

In This Guide

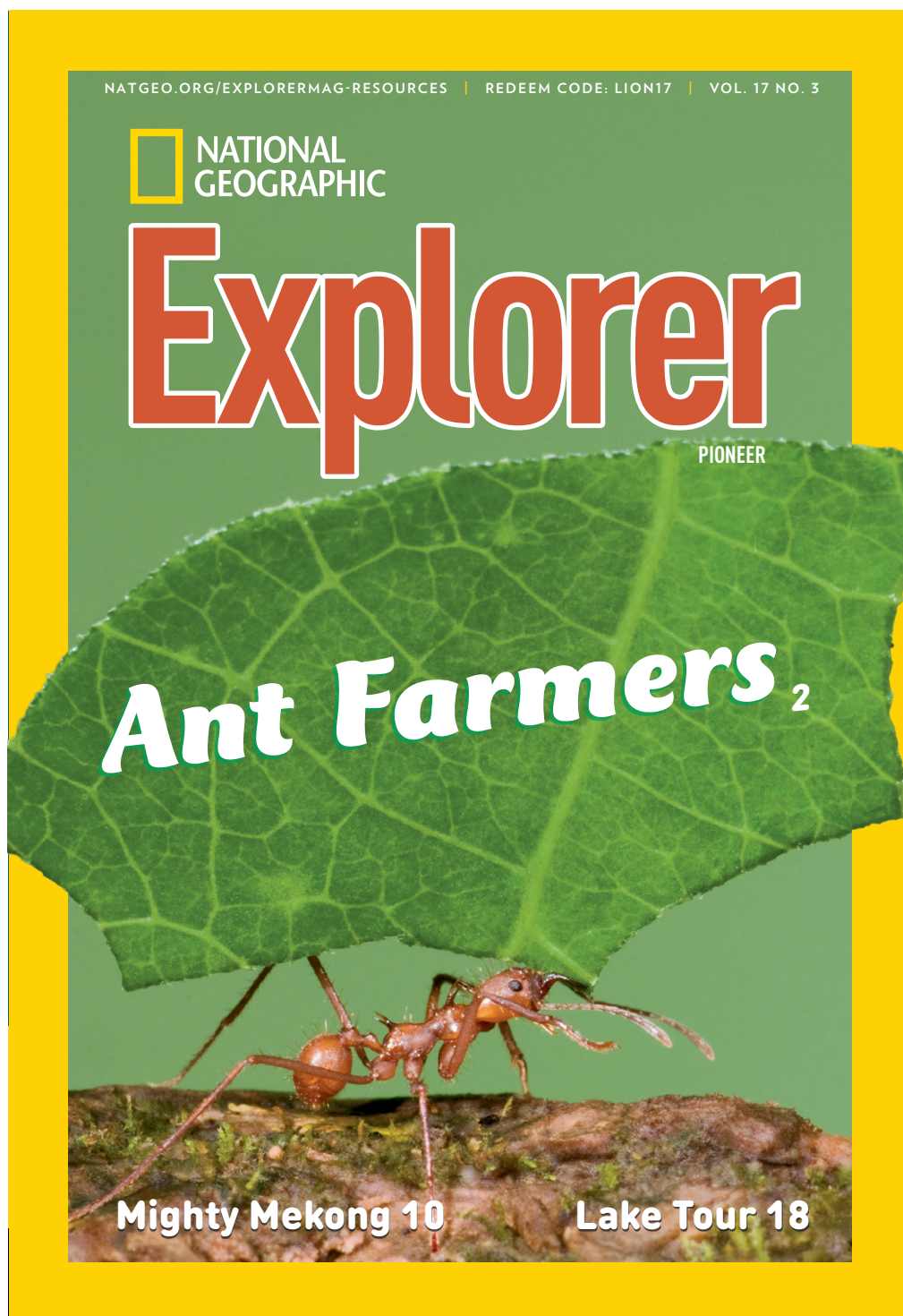
This guide contains language arts and science or social studies lessons for articles in this issue of EXPLORER PIONEER.

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 PIONEER will be within the 250-550L range.

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



Your Subscription Includes:

- Magazines
- Classroom Posters
- Projectable Magazine
- Teacher's Guide
- App (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 "Monster Fish."

MINDSET OF AN EXPLORER

KEY FOCUS AREAS



Attitudes

National Geographic kids are:

CURIOUS 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.



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.



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

- Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text. [CCSS.RI.2.7]

Resources

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

Summary

- The article "Ant Farmers" introduces readers to leafcutter ants, which farm their food and have a complex social system.

BUILD VOCABULARY AND CONCEPTS

- colony
- fungus

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.

In small groups, have students brainstorm ideas about what each word might mean. Instruct them to write a definition in their own words on their worksheets. Then display the Wordwise feature on page 9 of the projectable magazine. Have students record those definitions and compare them with the definitions they wrote.

READ

Inform students that the purpose of this article is to introduce them to leafcutter ants, a type of ant that lives in the rain forest and farms its own food.

Display pages 2-3 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 this photo, I see ants. The ants are carrying leaves.*

Ask: *What else can you learn by looking at this photo?* Encourage students to share their ideas.

Then point out to the class that the ants are not carrying whole leaves. They are carrying pieces.

Ask: *Who do you think cut up these leaves? And why do you think they did it?* Encourage students to answer the questions.

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. These text features are short, but in this instance they're packed with information. We learn that the ants are farmers. They live in colonies. They are leafcutter ants. They farm fungus in a rain forest. That's a lot of information. But we don't know how or why the ants do this. To figure this out, we could read the entire article. But we could find some of the answers quicker if we looked at the photos, captions, and diagrams 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 record each answer. Tell students to circle the word that tells where they found each answer in the article.

TURN AND TALK

Have students turn and talk to discuss what they learned about leafcutter ants. **Ask:** *Where can you find leafcutter ants?* (tropical forests in Central and South America; parts of Mexico and the United States) *What is a leafcutter ant home called?* (a colony) *What do leafcutter ants grow inside their homes?* (a fungus)

- **Understand Definitions** Poll the class to see how many students feel that they are more familiar with the article's vocabulary words now that they have studied the definitions. **Say:** *One way to see if you fully understand a new word or idea 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 define each vocabulary word in their own words to a partner. Encourage them to better explain each word by giving details and examples from the text. Prompt discussion with questions such as: *What is a colony? Why might leafcutter ants live in a colony instead of all alone?*

- **Interpreting Information** After reading the article, have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the answers they recorded for each question and the source they cited for each. Have students discuss how using photos, captions, and the diagrams helped them find answers more quickly than when they had to search through the text. As a class, identify other types of resources that could help them quickly learn even more about leafcutter ants.

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.

- *Where do you think leafcutter ants got their name?*
- *What does it look like inside a leafcutter ant nest?*
- *What surprised you about what you read?*

Standard Supported

- There are many different kinds of living things in an area, and they exist in different places on land and in water. (NGSS.2-LS4-1)

Resources

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

Science Background

There are more than 40 species of leafcutter ants. All are found in tropical forests in Central and South America as well as dry parts of Mexico and the southern United States.

Leafcutter ants live in underground colonies. There may be millions of leafcutters in one colony. They have some of the largest colonies of any type of ant.

Inside the colony, each ant has a specific job. The queen lays eggs. Soldier ants protect the colony from intruders. Worker ants gather leaves, tend to the garden, and take care of the young. They also build and maintain tunnels inside the colony and keep the colony clean.

Leafcutter ants are easily recognized when they are at work. Thousands of workers will march in a line as they cross the forest floor. Each ant carries a piece of leaf. The pieces are small, but they can weigh up to 50 times an ant's own weight.

The ants make their way back to the colony, where other workers chew up the leaves and turn them into a paste. The paste grows into a white fungus that the ants feed their young. Leafcutter ants have been growing their own food like this for more than 8 million years. They are some of the oldest farmers on Earth.

ENGAGE

Tap Prior Knowledge

As a class, brainstorm a list of chores students and their families do at home. Once a long list of chores has been compiled, poll the class to see how many students would rather do all of these jobs themselves and how many would prefer to split up the work. Discuss reasons why it's often easier to work as part of a group.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Invite volunteers to describe what they see. Then challenge them to explain what they think the ants are doing. **Ask:** *Why are the ants walking in a line? Where do you think they're going?* (Possible responses: They're walking in a line because they're all going to the same place. They're probably going to their home.) Read aloud the headline. **Say:** *According to the headline, the ants are farmers.* **Ask:** *How do you think they will use the leaves when they farm?* Encourage students to brainstorm ideas. Tell students that as they read the article they will learn how leafcutter ants grow their own food and why it is helpful for them to live in large groups.

Set a Purpose and Read

Have students read the article in order to learn where leafcutter ants live, how they grow their own food and why it is helpful for them to live in large groups.

EXPLAIN

Identifying Where Leafcutter Ants Live

Inform students that leafcutter ants live in Central America, Mexico, and the United States. Display a world map or globe. Challenge students to find each place. **Say:** *According to the article, they live in rain forests.* **Ask:** *What is it like in a rain forest?* Invite students to share their ideas. Then challenge the class to identify other types of animals that might live here, too.

EXPLAIN

(continued)

Understanding Ant Farms

Display page 4 of the projectable magazine. Point out to the class that the top photo shows what a leaf looks like when a leafcutter ant collects it. The bottom photo shows what leaves look like after the ants turn them into a paste. **Say:** *Leafcutter ants don't eat leaves. They farm with them. They chew the leaves into a mush.* **Ask:** *What do they do with that mush?* (They put it into piles. A white fungus grows on the mush. The ants eat the fungus.)

Recognizing the Benefits of Groups

Display the diagram on pages 4-5 of the projectable magazine. **Say:** *There may be millions of leafcutter ants in a colony. But there are only three types of ants: the queen, the soldiers, and the workers. And each of these ants has a specific job.* As a class, review the article to identify the jobs done by each type of ant. (workers: care for young, look after fungus garden, guard the trails and nest, cut leaves, clear trails, dig new rooms; soldier: protect the nest from predators; queen: lay eggs) Then display pages 6-7 of the projectable magazine. As a class, discuss how the diagram helps readers understand how leafcutter ants work together and live in their colonies. Give each student a copy of the **Content Assessment Master**. Using the diagram on pages 6-7 as a guide, have students draw their own picture of a leafcutter ant colony. Tell them to label each soldier, worker, and the queen in their picture.

ELABORATE

Find Out More

Remind students that leafcutter ants work together to build ant paths and find food. **Ask:** *How do they know where to go? How are they able to stay together?* Divide the class into groups. Have groups conduct research to learn more about leafcutter ants. Invite groups to share what they learned with the class.

Extend Your Thinking About Leafcutter Ants

Remind students that leafcutter ants can strip an entire tree of leaves in a few hours. They can quickly strip farmland clean, too. Inform students that many tropical forests like those where leafcutter ants live are disappearing. Often, the forests are replaced with farms. Discuss reasons why this could cause problems for leafcutter ants in the future.

EVALUATE

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

- *Which leafcutter ant lays eggs?* (the queen)
- *What do leafcutter ants do with their trash?* (They throw it into a trash pile at the bottom of the nest.)
- *How do leafcutter ants help the rain forest?* (They trim trees and bushes so new plants can start to grow.)

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

Name _____

Date _____

VOCABULARY ASSESSMENT: Ant Farmers

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:

LANGUAGE ARTS ASSESSMENT: Ant Farmers

Answer each question. Record the answer. Circle where you found each answer in the article.

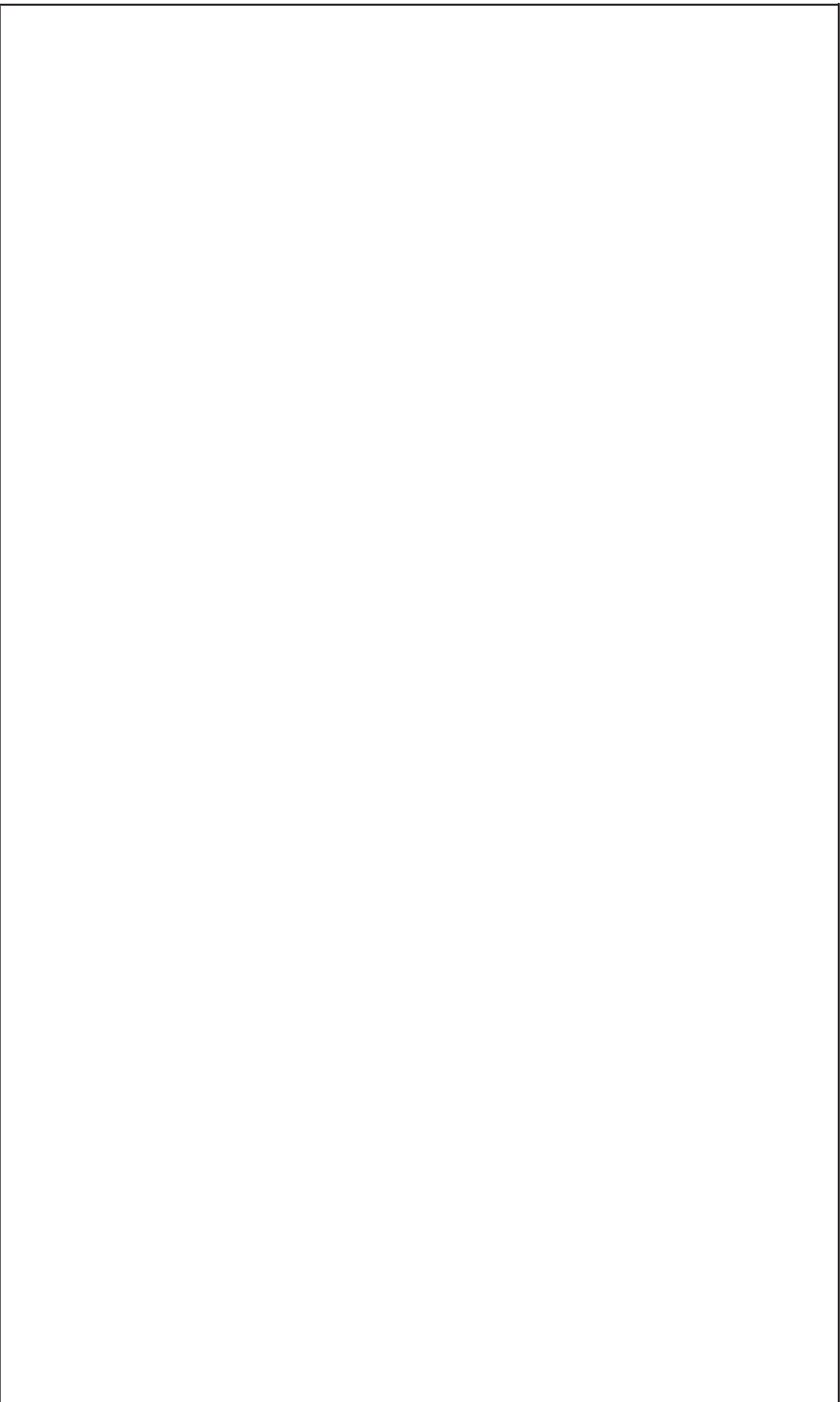
Question	Answer	Source	
What are the three main types of leafcutter ants?		Text Caption	Photo Diagram
What color are leafcutter ants?		Text Caption	Photo Diagram
What do leafcutter ants use to cut leaves?		Text Caption	Photo Diagram
What sound do leafcutter ants make?		Text Caption	Photo Diagram

Name _____

Date _____

CONTENT ASSESSMENT: Ant Farmers

Draw a picture of a leafcutter ant colony. Label each worker, soldier ant, and the queen.



COMPREHENSION CHECK: Ant Farmers

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

1. Where do leafcutter ants live?
Ⓐ deserts
Ⓑ oceans
Ⓒ rain forests
2. What do they do with leaves?
Ⓐ Eat them.
Ⓑ Cut them.
Ⓒ Grow them.
3. Which ant is most important in a leafcutter colony?
Ⓐ worker
Ⓑ soldier
Ⓒ queen
4. Which of these jobs does a worker ant do?
Ⓐ lay eggs
Ⓑ remove trash
Ⓒ attack enemies

5. Tell how living in a group helps leafcutter ants survive.

Standard Supported

- Identify the main purpose of a text, including what the author wants to answer, explain, or describe. (CCSS.RI.2.6)

Resources

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

Summary

- The article "The Mighty Mekong: River of Giants" follows American biologist, ichthyologist, and photographer Zeb Hogan as he travels along the Mekong River in search of monster fish.

BUILD VOCABULARY AND CONCEPTS

- **endangered**
- **extinct**
- **migrate**

Display the vocabulary words on page 17 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. Then have them think about how the words might be related. Challenge students to write three sentences, each containing two vocabulary words, to show these connections. For example: If a fish can't migrate, it could become extinct.

After reading the article, rejoin as a class. Have students share their sentences. Now that they've read the article, do the connections still make sense? If not, help students rewrite their sentences to show more logical connections between the vocabulary words.

READ

Display pages 10-11 of the projectable magazine. Give students a moment to examine the headline and illustration. Then ask students what they think this article is about and why the writer wrote it. Ask them to describe what they expect to read.

Compare students' expectations for the article. **Say:** *People write for different reasons. Sometimes, they want to inform or teach readers about a new topic. Sometimes, they want to persuade by expressing an opinion. And sometimes, they just want to entertain readers with a good story.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, challenge them to find evidence that identifies the writer's purpose for this article. Instruct students to record items that support that writer's purpose on their worksheets. Instruct students to also identify what they think the writer wanted to inform, persuade, or entertain readers about.

TURN AND TALK

Have students turn and talk to discuss what they learned about giant fish in the Mekong River. **Ask:** *What does Zeb Hogan do with giant fish when he finds them?* (He tags the fish, measures it, collects samples, and puts it back into the river.) *Why?* (He is studying the fish to learn how to save them.) Invite students to share other facts they learned about giant fish on the Mekong River.

- **Finding Connections** Explain to students that reading definitions tells you what a word means. But readers can get a more thorough understanding if they can see how words are connected. Point out that this is exactly what they did when they wrote their sentences. Instruct students to turn and share the sentences they wrote on their **Vocabulary Assessment Masters** in small groups. Encourage them to identify and discuss any similarities and differences they see. Talk about how comparing sentences helps give them a better understanding of the vocabulary words.

- **Recognizing the Writer's Purpose** Invite volunteers to reveal whether they thought the writer wrote this article to inform, entertain, or persuade. Encourage them to use the information on their **Language Arts Assessment Masters** to support their ideas. Then guide the class to recognize that the writer's intent is to inform. **Say:** *In this article, the writer isn't trying to convince readers to go to the Mekong River and save giant fish. And he isn't telling an exciting tale about catching fish. Sure, each section is interesting, but there are no characters and there is no plot. This writer isn't trying to entertain you. But he is trying to give you facts so you can understand the problem. The writer even included definitions and examples to make the purpose of the article clear.* Invite students to share what they learned about the giant fish that live in the Mekong River.

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 are there fewer giant fish in the Mekong River?*
- *What could cause the giant fish to become extinct?*
- *What surprised you about what you read?*

Standard Supported

- There are many different kinds of living things in an area, and they exist in different places on land and in water. (NGSS.2-LS4-1)

Resources

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

Science Background

The Mekong River flows 4,350 kilometers (2,700 miles) and goes past or through six countries. It is the longest river in Southeast Asia.

The Mekong is also one of the most biodiverse rivers on Earth. Among its bounty are some of the biggest freshwater fish in the world. The giant catfish, for example, can grow up to 3 meters (10 feet) long and weigh up to 295 kilograms (650 pounds). Nobody knows why the fish grow so big.

The Mekong is a large river with a healthy ecosystem. That same ecosystem provides food for more than 60 million people. They eat the river's fish and grow rice on its floodplains.

Giant catfish were once plentiful in the river, but their numbers have dropped dramatically—about 95 percent—over the past century. They are now a critically endangered species. There may only be a few hundred adult fish left.

How did this happen? Overfishing is the main problem. But people's quest for cheap energy hasn't helped. People built dams on the Mekong and its tributaries to harness hydroelectric power. Giant catfish are migratory fish. They cannot go past the dams to reach their spawning grounds. Engineers are working on a solution. But for now the dams block the way, increasing the chances that the giant fish will someday become extinct.

ENGAGE

Tap Prior Knowledge

Instruct students to imagine that they're with a group of friends fishing on a river. They catch a big fish. When they measure it, they find out that it's actually about nine feet long! What would they do: keep the fish or release it back into the river? Why?

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Inform students that this article is about giant fish that live in the Mekong River. Zoom in on the comprehension strategy in the upper right corner. Invite a volunteer to read it aloud. As a class, brainstorm a list of things people could do that might change the river. Tell students they will learn more about this as they read the article.

Set a Purpose and Read

Have students read the article in order to learn what a "river giant" is, understand how people are changing the Mekong River, and why it is important for scientists to study the big fish.

EXPLAIN

Understanding River Giants

Display pages 12-13 of the projectable magazine. Instruct students to compare the fish in the top photo to fish they've seen. To emphasize how large the fish in the photo is, use a tape measure to measure out 2.7 meters (9 feet). Have students compare the length of the fish to their own height.

Say: *Many large fish live in the ocean. But this is a freshwater fish. It's rare for fish to grow this big in a river.* As a class, brainstorm ideas about how the fish could grow this big in a river. (Possible responses: The river is long, wide, or deep, giving the fish lots of space to grow. There could be a lot of food or few animals that attack the fish in the river.)

EXPLAIN

(continued)

Recognizing How People Change the River

Display page 15 of the projectable magazine. Zoom in on the map. Invite a volunteer to identify the path of the Mekong River. Then zoom in on the section "Freshwater Titans." Point out to the class that people overfished the Mekong River. Discuss what that means. (They caught too many fish. Now there aren't many fish left.) **Ask:** *What else did people do to change the Mekong River?* (They built dams on the river.) *Why is this bad for the giant fish?* (A dam is a barrier that stops the flow of water. This keeps fish from swimming up and down the whole river.) Guide students to understand that the giant fish in the Mekong River migrate. They must move up and down the river to survive. Give each student a copy of the **Content Assessment Master**. In their own words, challenge students to explain how overfishing and building dams change the Mekong River and how they harm the giant fish.

Studying Giant Fish

Remind students that Zeb Hogan is a scientist who is trying to save the Mekong River's giant fish. **Say:** *When people catch giant fish, Zeb Hogan measures and studies the fish. He tags the fish so he can see where they are swimming in the river.* **Ask:** *How can this help save the giant fish?* (Possible response: If people know where the fish are going, they might be able to build a route past the dams for the fish to follow. Then the fish can make their way up the river.)

ELABORATE

Find Out More

Inform the class that the article identified four of the world's largest freshwater fish, which live in the Mekong River: giant catfish, giant freshwater stingray, dog-eating catfish, and giant carp. As a class, select one type of fish. Then have students conduct research to learn more about this. Invite students to share what they learned with the class.

Extend Your Thinking About Responsibility

Remind students that the Mekong River's giant fish are endangered. The fish can't save themselves. People must take responsibility and help. Display the back cover of the magazine. Discuss what it means to take responsibility for something. Then take the class outside. Challenge students to find a way they can help their local environment. Instruct them to make a plan and draw pictures of it. Then have students share their ideas with others.

EVALUATE

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

- *Why do people depend on the Mekong River?* (They need it for food and jobs. Land near the river is good for growing crops. Many people grow rice.)
- *Why do people want to build dams on the Mekong River?* (They use the dams to make electricity.)
- *Why do the giant fish need to migrate?* (They need to reach the places where they can find food and lay eggs. Without that ability, the giant fish may die.)

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

VOCABULARY ASSESSMENT: Monster Fish

Record each vocabulary word and its definition.

Word	Definition

Write three sentences. Use two vocabulary words in each sentence.

1. _____

2. _____

3. _____

Name _____

Date _____

LANGUAGE ARTS ASSESSMENT: Monster Fish

Complete each sentence. Then state your own opinion about the article.

I think the writer wrote this article to _____ readers.
(inform/persuade/entertain)

The first reason I think this is that _____

_____.

The second reason I think this is that _____

_____.

The main reason I think this is that _____

_____.

These reasons explain why I think the writer wrote this article. He wanted to
_____ readers about _____
(inform/persuade/entertain)
_____.

CONTENT ASSESSMENT: Monster Fish

Use this organizer to record information about the article.

Activity	How does it change the Mekong River?	How does it harm the giant fish?
Overfishing		
Building Dams		

COMPREHENSION CHECK: Monster Fish

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

1. Where is the Mekong River?
Ⓐ Africa
Ⓑ Asia
Ⓒ Australia

2. Which of these words best describes the Mekong River?
Ⓐ salty
Ⓑ mighty
Ⓒ filthy

3. What made it harder to find giant fish in the Mekong River?
Ⓐ overfishing
Ⓑ tagging fish
Ⓒ measuring fish

4. What do fish do when they migrate?
Ⓐ move from one place to another
Ⓑ no longer exist in living form
Ⓒ become endangered

5. How do dams harm giant fish on the Mekong River?

Standard Supported

- Describe how reasons support specific points the author makes in a text. (CCSS.RI.2.8)

Resources

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

Summary

- The article "Lake Tour " takes readers on a world tour of peculiar lakes, examining how the lakes formed and what lives there.

BUILD VOCABULARY AND CONCEPTS

- **bacteria**
- **freshwater**
- **minerals**

Explain to students that when they read they will sometimes come across scientific words that are hard to understand. Searching for context clues in the text and photos can help them figure out what difficult words mean. Drawing a picture can help them remember.

Display the Wordwise feature on page 23 of the projectable magazine. Invite a volunteer to read aloud the definition of *bacteria*. Discuss what it means. Then challenge students to find this bold word in the article. Encourage them to identify clues in the photos and text that help them understand the word *bacteria* even better.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write each vocabulary word and its definition. Then have each student make a detailed sketch showing what each word means. Inform students that their drawings won't all be the same. They should simply draw each word in a way that helps them remember its definition.

READ

Display pages 18-19 of the projectable magazine. Read aloud the headline and deck. **Say:** *This article is about lakes. Most likely, you've seen a lake. But maybe you haven't seen lakes like these. According to the text, these aren't any old lakes. For one reason or another each lake featured in this article is a bit strange.*

Point out to the class that it's easy to call something strange. But if you do, you'd better have a good reason. **Say:** *Reasons tell why things happen, or why they are a certain way. People can say or write anything they want to. But if they don't have solid reasons to back up their ideas, their ideas won't make sense. That's why good writers always include reasons that support important points they want to make.*

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 identify an important point the writer makes about each lake. Encourage them to search for reasons that support each point.

TURN AND TALK

Have students turn and talk to discuss what they learned about lakes. **Ask:** *What is meltwater?* (water formed by the melting of snow and ice, especially from a glacier) *How can you tell if a meltwater lake is deep?* (The darker blue its water is, the deeper the lake is.) *How can flamingos live in poisonous lakes?* (Their leathery legs keep them safe from the water.) Encourage students to share other interesting facts they learned about peculiar lakes.

- **Interpret Visual Information** Inform students that reading definitions tells people what words mean. But sometimes readers have to "see" words to really understand them. Point out that this is exactly what they did when they drew sketches of the vocabulary words in the article. They drew the words in a way that had meaning to them. Instruct students to turn and share the sketches they created on their **Vocabulary Assessment Masters** with a partner. Encourage them to explain how their drawings reflect the scientific meaning of each word.

- **Identifying Reasons** After reading the article, remind students that reasons tell why something happens or why it is a certain way. Invite students to share their **Language Arts Assessment Masters** in small groups. Challenge them to examine one another's results to determine whether or not all reasons are valid and if they support the identified key points in 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.

- *Pick a lake from the article. Why did the writer think it was so strange?*
- *What is Lake Natron like? Why do so many flamingos live there?*
- *What surprised you about what you read?*

Standard Supported

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and liquid form. [NGSS.2-ESS2-3]

Resources

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

Science Background

A lake is a body of water surrounded by land. There are millions of lakes on Earth. Lakes are found on every continent and in every type of environment.

Lakes come in all shapes and sizes. And they can have staggering depths. Lake Baikal in Russia, is more than 1,000 meters (almost a mile) deep. It is the deepest lake on Earth.

Many lakes were formed by glaciers. As the huge bodies of ice scraped across the land, they carved out big pits. As water filled the pits, they formed lakes.

But lakes can form in other ways, too. Lake Baikal, for example, was formed by the movement of tectonic plates. And Crater Lake, located in the U.S. state of Oregon, lies at the top of a collapsed volcanic cone.

Most lakes contain freshwater. But some are salty. Lake Natron in Tanzania is so salty that its water will burn your skin. The only animals that thrive there are flamingos, whose leathery legs protect them from the water.

Some lakes are filled with cool water. Others are not. A perfect example of this is Boiling Lake, which lies on top of a fumarole on the island of Dominica. Hot magma underneath heats the water, giving the lake its name.

ENGAGE

Tap Prior Knowledge

Give each student a piece of plain white paper and invite students to draw a picture of a lake. Compare and contrast the results. What shape are most of the lakes students drew? How big are they? Where are they located? If there are people in the drawings, what are they doing? Invite students to share what else they know about lakes.

EXPLORE

Preview the Lesson

Display pages 18-19 of the projectable magazine.

Say: *In this article, we're going to go on a tour of lakes. But they're probably not like any lakes you've ever seen before. Look at the photos.* **Ask:** *How are these all of these lakes the same?* (Each one is a body of water.) Brainstorm ideas about how they are different, both from each other and from any lake students have ever seen before.

Set a Purpose and Read

Have students read the article in order to understand what lakes are and to explain how certain events can cause a lake to become peculiar.

EXPLAIN

Understanding What Lakes Are

Instruct students to examine the article's images of lakes in their student magazines. Based on what they see, challenge the class to write a definition for the word *lake*. (Possible response: a large body of water surrounded by land) Discuss how lakes are different from other bodies of water, such as rivers, oceans, and streams. Challenge students to identify where the water in lakes might come from. (Possible response: rain, melting ice, rivers, etc.)

EXPLAIN

(continued)

How a Lake Becomes Strange

Inform students that the lakes they read about in the article are not like most other lakes. For one reason or another, they are peculiar. Give each student a copy of the **Content Assessment Master**. Instruct each student to pick two lakes from the article and draw a picture of each lake. In their own words, challenge students to describe what each lake is like and explain how it got to be so peculiar.

ELABORATE

Find Out More

Inform students that there are millions of lakes on Earth. Most aren't as unusual as those featured in this article. Divide the class into small groups. Instruct groups to visit the National Geographic Education site about lakes at: <http://www.nationalgeographic.org/encyclopedia/lake/>. Have groups summarize what they think is the most important information on the site to create a presentation about lakes. Invite groups to share what they learned with the class.

Extend Your Thinking About Weird Lakes

Point out to students that each of the lakes they read about in the article is weird for a reason. For example, Spotted Lake is spotted because its water evaporates, leaving the minerals behind. Boiling Lake is so hot because melted rock under the ground heats the lake water and makes it boil. As a class, brainstorm a list of other things—natural or man-made—that could change a lake. Discuss what these things could do to a lake and how they could cause a lake to become strange.

EVALUATE

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

- *Why is it safe to swim with the jellies in Ongeim'l Tketau, or "Jellyfish Central"?* (The jellies have lost their sting.)
- *How do meltwater lakes disappear?* (In summer the air warms up and the ice melts and cracks. Water in the lakes leaks down the cracks.)
- *What is bacteria?* (tiny one-celled organisms)

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

VOCABULARY ASSESSMENT: Lake Tour

Record the definition of each vocabulary word. Create a sketch to help you remember the scientific meaning of each word.

Word	Definition	Sketch
bacteria		
freshwater		
minerals		

LANGUAGE ARTS ASSESSMENT: Lake Tour

Write an important point the writer makes about each lake.
Record reasons that support each point.

Lake	Point	Reasons
Spotted Lake		
Lake Natron		
Lake Baikal		
Ongeim'l Tketau		
Boiling Lake		
meltwater lakes		

Name _____

Date _____

CONTENT ASSESSMENT: Lake Tour

Draw two lakes from the article. Describe each lake. Tell why each lake is so peculiar.

Draw	Describe	Tell

COMPREHENSION CHECK: Lake Tour

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

1. Which weird lakes is red because of bacteria?

- Ⓐ Ongeim'l Tketau
- Ⓑ Lake Natron
- Ⓒ Boiling Lake

2. What kind of water is in Lake Baikal?

- Ⓐ salty water
- Ⓑ dirty water
- Ⓒ freshwater

3. When does Spotted Lake become spotted?

- Ⓐ after the salt burns
- Ⓑ after the water dries up
- Ⓒ after the rock melts

4. What of these lakes has the hottest water?

- Ⓐ Ongeim'l Tketau
- Ⓑ meltwater lakes
- Ⓒ Boiling Lake

5. Compare and contrast two of the weird lakes from the article.

Understanding Maps

SOUTH AMERICA

Standard Supported

- Identify some cultural and environmental characteristics of specific places. (NCSS. D2.Geo.6.K-2)

Resources

- Content Assessment Master (page 28)
- Comprehension Check (page 29)
- South America Physical Map poster (teacher's edition)
- South America 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

Instruct each student to draw a picture of something they would expect to see in South America. Invite students to share their drawings with the class. Discuss how the drawings relate to South America.

EXPLORE

Preview the Lesson

Display the **South America Physical Map poster** and the **South America Political Map poster**. Cover the captions. Have students examine the photos. Discuss what each photo tells about South America.

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 **South America Physical Map poster**. Read aloud the text in the "Landforms" box at the top of the poster. As a class, examine the map to see which desert separates the Andes Mountains from the Pacific Ocean. (Atacama Desert) Review the other boxes, photos, and captions. **Ask:** *What is special about the Atacama Desert?* (It's the driest place on Earth.) Encourage students to share what the map taught them about the physical characteristics of South America.

Explore the Political Map

Display the **South America Political Map poster**. Invite volunteers to read aloud the captions and text in the boxes at the top of the poster. Have them find each location mentioned on the map. Ask questions that link South America's physical and political characteristics, such as: Why are most cattle raised in Argentina and Uruguay? (They have grasslands.)

ELABORATE

Find Out More

Explain that symbols are an important part of any map. They help readers find places and understand what they see. Point out that the Map Key on the Political Map has two symbols, but there are three symbols on the map. **Ask:** *What is the other symbol?* (three dots) *What does it show?* (Machu Picchu) Create a name for the symbol. Add it to the Map Key.

Extend Your Thinking About South America

Give each student a copy of the **South America Map Content Assessment Master**. As a class, label each country and make a Map Key of South America's physical features. Guide students as they use color and symbols to add those features to the map.

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 South American geography.

CONTENT ASSESSMENT: South America Maps

Name each country in South America. Make a Map Key of its physical features.
Draw the physical features on the map.



COMPREHENSION CHECK: South America Maps

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

1. What is the largest country in South America?

- Ⓐ Brazil
- Ⓑ Uruguay
- Ⓒ Ecuador

2. What do people celebrate in Rio de Janeiro?

- Ⓐ Machu Picchu
- Ⓑ gauchos
- Ⓒ Carnival

3. What is the Salar de Uyuni?

- Ⓐ a waterfall
- Ⓑ a mountain
- Ⓒ a salt flat

4. What ancient people lived in South America?

- Ⓐ the Inca
- Ⓑ the Aztecs
- Ⓒ the Mayans

5. Write three facts about South America.

Ant Farmers

Assess Vocabulary, page 7

Students should record the words and definitions 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.

colony: a group of plants or animals that live and grow together

fungus: a simple organism that is neither a plant nor an animal; must live in or on plants, animals, or decaying material

Assess Language Arts, page 8

1. workers, soldiers, queen; diagram
2. brownish-red; photo
3. their sharp jaws; caption
4. chirping; text

Assess Content, page 9

Drawings may vary but should resemble the colony shown on pages 6-7 of the article. All workers, soldiers, and the queen should be identified.

Comprehension Check, page 10

1. C; 2. B; 3. C; 4. B; 5: Students should note that each ant has a specific job. Together, the ants perform all of the jobs that help the colony survive.

Monster Fish

Assess Vocabulary, page 15

Students should record the words and definitions from the Wordwise feature on page 17.

endangered: at risk of becoming extinct or dying out

extinct: no longer existing in living form

migrate: to move from one place to another

Sentences will vary.

Assess Language Arts, page 16

Students should select one purpose and write it on the blank line to complete the first sentence. They should identify three valid reasons for their choice. They should write the same purpose in the final sentence and write the topic about which the writer is trying to inform/persuade/entertain about.

Assess Content, page 17

Overfishing: (Change) Overfishing reduces the amount of fish in the river. (Harm) As the number of fish grows smaller, the fish are more likely to become extinct.

Building Dams: (Change) The dams block the river. (Harm) This stops fish from migrating up the river. If the fish can't migrate, they could become extinct.

Comprehension Check, page 18

1. B; 2. B; 3. A; 4: A; 5: Possible response: Dams keep giant fish from swimming up the river so they can't migrate.

Lake Tour

Assess Vocabulary, page 23

Students should record definitions from the Wordwise feature on page 23.

bacteria: tiny, one-celled organisms

freshwater: of or living in water that is fresh or not salty

minerals: a natural substance that is not of plant or animal origin

Sketches will vary. Evaluate each response for accuracy.

Assess Language Arts, page 24

Answers will vary. All points and reasons should be stated directly in the article.

Assess Content, page 25

Answers will vary depending on which lakes students select. However, all lakes should be featured in the article, drawings should highlight each lake's peculiar qualities, and descriptions and explanations should be supported with information from the text.

Comprehension Check, page 26

1. B; 2. C; 3. B; 4: C; 5: Answers will vary depending on which lakes students select. Students should note, however, that both lakes are bodies of water surrounded by land.

ANSWER KEY

South America Maps

Assess Content, page 28

Students should correctly label all countries in South America. They should create a Map Key like the one on the Physical Map poster. They should add colors and symbols on their maps to show where each type of landform is located.

Comprehension Check, page 29

1. A; 2. C; 3. C; 4. A; 5: Facts will vary but should come from the South America Physical or Political Map posters.