



### In This Guide

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

### 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 PATHFINDER will be within the 450-850L range.

For additional resources to extend your students' learning, visit EXPLORER's website, [natgeo.org/explorermag-resources](http://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 "The Mighty Mekong: River of Giants."

## MINDSET OF AN EXPLORER

### KEY FOCUS AREAS



#### Attitudes

*National Geographic kids are:*

**CURIIOUS** 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

- Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on web pages) and explain how the information contributes to an understanding of the text in which it appear. (CCSS.RI.4.7)

### 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
- larvae
- mandibles
- mutualism
- pheromone

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

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

Instruct students to write what they think each word means on their worksheets. Then display the Wordwise feature on page 9 of the projectable magazine. Have students 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 live in the rain forest. And, they farm fungus. 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 many times, as in this article, readers can get information from photos, captions, diagrams, and other text elements. The information in those features can quickly answer some of the questions they have.*

Give each student a copy of the **Language Arts Assessment Master**. Review the questions on the worksheet with the class. Then have students read the article on their own. As they do, instruct them to answer each question and find four additional facts about leafcutter ants. Tell students to record where they found each answer or fact in the article.

# Ant Farmers

## LANGUAGE ARTS

### TURN AND TALK

Have students turn and talk to discuss what they learned about leafcutter ants. **Ask:** *Where do leafcutter ants live?* (tropical forests in Central and South America, dry parts of Mexico, and the southern United States) *Do adult ants eat the leaves they harvest?* (No, but they drink leaf sap.) *Why do they harvest the leaves?* (To grow a fungus that young ants eat.)

- **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. Point out that completing this exercise not only taught them new words. It ensured that they have a good understanding of each word's definition. **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 go a step further by giving details and examples related to each word. Prompt discussion with questions such as: *What is mutualism? With what does the article say leafcutter ants have a mutualistic relationship? Why?*

- **Interpreting Information** After reading the article, remind students that articles contain much more than main text. They often contain photos, diagrams, captions, and other text elements, too. These elements highlight important points in the text. Because of that, readers can often find answers to questions more quickly if they study the text elements on the page. Have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the answers they recorded for each question. If their answers differ, suggest that they revisit the text elements they identified as sources and reevaluate their responses. Then have them share the facts they collected. If any facts are questionable, instruct students to refer to the sources they cited to clarify the information.

### WRITE AND ASSESS

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

- *What is a fungus?*
- *What jobs do leafcutter ants do inside a colony?*
- *What surprised you about what you read?*

### Standard Supported

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (NGSS.4-LS1-2)

### 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

Prior to conducting this activity, fill one small container with freshly cut pieces of apple. Fill another with freshly cut pieces of onion. Put a lid on each container. (Note: If any students have allergies to these foods, use something else.) Select a volunteer and put a blindfold over the student's eyes. Then pick two more volunteers. Give a container to each one. Have the three volunteers stand in an open part of the room, with the blindfolded student in the middle. Tell the other students to remove the lids on their containers. Then challenge the blindfolded student to walk left or right to find the classmate who is holding the container of onions. As a class, discuss the power of the sense of smell.

### 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 about the ants, how they farm, and why their sense of smell is important. They will also learn about the different types of ants living in the colony and the important role played by each.

#### Set a Purpose and Read

Have students read the article in order to understand how a leafcutter ant's senses help it survive, the roles of ants living in the colony, and the important connection between leafcutter ants and the fungus they grow.

### EXPLAIN

#### Understanding Leafcutter Ants and Senses

Display the Wordwise section on page 9 of the projectable magazine. Review the definition of the word *pheromone*. Then display page 4. Zoom in on the section "Master Gardeners." Read aloud the second paragraph. Discuss how pheromones and smell help leafcutter ants survive. (They use pheromones to make a scent trail other ants can follow.) Point out that smell isn't the only sense that helps them survive. Sound does, too. Review the article to find out how. (Some scientists think they chirp to guide other ants to good branches.)

#### Recognizing the Roles of Ants in a Colony

Display the diagram on page 5 of the projectable magazine. **Say:** *This diagram identifies three types of leafcutter ants: workers, the queen, and the soldier. But workers are the only type of ant with an "s" at the end of its name.* Challenge students to explain why. (Possible response: There are many types of workers and each has a different job. There is only one queen, and all soldiers do the same thing.) Give each student a copy of the **Content Assessment Master**. Then divide the class into small groups. Instruct groups to review the text and diagrams to list the jobs done by each type of leafcutter ant. Then, using the diagram on pages 6-7 as a guide, have students draw their own depiction of a leafcutter ant colony. Instruct them to add labels describing what key ants in the colony are doing.

#### Connecting Ants, Leaves, and Fungus

Display page 4 of the projectable magazine. Point out to the class that the two photos they see could be described as "Before and After." Divide the class into small groups. Give groups five minutes to collect information from the article to explain that comparison. Rejoin as a class to compare notes. (Possible response: The top photo shows a leaf before the ants chew it up. The bottom (after) photo shows the paste the ants make from the leaves to grow their fungus gardens.) Discuss how the leaves help leafcutter ants survive. (Adult ants feed on leaf sap. Their young (larvae) feed on the fungus.)

### ELABORATE

#### Find Out More

Remind students that the article identifies three distinct types of leafcutter ants: workers, the queen, and soldiers. According to the article, young ants are larvae. And workers only live a few weeks. But the article gives few other details the life cycles of different types of leafcutter ants. Divide the class into small groups. Have groups conduct research to learn about the life cycles of each type of leafcutter ant. 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.

- *What do soldier ants do?* (Soldier ants defend the colony from intruders.)
- *What kinds of leaves do leafcutter ants like best?* (They like leaves that are in direct sunlight, which are healthier. They also like young leaves that are easy to slice.)
- *How are leafcutter ants like farmers?* (They grow their own food.) *How do they do this?* (They chew leaves into a moist paste and a white fungus grows in that paste.)

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 about leafcutter ants. Record where you found the information in the article.

	Answer	Source
What are the three main types of leafcutter ants?		
What is it like inside a leafcutter ant colony?		
Which ant is the most important member of the colony? Why?		
List four other facts you learned about leafcutter ants.	1. 2. 3. 4.	1. 2. 3. 4.

**CONTENT ASSESSMENT: Ant Farmers**

List the jobs done by each type of ant in a leafcutter colony.

Workers	Queen	Soldier

Draw a picture of a leafcutter ant colony. Add labels describing what key ants are doing.



**COMPREHENSION CHECK: Ant Farmers**

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

1. What do leafcutter ants grow on their farms?

- Ⓐ leaves
- Ⓑ fungus
- Ⓒ paste

2. Which kind of leafcutter ant guards the nest?

- Ⓐ worker
- Ⓑ queen
- Ⓒ soldier

3. What is a pheromone?

- Ⓐ a scent
- Ⓑ a sound
- Ⓒ a taste

4. Where do leafcutter ants store their trash?

- Ⓐ outside the nest
- Ⓑ at the top of the nest
- Ⓒ at the bottom of the nest

5. How do scents and sounds help leafcutter ants survive?

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# The Mighty Mekong

LANGUAGE ARTS  LEXILE 740L

## Standard Supported

- Explain how an author uses reasons and evidence to support particular points in a text. (CCSS.RI.4.8)

## 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**
- **spawning**
- **tributary**

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 and record five connections they see. For example, a fish might swim up a tributary to reach its spawning grounds.

After reading the article, divide the class into small groups. Have students share the connections they predicted before reading the article. Instruct them to reevaluate each connection based upon what they have learned. If necessary, have students rewrite their ideas to more accurately reflect connections between different vocabulary words.

## READ

Write the words *reasons* and *evidence* on the board.

**Then ask:** *What's the difference between these two words?* Invite students to share their ideas. Guide the class to understand that a reason tells why something happened. Evidence shows how.

Inform students that valid reasons and solid evidence are crucial elements of any text. Writers use them to support key points on a topic.

Display pages 10-11 of the projectable magazine. Invite a volunteer to read aloud the headline. Instruct students to then examine the illustration. Point out that the headline and illustration work together to state one of the key points made in this article: Giant fish live in the Mekong River.

Give each student a copy of the **Language Arts Assessment Master**. Instruct students to record this key point. Then have students read the article on their own. As they read, challenge them to record two more key points. Encourage them to search for reasons and evidence that support all three key points made in the article.

# The Mighty Mekong

## LANGUAGE ARTS

### TURN AND TALK

Have students turn and talk to discuss what they learned about giant fish in the Mekong River. **Ask:** *What is spawning?* (laying eggs and reproducing) *How do dams on the Mekong River keep giant fish from spawning?* (The dams block the river, preventing the fish from reaching their spawning grounds.) *How are engineers trying to solve this problem?* (They plan to build a passageway of pools to help the fish get around the dams.) Have students share other facts they learned about giant fish on the Mekong River.

- **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 wrote sentences connecting the article's vocabulary words. Instruct students to turn and share the sentences they wrote on their **Vocabulary Assessment Masters** with a partner. Encourage them to identify and discuss similarities and differences in their sentences to get an even deeper understanding of the vocabulary words.

- **Identifying Reasons and Evidence** After reading the article, remind students that reasons tell why something happened. Evidence explains how. Invite students to share their **Language Arts Assessment Masters** in small groups. Challenge them to examine each other's results to determine whether or not all reasons are valid, all evidence is solid, and both support the key points they are connected to 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.

- *Why is "River of Giants" a good description of the Mekong River?*
- *Why is it helpful for Zeb Hogan to work with local fishermen as he studies the big fish that live in the Mekong River?*
- *What surprised you about what you read?*

### Standard Supported

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (NGSS.4-ESS3-1)

### 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, share ideas about how giant fish and people's need for natural resources could be connected. Tell students that this connection will become clear as they read the article.

#### Set a Purpose and Read

Have students read the article in order to recognize what a "river giant" is and understand how people's use of natural resources affects fish living in the Mekong River. They will also learn how people are trying to protect the Mekong River's giant 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 and few predators.)*

### EXPLAIN

(continued)

#### Recognizing How People Affect Nature

Inform students that both the fish that live in the Mekong River and the waters that run through its channels are valuable natural resources that people use. But accessing those resources can cause problems. For example, catching fish gives people food. But over the years people have caught too many fish. Some species could become extinct. Display the map on page 15 of the projectable magazine. Guide the class to understand that this map shows all of the completed, under construction, and proposed dams on the Mekong River. Discuss reasons why building dams can cause problems for fish and people, too. (The fish cannot travel upstream for spawning. The dams create electricity for people to use, but they stop sediments from settling downriver where people grow rice on the Delta.) Give each student a copy of the **Content Assessment Master**. With a partner, have students draw an X to show how catching fish and building dams affects people and fish. Challenge them to explain their answers. Have students discuss their results in small groups.

#### Protecting Giant Fish

Point out to students that people are aware of how their actions are affecting the giant fish in the Mekong River, so they are trying to help. Divide the class into small groups. Instruct groups to review the article to find out how people are trying to help. Encourage them to summarize their findings and share what they learned with the class. (Possible response: Fisherman call scientists when they catch a big fish. The scientists study the fish and release it back into the river. Engineers plan to create special routes for fish to swim past dams. This would help the fish travel from one part of the river to another.)

### 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. Divide the class into four groups. Assign each group one giant fish. Instruct groups to conduct research to learn more about their assigned fish. Then have groups prepare a presentation to show and tell the class all about their giant fish.

#### 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. Review the information about "Responsibility." Then take the class outside. Challenge students to find a way they can help their local environment. Instruct them to create a plan and write an argument that will persuade others to help them carry out their ideas.

### EVALUATE

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

- *What is a tributary?* (a river or stream that flows into a larger river or stream)
- *How can working with fishermen help save the Mekong River's giant fish?* (Fishermen tell scientists when they catch giant fish. They can also identify giant fishes' habitats so builders can consider them when they make plans for new dams.)
- *Why are the four largest species of giant fish in the Mekong River endangered?* (People overfished the waters. They built dams blocking the fish from traveling up the river to spawning grounds.)

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

**VOCABULARY ASSESSMENT: The Mighty Mekong**

Record each vocabulary word and its definition.

Word	Definition

Write five sentences to tell how different words are connected.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Name \_\_\_\_\_

Date \_\_\_\_\_

**LANGUAGE ARTS ASSESSMENT: The Mighty Mekong**

Identify three key points the writer makes in the text. Record reasons and evidence that support each point.

Key Point	Reasons	Evidence

Name \_\_\_\_\_

Date \_\_\_\_\_

**CONTENT ASSESSMENT: The Mighty Mekong**

Draw an X to show how each activity on the Mekong River affects giant fish and humans. Explain your answers.

Activity	Impact on Giant Fish		Explain	Impact on Humans		Explain
Catching Fish	Help			Help		
	Hurt			Hurt		
	Both			Both		
Building Dams	Help			Help		
	Hurt			Hurt		
	Both			Both		

**COMPREHENSION CHECK: The Mighty Mekong**

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?

- Ⓐ Australia
- Ⓑ Africa
- Ⓒ Asia

2. Which of these giant fish lives in the Mekong River?

- Ⓐ great white shark
- Ⓑ giant catfish
- Ⓒ tuna

3. When do giant catfish swim in the Mekong's tributaries?

- Ⓐ during the dry season
- Ⓑ during the rainy season
- Ⓒ all year long

4. What caused the giant fish to become endangered?

- Ⓐ overfishing
- Ⓑ spawning
- Ⓒ floods

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

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### Standard Supported

- Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. [CCSS.RI.4.3]

### 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

- **evaporate**
- **freshwater**
- **fumarole**
- **meltwater**

Explain to students that when they read it's sometimes necessary to understand the technical meaning of words in order to fully understand the text. This is particularly true when reading articles about science. 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 *evaporate*. 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 *evaporate* 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. The point is for students to draw each word in a way that will help them remember its definition.

## READ

Inform students that the purpose of this article is to introduce them to some of the world's most peculiar lakes. As they read, they will learn how the lakes formed and why that makes them peculiar.

Display pages 18-19 of the projectable magazine. Invite a volunteer to read aloud the headline and deck. Challenge students to match the photos they see to the descriptions in the deck. Encourage them to brainstorm other ways to describe the lakes they see. **Say:** *As you can see, not all of Earth's lakes are calm pools of blue water. Some, like the lakes you see here, are quite strange.* **Ask:** *What do you think caused the lakes to be like this?* Encourage students to share their opinions.

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 pick three lakes from the article. Have students draw a picture of each lake. Tell them to describe what each lake is like and explain how it got to be that way.

# Lake Tour

## LANGUAGE ARTS

### 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.

- **Explaining Scientific Concepts** After reading the article, remind students that people often have set ideas about how things happen. But sometimes strange things happen in nature and those rules don't apply. The lakes they read about in this article are a perfect example of that. Have students share their **Language Arts Assessment Masters** in small groups. Instruct them to examine each other's drawings and guess which lake each illustration shows. Then have them share and compare their descriptions and explanations. If any answers about the same lake vary, encourage students to revisit the article to see which answer is correct. Rejoin as a class. Invite groups to explain what they learned about Earth's peculiar lakes.

### 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.

- *Which lake featured in the article do you think is the weirdest body of water? Why?*
- *Why do you think people are so interested in learning about Earth's weird lakes?*
- *What surprised you about what you read?*

### Standard Supported

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils and sediments into smaller particles and move them around. (NGSS.4-ESS2-1)

### 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 recognize that lakes are natural landforms on Earth and are filled with and shaped by water.

### EXPLAIN

#### Understanding Lakes

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. **Say:** *Because lakes are surrounded by land, they are often filled by rain or melting snow. But that's not always the case.* Assign each student a partner and give each student a copy of the **Content Assessment Master**. Instruct pairs to identify each lake from the article and record its location. Whenever possible, have them identify the source for the water in the lake. Then have students write one interesting fact they learned about each lake. Encourage students to share their results in small groups.

### 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/>. Assign each group one section on the site. Instruct groups to think of a creative way to summarize the information in their section about lakes. Invite groups to share their presentations 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 looks like a patio because its water evaporates, leaving the minerals behind. Boiling Lake is so hot because its water fills a fumarole that is heated by magma underneath. As a class, brainstorm a list of other things—natural or man-made—that could change a lake. Share theories about how each one might impact the water in the lake.

### EVALUATE

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

- *Why do some of Greenland's meltwater lakes disappear?* (The lakes are located on Greenland's vast ice sheet. As temperatures rise, the ice shifts. This creates big cracks. The lakes' waters drain down the cracks.)
- *Why is Boiling Lake a good name for a lake that fills a fumarole?* (A fumarole is an opening in or near a volcano, through which hot gases and steam flow into the air. Hot magma under the fumarole causes the water inside it to boil.)
- *How is Lake Baikal in Russia unique?* (It's the world's deepest and oldest lake. It's one of Earth's clearest lakes, too.)

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
evaporate		
freshwater		
fumarole		
meltwater		

Name \_\_\_\_\_

Date \_\_\_\_\_

**LANGUAGE ARTS ASSESSMENT: Lake Tour**

Draw three lakes from the article. Describe each lake and explain why it is so peculiar.

Draw	Describe	Explain

Name \_\_\_\_\_

Date \_\_\_\_\_

**CONTENT ASSESSMENT: Lake Tour**

Use this organizer to record information about each lake mentioned in the article.

Lake Name	Location	Water Source	Interesting Fact

**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 lake is it safe for people to swim in?  
Ⓐ Lake Natron  
Ⓑ Ongeim'l Tketau  
Ⓒ Boiling Lake
  
2. What color is the water in a really deep meltwater lake?  
Ⓐ light blue  
Ⓑ medium blue  
Ⓒ dark blue
  
3. What causes the water in Lake Natron to be red?  
Ⓐ flamingos  
Ⓑ salt  
Ⓒ bacteria
  
4. Which extreme lake holds one-fifth of Earth's liquid freshwater?  
Ⓐ Lake Baikal  
Ⓑ North Lake  
Ⓒ Spotted Lake

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

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# Understanding Maps

## SOUTH AMERICA

### 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)
- 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**. Have students label each country. Then have students make a Map Key of South America's physical features and 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

Identify each country in South America. Then make a Map Key of its physical features. Use color and symbols to add those features to 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  
Ⓑ Argentina  
Ⓒ Colombia
  
2. Where is Machu Picchu?  
Ⓐ the Andes Mountains  
Ⓑ the Amazon rain forest  
Ⓒ the pampas
  
3. Which of these deserts is in South America?  
Ⓐ Sahara  
Ⓑ Gobi  
Ⓒ Atacama
  
4. What is the most popular sport in South America?  
Ⓐ baseball  
Ⓑ soccer  
Ⓒ basketball

5. Write three facts about South America.

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### 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

**larvae:** young, worm-like insects that are in the life stage between egg and pupa

**mandibles:** insect jaws, used for grabbing, cutting, crushing, chewing

**mutualism:** a close relationship between two different organisms in which both benefit

**pheromone:** a chemical odor that can be used to mark a trail

#### Assess Language Arts, page 8

**1. Answer:** workers, queen, soldier. **Source:** diagram, page 5.

**2. Answer:** Students may note that there are many underground tunnels and chambers. Each chamber has a specific purpose, such as growing fungus, laying eggs, raising the young, or storing trash.

**Source:** "Inside a Colony" diagram, pages 6-7.

**3. Answer:** The queen is the most important member of the colony. She is the only one that lays eggs. **Source:** "Inside a Colony" diagram, pages 6-7.

Students' facts will vary but should come from the article. A source should be cited for each fact.

#### Assess Content, page 9

**Workers:** Possible responses include: act as bodyguards, care for young, patrol trails, cut and carry leaves, clear and widen trails, dig tunnels, carry dirt outside, haul trash

**Queen:** lays eggs

**Soldier:** protect the nest and trails from predators

Drawings may vary but should resemble the colony shown on pages 6-7 of the article. Ants performing various jobs should be identified.

#### Comprehension Check, page 10

1. B; 2. C; 3. A; 4. C; 5: Possible response: They release a scent (pheromones) that makes a trail for other ants to find leaves. They also make chirping sounds to communicate with other ants.

### The Mighty Mekong

#### 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

**spawning:** laying eggs and reproducing

**tributary:** a river or stream that flows into a larger river or stream

Sentences will vary depending on the connections students identify.

#### Assess Language Arts, page 16

Students should record the key point that giant fish live in the Mekong River. Other possible key points include: The Mekong is a great river; The number of giant fish found in the Mekong River is decreasing; People's actions are making it harder for giant fish to live in the Mekong River; or The dams people build on the Mekong River put people at peril, too. Reasons and evidence may vary but should relate to each point and come directly from the text.

#### Assess Content, page 17

**Catching Fish:** Students will most likely note that this hurts fish and helps humans. **Explain:** If people catch too many fish, some species may become extinct. Catching fish provides food for people.

**Building Dams:** Students will most likely note that this hurts fish but can help or hurt people.

**Explain:** The dams block the way so fish can't travel upstream. People get energy from the dam. (help) But, the dams prevent sediment from traveling downstream to farmland. (hurt)

#### Comprehension Check, page 18

1. C; 2. B; 3. B; 4. A; 5: Possible response: The dams block the river so fish can't migrate upstream.

(continued)

### Lake Tour

#### Assess Vocabulary, page 23

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

**evaporate:** to turn into a vapor

**freshwater:** of or living in water that is fresh or not salt

**fumarole:** an opening in or near a volcano, through which hot gases and steam flow into the air

**meltwater:** water formed by the melting of snow and ice, especially from a glacier

Sketches will vary depending on students' interpretations of each word. Evaluate each response for accuracy.

#### Assess Language Arts, page 24

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.

#### Assess Content, page 25

1. Spotted Lake; British Columbia, Canada; rain/melting snow; Facts will vary.
2. Lake Natron, Tanzania, Africa; The article doesn't identify a water source; Facts will vary.
3. Lake Baikal; Russia; more than 300 rivers; Facts will vary.
4. Ongeim'l Tketau; a tiny island in the Pacific Ocean; The article doesn't state this, but students may think the water came from the Pacific Ocean; Facts will vary.
5. Boiling Lake; Dominica; The article doesn't identify a water source; Facts will vary.
6. North Lake; Greenland; meltwater from Greenland's ice sheet; Facts will vary.

#### Comprehension Check, page 26

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

### South America Map

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