the **Australia and Oceania Political Map poster**. Cover the captions. Discuss what each photo tells about Australia and Oceania.

Set a Purpose and Read

Have students examine the posters in order to understand that physical and political maps can be used to describe the cultural and environmental characteristics of a location.

EXPLAIN

Explore the Physical Map

Display the **Australia and Oceania Physical Map poster**. Read aloud the text in the "Landforms" box on the left side of the poster. Have students find the Great Dividing Range and the Australian Alps. Challenge students to identify and locate other mountain ranges in Australia and Oceania. Review the other boxes in this same way. Then read aloud the caption for each photo. Invite students to share what the map taught them about the physical characteristics of Australia and Oceania.

Explore the Political Map

Display the **Australia and Oceania Political Map poster**. Invite volunteers to read aloud the captions and text. As a class, find each location mentioned on the map. Challenge students to add another fact they know about each place.

ELABORATE

Find Out More

Display the **Australia and Oceania Political Map poster**. Invite a volunteer to locate New Caledonia. Point out "(France)" below the island's name. **Say:** *New Caledonia is not an independent country. It is a dependent nation controlled by another country, France. There are several dependent nations in Oceania.* As a class, conduct research to identify other dependent nations. Challenge students to find each place on a larger world map.

Extend Your Thinking

Give each student a copy of the **Australia and Oceania Map Content Assessment Master**. Have students create a physical or political map of this continent. Then have them conduct research to find and record three more facts.

EVALUATE

Have students ask and answer questions about the physical and political maps. If you wish, have them complete the **Comprehension Check** to assess their knowledge of the continent's geography.

Name _____

Date _____

CONTENT ASSESSMENT: Australia and Oceania Maps

Create a physical or political map of Australia and Oceania. Record three new facts about the continent.



Sample Box #1

Sample Box #2

Sample Box #3

COMPREHENSION CHECK: Australia and Oceania Maps

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

- 1. How many countries are in Australia and Oceania?
Ⓐ 4
Ⓑ 14
Ⓒ 24

- 2. What kind of climate covers central Australia?
Ⓐ rain forest
Ⓑ wetland
Ⓒ desert

- 3. Australia and New Zealand are the world's leading producers of which product?
Ⓐ crickets
Ⓑ sheep
Ⓒ wool

- 4. Which landform in Australia and Oceania is so big it can be seen from space?
Ⓐ Mount Wilhelm
Ⓑ the Great Barrier Reef
Ⓒ Uluru

5. Write one political fact and one physical fact you learned about Australia and Oceania.

Sailing With the Blue Fleet

Assess Vocabulary, page 7

Students should record the words and definitions from the Wordwise feature on page 9.

countershading: a color scheme used by some animals for protection. Parts normally in shadow are in light and those exposed to the sky are dark.

pleustal zone: the region between water and air where some animals live

polyp: a simple animal with a tube-shaped body and with a mouth on top surrounded by tentacles

tentacle: a flexible body part in animals, especially invertebrates, used for feeling, grasping, or moving

Text clues, visual clues, and what students think each word means may vary. Evaluate answers for accuracy.

Assess Language Arts, page 8

Students should record the main idea of the article. (Some animals, known as the "Blue Fleet," spend their entire lives drifting on the open sea.) Additional responses will vary, depending on which paragraphs students choose to investigate.

Assess Content, page 9

1. blue button jellyfish; Drawings should resemble the animal on page 4; Possible response: blue coloring and stinging cells; The coloring helps the blue button jellyfish blend in with the ocean. The stinging cells help it catch prey.

2. Portuguese-man-of-war; Drawings should resemble the animal on page 5; Possible response: blue coloring and stinging tentacles; The coloring absorbs the sun's rays. The tentacles inject poison into prey.

3. by-the-wind sailor; Drawings should resemble the animal on page 6; Possible response: blue coloring, vane, disk; The coloring protects the sailor from the sun's harmful rays. The vane catches wind so the sailor can move. The disk has chambers filled with air to help the sailor float.

4. violet sea snail; Drawings should resemble the animal on page 7; Possible response: foot and countershading; The foot makes bubbles and oozes mucus to make a bubble raft so the snail can float. Countershading helps the snail hide from predators.

5. blue dragon sea slug; Drawing should resemble the animal on page 8; Possible response: cerata, stomach, and countershading; The cerata store poison and sting prey. The stomach stores air bubbles so the sea slug can float. Countershading helps the sea slug hide from predators.

Comprehension Check, page 10

1. C; 2. C; 3. B; 4. B; 5: Possible response: Countershading makes predators below think they're looking at the sky above and predators above think they're seeing the sea below.

In Search of the Lost City

Assess Vocabulary, page 15

Students' predictions and the sentences they write will vary. They should record the words and definitions from the Wordwise feature on page 15.

archaeologist: a scientist who studies human history by studying the things people left behind such as artifacts and monuments

culture: the customs, arts, beliefs, and achievements of a particular nation, people, or social group

excavation: the act of excavation or unearthing something by cutting, digging, or scooping

Assess Language Arts, page 16

Questions should begin with the identified question words. Answers should come directly from the text.

Assess Content, page 17

Drawings will vary but students should follow the format presented in the "Archaeology From Above" feature on pages 12-13 of the article.

Comprehension Check, page 18

1. C; 2. B; 3. A; 4. A; 5: Lidar shows the shape of the land below the trees. It helps archaeologists find areas that may have been changed by people.

(continued)

The Ups and Downs of Ramps

Assess Vocabulary, page 23

Students should record the words and definitions from the Wordwise feature on page 21.

effort: the force that makes a simple machine do work

inclined plane: a surface that is slanted so that one end is higher than the other

load: an object that is to be moved or the work that is to be done

simple machine: a machine with no more than a few parts

Diagrams should show an accurate connection between the words. All terms should be labeled in the diagram.

Assess Language Arts, page 24

Questions will vary. Students should cite specific sources in the text as the basis for each answer.

Assess Content, page 25

1. Possible Response: I am trying to move the load up the ramp with the least amount of effort.
2. bag of rice
3. cardboard
4. I am pulling on the free end of the rubber band.
5. Answers will vary.
6. Answers will vary.
7. Students should note that less effort was required in Step 7. They pulled the load a longer distance, decreasing the amount of effort needed to move it.
8. Students should note that the rubber band would stretch more. The load would be traveling a shorter distance, increasing the amount of effort needed to move it.

Comprehension Check, page 26

1. A; 2. A; 3. C; 4. B; 5: Inclined planes allow you to move a load over a longer distance, which decreases the amount of effort you need to do work.

Australia and Oceania Maps

Assess Content, page 28

Students should create an accurate physical or political map of Australia and Oceania. Students should write three facts. Facts will vary, but they should relate to the type of map (physical or political) that the student chose to create.

Comprehension Check, page 29

1. B; 2. C; 3. C; 4. B; 5: Answers will vary.