

In This Guide

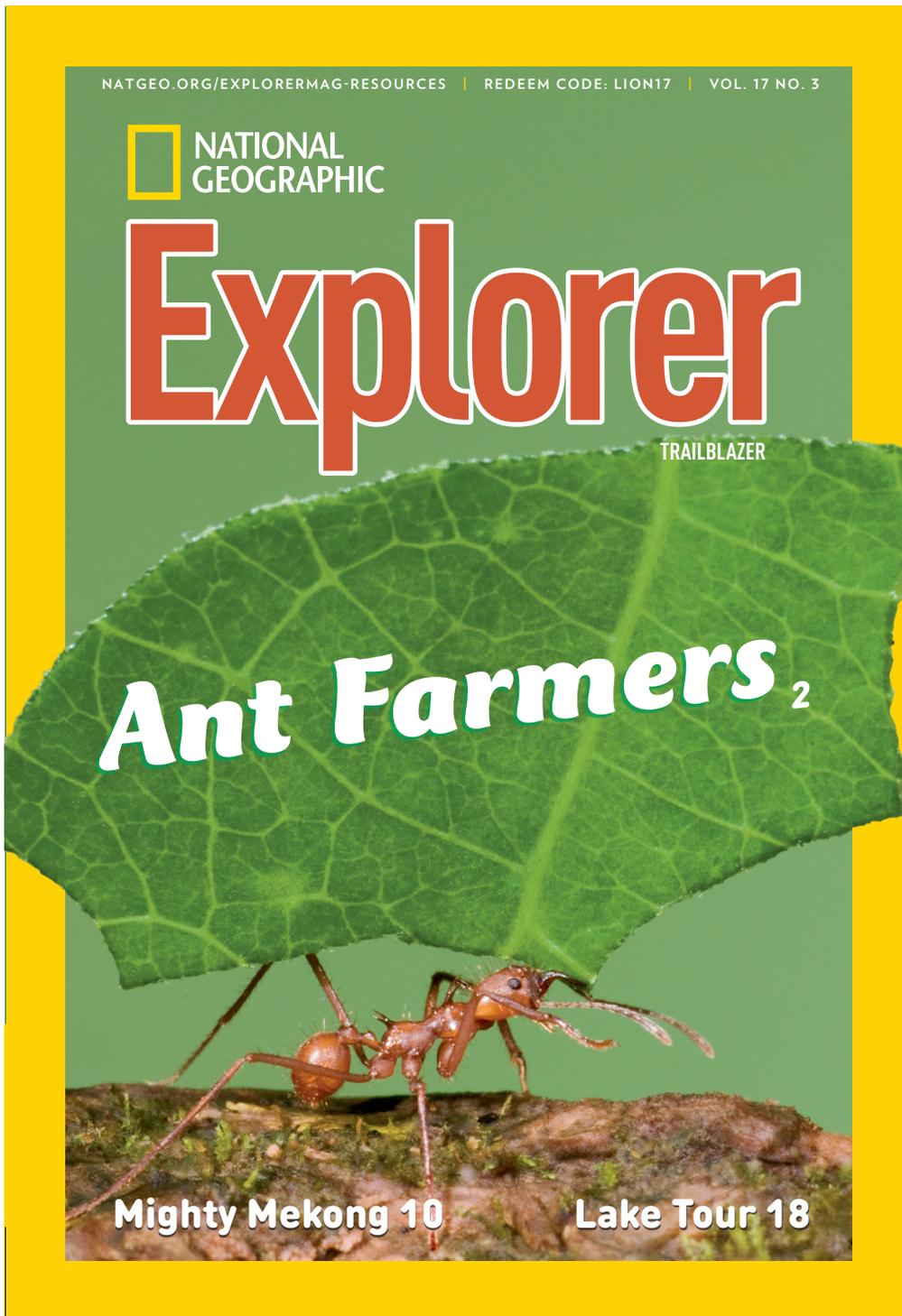
This guide contains language arts and science or social studies lessons for articles in this issue of EXPLORER TRAILBLAZER.

Explorer Magazine

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

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

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



Your Subscription Includes:

- Magazines
- Classroom Posters
- 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

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

Resources

- Vocabulary Assessment Master (page 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

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.

With a partner, 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 partners 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 we could find some of the answers quicker if we looked at the photos, captions, diagrams, and other features in the article.*

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

Ant Farmers

LANGUAGE ARTS

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 are mandibles? How do leafcutter ants use their mandibles? Why?*

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

- *What does a leafcutter ant colony look like?*
- *What happens inside a leafcutter ant colony?*
- *What surprised you about what you read?*

Ant Farmers

SCIENCE

Standard Supported

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (NGSS.3-LS1-1)

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 its 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 how they benefit from living in a well organized group.

Set a Purpose and Read

Have students read the article in order to learn how leafcutter ants grow their own food and how they benefit from living in a well organized group.

EXPLAIN

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. Instead, they make a paste out of leaves for their gardens. That's where they grow the fungus that young ants eat to survive.* As a class, review the page for more details about how the ants work together to find, collect, transport, and transform leaves on their farms. Guide them to understand that the ants and the fungus need each other to survive.

Recognizing the Benefits of Groups

Display the diagram on page 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.* 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. Tell them to add labels describing what key ants in the colony are doing. Invite students to share their diagrams with the class. Discuss how living in a group helps leafcutter ants survive.

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.

- *What do queen ants do?* (lay eggs)
- *How can flies harm a leaf-collecting ant?* (The flies lay eggs on the ant's body. When the eggs hatch, the maggots eat the ant's brain.)
- *How do leafcutter ants keep their colonies clean?* (Trash-removing ants lug garbage to dumps inside or out of the nest.)

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:

Name _____

Date _____

LANGUAGE ARTS ASSESSMENT: Ant Farmers

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

Question	Answer	Source

CONTENT ASSESSMENT: Ant Farmers

Tell what each type of ant does in a leafcutter colony.

Workers	Queen	Soldier

Draw a picture of a leafcutter ant colony. Add labels that tell what the 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?
Ⓐ leaves
Ⓑ fungus
Ⓒ paste

2. What do the ants use to cut leaves?
Ⓐ larvae
Ⓑ maggots
Ⓒ mandibles

3. How many eggs can a queen lay in her lifetime?
Ⓐ 5 million
Ⓑ 50 million
Ⓒ 500 million

4. Where do soldier ants do?
Ⓐ clear the trails
Ⓑ remove trash
Ⓒ protect the nest

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

The Mighty Mekong

LANGUAGE ARTS 670L

Standard Supported

- Distinguish their own point of view from that of the author of a text. (CCSS.RI.3.6)

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**
- **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

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. After they finish, instruct them to summarize the article, identify the writer's purpose, and explain why they chose that purpose. Then have students express their own opinions regarding a statement the writer makes at the end of the article.

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.

- **Distinguishing Point of View** 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 poll the class to see how many students agreed with the writer's statement about protecting giant fish on the Mekong River. **Say:** *You can view this statement as a basic fact or as an attempt to persuade. Either way, it's something readers can form an opinion about after reading the article.* Invite volunteers to share their opinions. Challenge them to explain why they agree or disagree with the writer's point of view.

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 the difference between being endangered and being extinct?*
- *Do you think the Mekong giant catfish will become extinct? Why or why not?*
- *What surprised you about what you read?*

Standard Supported

- Populations live in a variety of habitats, and change in those habitats affect the organisms living there. (NGSS.3-LS4-4)

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 human activity can change the environment for giant fish. 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 and understand how overfishing and building dams changes the environment in and around the Mekong River.

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 the Impact of Overfishing

Display pages 12-13 of the projectable magazine.

Say: *It is now rare to see giant fish like these in the Mekong River.* **Ask:** *Why?* (People caught too many of the giant fish over the past century.) Discuss reasons why that is bad for the fish and the people who live along the river. (The fish are now endangered species. They could become extinct. The people have lost a valuable food source.) Give each student a copy of the **Content Assessment Master**. Instruct students to record this information on their worksheets.

Understanding How Dams Change a River

Display page 13 of the projectable magazine. Zoom in on the photo of the river at the bottom of the page. Invite volunteers to describe what they see. Then display the map on page 15. Have students count the number of completed (5), under construction (5), and proposed (11) dams on the Mekong River. Inform students that building these dams hurts the fish. But it can also hurt the people who live along the river. Encourage students to review the article with a partner to find out how. Instruct them to record this information on their **Content Assessment Masters**. Have students discuss their answers in small groups.

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. Discuss what it means to take responsibility for something. Then take the class outside. Encourage students to find things they can do to help Earth. Instruct them to think of a plan and share it with their friends. Challenge them to be persuasive enough to convince people to help them carry out their plan.

EVALUATE

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

- *What are smaller rivers that flow into the Mekong River called?* (tributaries)
- *Why do people want to build dams on the Mekong River?* (They use the dams to make electricity.)
- *How do the dams harm giant fish that live in the river?* (The dams block the river. Fish cannot migrate up the river to their 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. _____

LANGUAGE ARTS ASSESSMENT: The Mighty Mekong

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

This article is about _____
_____.

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

I think this because _____

_____.

On page 17, the writer says, "People must think about how to keep the connections between fish habitats on the Mekong." I _____ with this statement.
(agree/disagree)

I think _____

_____.

Name _____

Date _____

CONTENT ASSESSMENT: The Mighty Mekong

Explain how overfishing and building dams affects giant fish and people who live along the Mekong River.

Activity	Giant Fish	People
Overfishing		
Building Dams		

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?
Ⓐ Africa
Ⓑ Asia
Ⓒ Australia

2. What caused the giant fish in the river to become endangered?
Ⓐ overfishing
Ⓑ building dams
Ⓒ spawning

3. What do fish do when they migrate?
Ⓐ lay eggs and reproduce
Ⓑ no longer exist in living form
Ⓒ move from one place to another at regular times

4. What keeps giant fish from migrating on the Mekong River?
Ⓐ fishermen
Ⓑ dams
Ⓒ sediment

5. Why do people build dams on the Mekong River?

Standard Supported

- Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence). [CCSS.RI.3.8]

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

- **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. They should simply draw each word in a way that helps 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.

Explain to students that writers use several different strategies to make logical connections when they write. Good readers always search for these connections when they read. One common strategy to look for is cause-and-effect.

Display pages 18-19 of the projectable magazine. Read aloud the headline and deck. Then model how to identify an example of cause-and-effect.

Say: *Sometimes when you read, you come across simple cause-and-effect statements. One thing causes another thing to happen. And other times, you may find one part of the relationship but not the other. For example, the text here tells us that we're going to learn about peculiar lakes. One lake is poisonous. Another has polka dots. Those descriptions tell us what the lakes are like, but they don't tell us what caused the lakes to become this way. Whatever those reasons are, they are the other half of these cause-and-effect relationships.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they read, instruct students to record cause-and-effect statements that explain how each lake came to be so peculiar. Then have students complete a sentence telling which lake they think is most peculiar and why.

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.

- **Describe Connections** After reading the article, remind students that making connections can help them understand what they've just read. One type of connection is the relationship between a cause and an effect. Invite students to turn and take to share their **Language Arts Assessment Masters** in small groups. Did each student identify the same cause-and-effect relationships? If not, do all of their examples make sense? If students find some example to be confusing, encourage them to review the article to see where the connection went astray. Rejoin as a class. Discuss how identifying cause-and-effect relationships helped them appreciate the one they considered to be the most peculiar.

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 isn't it safe to swim in all lakes?*
- *What kinds of things can cause a lake to become peculiar?*
- *What surprised you about what you read?*

Standard Supported

- Obtain and combine information from books and other reliable media to explain phenomena. (NGSS.3-ESS2-2)

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)

Explaining How a Lake Becomes Peculiar

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. If you wish, have students review their **Language Arts Assessment Masters** in small groups to examine why. Then 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. Encourage students to use both the article and their **Language Arts Assessment Masters** as resource guides.

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 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 ideas 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 flamingoes flock to Lake Natron?* (The poisonous water doesn't bother them, but it keeps other animals away. That makes it a safe place for them to build their nests and raise their young.)
- *Why could Lake Baikal in Russia be described as an extreme lake?* (It's the world's deepest and oldest lake. It's one of Earth's clearest lakes, too.)
- *Why is it safe to swim with the jellies in Ongeim'l Tketau?* (Over thousands of years, these jellies have lost their sting.)

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		

LANGUAGE ARTS ASSESSMENT: Lake Tour

Record a cause-and-effect relationship to explain why each lake is peculiar

Lake	Cause	>	Effect
Spotted Lake		>	
Lake Natron		>	
Lake Baikal		>	
Ongeim'l Tketau		>	
Boiling Lake		>	
meltwater lakes		>	

Complete the sentence.

I think _____ is the most peculiar lake because _____

Name _____

Date _____

CONTENT ASSESSMENT: Lake Tour

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

Draw	Describe	Explain

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 called "Jellyfish Central"?
Ⓐ Ongeim'l Tketau
Ⓑ Lake Natron
Ⓒ Boiling Lake

2. What causes the water in Lake Natron to be red?
Ⓐ flamingos
Ⓑ salt
Ⓒ bacteria

3. Where is Boiling Lake located?
Ⓐ on a glacier
Ⓑ on a mountain
Ⓒ on a fumarole

4. What color is the water in a deep meltwater lake?
Ⓐ dark blue
Ⓑ bright red
Ⓒ yellowish-green

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

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
Ⓑ Bolivia
Ⓒ Peru

2. What is the Pampas?
Ⓐ a desert
Ⓑ a rain forest
Ⓒ a grassy plain

3. Where are most of the largest cities in South America located?
Ⓐ in deserts
Ⓑ on top of mountains
Ⓒ near the ocean

4. What are gauchos?
Ⓐ South American cowboys
Ⓑ seaports
Ⓒ large salt flats

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

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

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

Assess Language Arts, page 8

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

Assess Content, page 9

Workers: Possible responses include: act as bodyguards, care for young, tend the gardens, patrol trails, cut and carry leaves, clear trails, dig rooms, remove dirt, take out trash

Queen: lays eggs

Soldier: defend the colony from invaders

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

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

migrate: to move from one place to another at regular times

spawning: laying eggs and reproducing

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

Sentences will vary.

Assess Language Arts, page 16

Students should summarize the article and identify the writer's purpose. They may think the writer wrote to inform or persuade and should record evidence from the article to support either purpose. They should state whether they agree or disagree with the writer's statement and explain why.

Assess Content, page 17

Overfishing: (Fish) There are so few fish left that the giant fish are now endangered. (People) With fewer fish, there is less food for people to eat.

Building Dams: (Fish) The dams block the way so fish can't migrate upstream. If they don't reach their spawning grounds, they can't reproduce. (People) People get energy from the dam. But, the dams mean there are no fish for people to catch. They also block sediment from traveling downstream so farmland is less fertile and farmers grow less rice.

Comprehension Check, page 18

1. B; 2. A; 3. C; 4. B; 5: Possible response: People build dams to create electricity. They can sell the electricity to other countries.

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. Evaluate each response for accuracy.

(continued)

Lake Tour

Assess Language Arts, page 24

Possible responses include:

Spotted Lake: (Cause) In summer, most of the lake's water evaporates. (Effect) This leaves behind many pools filled with minerals, making the lake look like it has polka-dots.

Lake Natron: (Cause) In the dry season, most of the water evaporates. (Effect) The water that is left is hot and so salty it will burn your skin. The water is also red (Effect) because of bacteria (Cause).

Lake Baikal: (Cause) This is Earth's deepest lake. (Effect) It contains a fifth of the planet's liquid freshwater. (Cause) This is Earth's oldest lake. (Effect) It is home to some 1,500 species.

Ongeim'l Tketau: (Cause) The lake is filled with jellyfish. (Effect) The lake is known as "Jellyfish Central." (Cause) The jellies in the lake have lost their sting. (Effect) It is safe to swim here. (Cause) The jellies get energy from algae, which get their energy from the sun. (Effect) The jellies float from east to west to follow the sunlight.

Boiling Lake: (Cause) The lake fills a fumarole. (Effect) Water in the lake is boiling and it smells like rotten eggs.

meltwater lakes: (Cause: The ice melts and cracks. (Effect) Water leaks through the cracks and the lakes disappear.

Students should provide valid reasons to explain why they think one lake is the most peculiar.

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. A; 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 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.