

TEACHER'S GUIDE

Adventurer

Vol. 16 No. 2



In This Guide

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

Explorer Magazine

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

The EXPLORER magazines strive to offer a variety of reading experiences for students with different ability levels in the same class. Thus, all articles have been measured using the Lexile® Framework for Reading. Some articles will be easier to read than others, but all articles in EXPLORER ADVENTURER will be within the 520-950L range.

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- Interactive Whiteboard Lesson
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Save the Frogs

LANGUAGE ARTS 850L

Objectives

- Students will identify and explain connections between vocabulary words.
- Students will explain how the writer uses reasons and evidence to support key points in the text.

Resources

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

Summary

- The article “Save the Frogs” examines threats that frogs face today through the eyes of National Geographic photographer Joel Sartore.

BUILD VOCABULARY AND CONCEPTS

- **amphibian**
- **biodiversity**
- **endangered**
- **extinct**
- **habitat**
- **species**

Display the Wordwise section on page 9 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 vocabulary words are related. Tell them to record five connections they see. For example: The Rabbs' fringe-limbed tree frog is a species of amphibian that is nearly extinct.

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.

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

Display pages 2-3 of the projectable magazine. Instruct students to examine the images of frogs. Then invite a volunteer to read aloud the headline and text. **Say:** *Sometimes when you read an article, you have to get a paragraph or two into the text before you can identify the key point the writer is trying to make. Not here. In this article, the writer has stated his main point loud and clear in the headline: Save the frogs. Point out that there are plenty of frogs in these photos. They seem to be doing OK. Then guide students to ponder the text pointing toward the brown frog. **Say:** According to the text in this arrow, this frog is different. I wonder why? Display page 4 of the projectable magazine. Zoom in on the brown frog at the top. **Say:** Population: 1. That explains it. There's only one frog of this type left! I guess that explains why the frog's name is Toughie. And this is also a strong reason and reliable evidence that supports the writer's point. People must work to save frogs from extinction.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As students read, encourage them to search for additional reasons and evidence that support the writer's claim that people need to save frogs. Have students summarize what they learned in their own words.

Save the Frogs

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about threats facing frogs. **Ask:** *How is a fungus killing frogs?* (It prevents frogs from taking in water and certain nutrients through their skin.) *Does the fungus only kill frogs?* (No. It's killing other amphibians, too.) *What is causing so much of the frogs' habitat to disappear?* (People are burning the land to clear it for planting crops.) Invite students to share what else they learned about the threats frogs face and how people can save them.

- **Finding Connections** Explain to students that reading definitions tells people what words mean. 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 about the vocabulary words in the article. Instruct students to turn and share the sentences they wrote on their **Vocabulary Assessment Masters** with a partner. Encourage them to 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 one another's results to determine that all reasons are valid, all evidence is solid, and both support the writer's point that people must help save frogs from extinction.

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 did scientists bring hundreds of Rabb's fringe-limbed tree frog to labs in the U.S.? Did it work?*
- *How is a fungus causing species of amphibians to become extinct?*
- *What surprised you about what you read?*

SCIENCE

Objectives

- Students will recognize that amphibians, including frogs, are endangered as a result of disease, habitat loss, and climate change.
- Students will identify actions people can take to protect disappearing species.

Resources

- Content Assessment Master (page 8)
- "Joel Sartore's Photo Ark" poster (Teacher's Edition)
- "All in a Day's Work" poster (Teacher's Edition)
- Comprehension Check (page 9)
- "Save the Frogs" Interactive Whiteboard (optional)

Science Background

Amphibians are cold-blooded animals that live part of their lives in water and part on land. They are vertebrates, meaning they have a backbone. And they go through metamorphosis. When they hatch from eggs, they look quite different from the animals they develop into as adults.

Frogs are one type of amphibian. Like many other amphibians, their skin is covered by a layer of mucus. This slippery layer keeps the moisture in so the frog's skin doesn't dry out.

Amphibians have lived on Earth for about 300 million years. But due to a combination of threats, one in three species of amphibians is now at risk of extinction.

The biggest problems stem from habitat loss, climate change, and disease. As people clear land to plant crops, they destroy habitats. Warmer, drier climates result in fewer ponds and other water sources that amphibians need to live. And a deadly fungus, first described in 1999, has the potential to infect and kill most of the world's 6,000 amphibian species.

While the situation may be perilous, it is not without hope. There is still time for people to protect and restore habitats where amphibian populations can recover.

ENGAGE

Tap Prior Knowledge

Instruct students to think of a time they saw a frog. What did it look like? What did it sound like? Encourage students who felt the frog to describe what it felt like. Then tell students to imagine that there were no more frogs. Brainstorm ideas about how the world would be different.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Have students compare and contrast the different frogs shown in the photos. Then invite a volunteer to read aloud the headline and deck. **Say:** *To me, this looks like an ordinary frog. It isn't as colorful as the other frogs. And it doesn't have any strange features like the frog at the bottom of the screen. That frog has horns. But this frog has a name: Toughie. That name must be a clue.* As a class, brainstorm ideas about why this frog is unlike any other animal in the world.

Set a Purpose and Read

Have students read the article in order to recognize that amphibians, including frogs, are endangered as a result of disease, habitat loss, and climate change. Instruct them to also identify actions people can take to protect disappearing species.

EXPLAIN

Recognizing Causes and Effects

Display pages 2-3 of the projectable magazine. Zoom in on the comprehension strategy in the upper left corner of the page. Read the strategy aloud. **Say:** *As the headline states, this article is about saving frogs. Here, we learn that humans are somehow responsible for the dangers amphibians are facing. As you read the article, you'll learn what humans have done and why those actions are dangerous for amphibians.* Give each student a copy of the **Content Assessment Master**. With a partner, have students read the article to find and record details about the dangers amphibians face.

SCIENCE

EXPLAIN

(continued)

How People Can Save Frogs

Display page 5 of the projectable magazine. Zoom in on the top photo. As a class, discuss what the researchers are doing (swabbing the frog's limb) and why. (They're looking for signs of the deadly virus.) Remind the class that frogs and amphibians are disappearing for three reasons: disease, loss of habitat, and climate change. Divide the class into small groups. Instruct students to discuss the impact humans have had on amphibian populations as they review the information they collected on their **Content Assessment Masters**. Then rejoin as a class to brainstorm other ways people can help save frogs. (For example, people could find a cure for the deadly virus. They could also raise more frogs in captivity so more species don't become extinct.)

Saving Other Endangered Species

Display page 9 of the projectable magazine. Zoom in on the sidebar about Joel Sartore. Invite volunteers to read the text aloud. Discuss what Sartore does and how he hopes his work will help save endangered species. (He is attempting to photograph every animal species that is in captivity. He hopes the photos will inspire people to care about animals and save them from extinction.) Display the **"All in a Day's Work" poster**. Discuss what Sartore goes through to capture his photos. Then display the **"Joel Sartore's Photo Ark" poster**. Invite volunteers to read aloud the information about each animal. Instruct students to visit Sartore's Photo Ark at: <http://www.joelsartore.com/galleries/the-photo-ark/>. Assign each student a partner. Have each pair pick four different animals from the Photo Ark. Challenge them to recreate the **"Joel Sartore's Photo Ark" poster** with images, captions, and a map related to the four animals they selected.

ELABORATE

Find Out More

Remind students that a deadly fungus is killing many of the world's amphibians. Assign each student a partner. Instruct pairs to conduct research to learn more about this fungus. What is it called? Where did it come from? How does it spread? How can it be treated? And, why does it only affect amphibians? Have partners write a brief summary of their findings. Then have them share what they learned with the class.

Extend Your Thinking About Habitats

Remind students that people have destroyed many frog habitats as they clear land to plant crops. As a class, debate the merits of planting more crops versus saving animal habitats. Challenge the class to identify ways both people and animals can get what they need to survive.

EVALUATE

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

- *What is a habitat?* (an environment where an animal lives)
- *What does an animal get from its habitat?* (everything it needs to survive)
- *Why does Joel Sartore take photos of animals in captivity?* (He wants to inspire people to care about animals so they will want to save species from extinction.)

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

VOCABULARY ASSESSMENT: Save the Frogs

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: Save the Frogs

Record reasons and evidence that prove that people need to save frogs.
Summarize what you learned.

Reasons

Evidence

Summary

Name _____

Date _____

CONTENT ASSESSMENT: Save the Frogs

Use this organizer to record information about three dangers amphibians face.

	disease	habitat loss	climate change
What is happening?			
What, if anything, did people do to cause this problem?			
What, if anything, are people doing to find a solution?			

COMPREHENSION CHECK: Save the Frogs

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

1. Which amphibian body part has been affected by a deadly fungus?

(A) brain

(B) skin

(C) bones

2. What have people done to destroy many frog habitats?

(A) cleared land

(B) swabbed limbs

(C) planted trees

3. Which type of climate is dangerous for amphibians?

(A) hot and wet

(B) cold and wet

(C) warm and dry

4. What is the population of a species that has become extinct?

(A) zero

(B) one

(C) 100

5. Explain how a deadly fungus is causing many frog species to disappear.

Moon Madness

LANGUAGE ARTS 730L

Objectives

- Students will create sketches to understand the scientific meaning of vocabulary words.
- Students will identify the main idea of the article.
- Students will summarize the article.

Resources

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

Summary

- The article “Moon Madness” broadens students’ knowledge of Earth’s moon and the many other interesting moons found in our solar system.

BUILD VOCABULARY AND CONCEPTS

- **air**
- **gravity**
- **moon**
- **planet**
- **solar system**

Display the vocabulary words on a word wall or the whiteboard. Point out 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. Remind the class that using clues such as the sentences before and after words and photos on the page can help them figure out what a word means in this type of context.

Invite a volunteer to read the definition of *air* in the Wordwise feature on page 15 of the article. Examine this word in context. Then give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write the word’s definition and create a detailed sketch showing what it means. Inform students that their drawings won’t all be the same. The point is for students to draw the word in a way that will help them remember its definition. Examine the other words in this way, too.

READ

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

Explain to students what they just attempted to identify was the main idea or overall topic of the article. Everything in the article is connected to the main idea. Each section has a main idea, too. Everything in a section is connected to the main idea of that section.

Display pages 10-11 of the projectable magazine. Model how to identify the main idea of the article. **Say:** *When I look at these pages, I notice three things right away: the headline, the photo, and block of text on the right side of the page. Each of these is a clue that will help me understand what the article is about. Based on the headline, I know that this article is about moons. The photo shows me what Earth’s moon looks like. It also tells me that people have visited Earth’s moon. Invite a volunteer to read aloud the text on the right. **Then say:** *Often when we think of moons, we only consider the one moon we can see: Earth’s moon. However, as this text points out, that isn’t the only moon in space. In fact, the point of this article is to learn about the many other interesting moons found in our solar system.**

Have students read the article on their own. As students read, encourage them to search for details that support the main idea of the article.

Moon Madness

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about moons. **Ask:** *What is a moon?* (an object that orbits a planet or asteroid) *How many planets in our solar system have moons?* (six) *How many planets in our solar system have no moons?* (two)

- **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.

- **Identify Main Ideas** Remind students that the article has a main idea. But each section has its own main idea, too. Explain that they can find the main idea of a section the same way they found the main idea of the article. They search for important clues. Give each student a copy of the **Language Arts Assessment Master**. Have students write the title and record the main idea of the article. Then instruct students to record the name of each section and skim the text to determine the main idea of each. Once students are finished, challenge them to analyze the information and write a brief summary of the article.

- **Summarize the Text** Tell students that summarizing an article is also a good strategy to check their understanding. **Say:** *When you summarize, you restate the major ideas of the article in your own words. If you are unable to do this, you may not fully understand what you read.* Have students turn and talk with a partner to share the summaries they wrote on their **Language Arts Assessment Masters**. If partners find that their summaries are vastly different, encourage them to review the article together, analyze each summary, and rewrite one or both of their ideas.

WRITE AND ASSESS

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

- *How are moons and planets alike? How are they different?*
- *How are moons formed?*
- *What surprised you about what you read?*

Moon Madness

SCIENCE

Objectives

- Students will recognize relationships between moons, planets, and the sun.
- Students will compare and contrast characteristics of moons.
- Students will understand various ways that gravity impacts objects in our solar system.

Resources

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

Science Background

A moon is an object that orbits a planet or asteroid. The force of gravity holds a moon in place as it goes around the larger celestial object.

Many moons formed at the same time as the objects they orbit. Gravity pulled bits of dust and gas together into bodies of different sizes. The smaller clumps formed moons.

Some moons are the results of collisions. Earth's moon, for example, is thought to have formed when an object as big as the planet Mars crashed into Earth long ago. And other moons are former asteroids that came so close to a larger object that they became trapped by that object's stronger pull of gravity.

Although most moons are made of rock, moons are actually quite diverse. For example, Jupiter has one moon, Io, that is covered with giant volcanoes and another, Europa, that hides a liquid ocean beneath its white, icy surface. The barren surface of Earth's moon is scarred with craters that formed when other large objects struck the moon's surface long ago.

ENGAGE

Tap Prior Knowledge

Invite a volunteer to draw a picture of Earth on a large sheet of paper or the blackboard. Invite another student to draw a picture of the moon. As a class, discuss how Earth and its moon are alike and different. Encourage students to share what they know about each.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Give students a moment to read the headline and caption and to examine the photo. **Ask:** *Where was this photo taken? (on the moon) How do you know? (The caption tells you. The photo shows an astronaut on the moon.)* As a class, discuss what it looks like on the surface of Earth's moon. (Possible response: gray, bare, and dark)

Set a Purpose and Read

Have students read the article in order to recognize relationships between moons, planets, and the sun. They will also identify characteristics of moons and understand various ways that gravity impacts objects in our solar system.

EXPLAIN

Recognizing Relationships in the Solar System

Display the Wordwise feature on page 15 of the projectable magazine. Review the definitions of the words *moon* and *planet*. As a class, discuss how moons, planets, and the sun are related in the solar system. (Moons can orbit around planets. Planets orbit around the sun.) **Ask:** *Based on what you know about the sun, can you identify one other connection between moons, planets, and the sun? (Possible response: The light and heat that shines on moons and planets comes from the sun.)*

Moon Madness

SCIENCE

EXPLAIN

(continued)

Characteristics of Moons

Instruct students to examine the article's photos in their student magazines. Point out that some of the photos show planets and some show moons. Challenge students to identify the one photo that shows both. (pp. 12-13: photo of Mars and its two moons) Then divide the class into small groups. Assign each group one section of the article. Challenge students to write a brief description of the moons identified in their sections. Have each group share what it learned about moons with the class.

Understanding the Impact of Gravity

Display pages 12-13 of the projectable magazine. Zoom in on the photo of Mars and its two moons. **Say:** *Mars, like Earth, is a planet. Unlike Earth, it has two moons rather than one.* **Ask:** *How are these moons like Earth's moon? (They circle around the planet.) How are they different? (Earth's moon is round. The two moons of Mars are shaped like potatoes.)* As a class, discuss how gravity is responsible for each of these traits. (Similarity: Gravity keeps moons circling around both planets. Difference: Gravity is the force that pulls one mass toward another. Earth's moon has enough mass for its gravity to squeeze it into a sphere. The mass of Mars' two moons is so small that they don't have enough gravity to do this. Thus, they are misshapen.) Assign each student a partner and then give each student a copy of the **Content Assessment Master**. Inform students that this worksheet includes four more examples of how gravity impacts moons in our solar system. Challenge students to find information from the article to explain why each sentence is true. Instruct them to include details about the role of gravity in each situation.

ELABORATE

Find Out More

Display page 12 of the projectable magazine. Highlight the last paragraph in the first column. Point out to the class that Earth's moon is the fifth largest moon in our solar system. Have students conduct research to learn more about moons. Challenge them to identify and rank the 10 largest moons in our solar system.

Extend Your Thinking About Moons

Remind students that Saturn's moon Titan has an atmosphere. Point out that this is highly unusual for a moon. Discuss what an atmosphere is. (the air surrounding a celestial body) As a class discuss how Titan's atmosphere is similar and different to Earth's. (Similar: Both contain air. Both are held in place by gravity. Different: Titan's atmosphere is thicker than Earth's. Titan's atmosphere is colder than Earth's so the air molecules move more slowly.)

EVALUATE

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

- *What is a solar system?* (a star plus everything that orbits around it)
- *Why do moons circle planets and asteroids?* (Gravity pulls the objects toward each other. It keeps moons in orbit around the larger objects.)
- *Why is it possible that life exists on Saturn's moon Enceladus?* (There is water beneath this moon's surface. Water is one of the key ingredients for living things.)

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

VOCABULARY ASSESSMENT: Moon Madness

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

Word	Definition	Sketch
air		
gravity		
moon		
planet		
solar system		

LANGUAGE ARTS ASSESSMENT: Moon Madness

Record the headline and main idea of the article and each section.
Summarize the text.

Article Headline	Main Idea
Section Subhead	Main Idea
Summary	

CONTENT ASSESSMENT: Moon Madness

Use information from the article to explain why each sentence is true. Include details about the role of gravity in each example.

Sentence	Explanation
1. Earth is a planet, but Titan is a moon.	
2. Jupiter has more moons than any other planet.	
3. Saturn's moon Titan is one of the few moons that has an atmosphere.	
4. Triton circles Neptune in the opposite direction that the planet spins.	

COMPREHENSION CHECK: Moon Madness

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

1. What causes a moon to orbit a planet?

- Ⓐ the atmosphere
- Ⓑ air
- Ⓒ gravity

2. Why are some moons misshapen?

- Ⓐ Their gravity is too strong.
- Ⓑ Their gravity is too weak.
- Ⓒ They have no gravity.

3. Which planet has the most moons?

- Ⓐ Earth
- Ⓑ Saturn
- Ⓒ Jupiter

4. What causes Jupiter's moon Io to look like a pizza?

- Ⓐ volcanoes
- Ⓑ asteroids
- Ⓒ comets

5. Compare and contrast Earth's moon to one other moon in the solar system.

Running the River

LANGUAGE ARTS  660L

Objectives

- Students will record, define, and sketch vocabulary words and draw a picture to show how the words are related.
- Students will recognize characteristics of writing in the first-person point of view.
- Students will write a first-person narrative about the article.

Resources

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

Summary

- In the article “Running the River,” students read a first-person account of the first ever source-to-mouth descent of the Chitina River in Alaska.

BUILD VOCABULARY AND CONCEPTS

- **climate change**
- **glacier**
- **silt**

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

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

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

READ

Let students know that in this article they will read about the first ever trip down the entire length of the Chitina River in Alaska.

Inform students that this article is written in first person. As they read, they will experience the trip through the eyes of expedition leader, Todd Wells, as he and his team complete the perilous journey.

Discuss what the first-person point of view is and how it impacts both the writing and content of the article. **Say:** *First person means that the article is written from the writer's point of view. This type of writing is easy to spot. Sentences contain the words I and we. Content is descriptive, but the text is written so readers experience the event just as the writer did when it occurred.*

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 take detailed notes to describe what happened as Wells and his team made their way down the river. Remind students to record events as they happened from Wells' point of view.

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about the team's trip down the Chitina River.

Ask: *Where is the Chitina River? (Alaska) Why hasn't anyone run the entire length of the river before? (Part of the river was covered in ice.) Why is it now possible to take a boat down the entire length of the river? (Warmer temperatures have melted the ice that once blocked the river.)* Encourage students to share other interesting facts they learned about the first trip down the entire length of the Chitina River.

- **Recognizing First Person** Remind students that first-person is a type of writing in which the text is presented from the writer's point of view. Select a section of the article. Invite volunteers to point out each use of the words *I* and *we*. As a class, replace the pronouns with *he/she/they* or *him/her/them* to rewrite that section from a different perspective. Examine the results. Discuss why first-person was the best choice for Todd Wells to use as he wrote this article.

- **Writing a First-Person Narrative** Point out to students that when people speak, they often tell stories from the first-person point of view. But when they write, particularly in published material like magazine articles, it's more common to use the second- (*he/she/they*) or third-person (*him/her/them*) perspective. **Say:** *That's because most of the time people are writing about other people's experiences. Because of that, second- or third-person makes sense. If anyone other than Todd Wells or one of his team members had written this article, it would have been written that way, too.* Inform students that one benefit of writing from the first-person point of view is that it brings readers into the story. **Say:** *You aren't watching people take a trip down a dangerous river. You're in a kayak with them.* Have students take out their **Language Arts Assessment Masters**. Instruct them to imagine that they were part of the team going down the Chitina River. Tell them to use their notes to write a detailed narrative describing what happened. Remind them to write using the first-person 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 precautions did Wells take to keep his team safe as they went down the river?*
- *What dangerous situations did Wells and his team face along the way?*
- *What surprised you about what you read?*

Running the River

SCIENCE

Objectives

- Students will understand how climate change has altered the environment of Alaska's Chitina River.
- Students will explain how Todd Wells and his team devised a safe way to tackle the Chitina River .

Resources

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

Science Background

A glacier is a large mass of ice that moves very slowly. The ice within a glacier can be extremely old, ranging from several hundred to several hundreds of thousands years old.

Logan Glacier, located in the heart of Alaska's Wrangell—St. Elias National Park, is the source of the 210-kilometer-long Chitina River. Until recently, the first stretch of the river was frozen. But like other glaciers, Logan Glacier has been melting, or retreating, due to warmer temperatures around the globe. That stretch of river is now open, revealing a canyon that features a Class V+ gorge.

Based on the International Scale of River Difficulty—Standard Rated Rapids, the gorge presented one of the most difficult, unpredictable, and dangerous river runs that exist. Class V+ rapids are rarely attempted because mistakes can be fatal. It may be impossible to rescue anyone who finds themselves in trouble along the way.

Despite the danger, National Geographic Young Explorer Todd Wells saw the gorge as a unique opportunity to explore. Wells compiled a team of expert kayakers. After careful scouting and preparation, the team took to the water, becoming the first people to run the entire length of the Chitina River.

ENGAGE

Tap Prior Knowledge

Instruct students to close their eyes and form a mental picture as you state the following words out loud: *glacier, impassable, melting, river, waves, submerged rocks, dangerous challenge, explosions of water, and drifting icebergs*. Now tell students to imagine themselves sitting in the middle of this picture in a kayak. Invite volunteers to share how they would feel and why.

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable magazine. Invite a volunteer to read aloud the headline and deck. As a class, brainstorm a list of challenges the team might face as they try to run the length of the Chitina River.

Set a Purpose and Read

Have students read the article in order to understand how climate change has altered the environment of Alaska's Chitina River and to explain how Todd Wells and his team devised a safe way to tackle the entire length of the river.

EXPLAIN

Understanding Climate Change

Prior to conducting this activity, download several images of glaciers. Display those images for the class. Then have students scan the images in the article. **Ask:** *Do you see any glaciers in these photos?* (no) Challenge students to find the paragraph in the article that explains why not. (Page 18, second paragraph) Guide students to understand that the rising temperatures caused by climate change have caused the glacier that feeds this river to melt. **Say:** *Instead of an impassable block of ice, the river is now a fast-moving stretch of water.* Encourage students to scan the article for evidence that shows this water originated from a glacier. (Possible responses: As the temperature rises, the glacier melts faster, and the water level rises; The water has an icy chill; The water is full of silt and debris from the glacier.)

Running the River

SCIENCE

EXPLAIN

(continued)

Putting Safety First

Display page 19 of the projectable magazine. Zoom in on the bottom photo. **Say:** *This article is about a team of explorers who took kayaks down a river. But this photo is taken from an airplane.* **Ask:** *Why do you think that is?* Invite volunteers to share their ideas. Then guide the class to understand that viewing the river from above is a good way to scout the river. **Say:** *The best way to stay safe on a trip like this is to plan. And you can't plan unless you know what obstacles you must overcome. Viewing the river from above helped Wells spot obstacles so he could figure out how to get around them safely.* Give each student a copy of the **Content Assessment Master**. Instruct students to describe the obstacles Wells and his team faced at two specific points in their journey: the rapids and The Pinch. Then have them outline the solution that allowed the team to safely navigate those dangerous parts of the river.

ELABORATE

Find Out More

Inform students that the Logan Glacier isn't the only glacier melting because of climate change. Assign each student a partner. Tell each pair to identify another glacier. Instruct them to conduct research to learn how rising temperatures have impacted that glacier and the surrounding area. Invite pairs to share what they learned with the class.

Extend Your Thinking About Safety

Remind the class that Wells and his team faced many different obstacles as they went down the Chitina River. The article has entire sections about the rapids and The Pinch. But it also mentions house-sized boulders, drifting icebergs, hydraulic holes, jagged rocks, and three-meter-high waves. Plus, the water was icy cold and filled with silt. Discuss reasons why only experienced people should attempt a trip like this. Have students write a list of safety guidelines experienced kayakers should follow if they try to follow in Wells' footsteps.

EVALUATE

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

- *What is climate change?* (changes in the patterns of weather in an area over a long period of time)
- *How did climate alter the Chitina River?* (Warmer temperatures caused the Logan Glacier, which feeds the river, to melt. The block of ice in the canyon melted, opening up a river of turbulent, fast moving glacial waters.)
- *Why was there so much silt in the water?* (The silt had been trapped in the glacier and was released when the glacier melted.)

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

Name _____

Date _____

VOCABULARY ASSESSMENT : Running the River

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

Word	Definition	Picture	Larger Picture

Name _____

Date _____

CONTENT ASSESSMENT: Running the River

Describe the problems Wells and his team faced at dangerous parts of the river. Outline the plan they used to get through safely.

	Problem	Solution
the rapids		
The Pinch		

COMPREHENSION CHECK: Running the River

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

- 1. What is the source of the Chitina River?
 - Ⓐ The Pinch
 - Ⓑ Logan Glacier
 - Ⓒ the Wrangell Mountains

- 2. What did climate change do to the water in the Chitina River?
 - Ⓐ increased its volume
 - Ⓑ decreased its volume
 - Ⓒ increased its temperature

- 3. Which obstacle made part of the river impassable for Wells and his team?
 - Ⓐ icebergs
 - Ⓑ hydraulic holes
 - Ⓒ silt

- 4. Why did the water in the Chitina River look like chocolate milk?
 - Ⓐ It was filled with brown ice.
 - Ⓑ It was filled with silt.
 - Ⓒ It was filled with dead plant matter.

- 5. Why did Wells encounter icebergs in the river after he squeezed through The Pinch?

ANSWER KEY

Save the Frogs

Assess Vocabulary, page 6

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

amphibian: a cold-blooded vertebrate animal, such as a frog, toad, or salamander

biodiversity: variety of living things

endangered: at risk of becoming extinct, or dying out

extinct: no longer existing in living form

habitat: an environment where an animal lives

species: a group of living things that share common characteristics

Sentences will vary depending on the connections students identify.

Assess Language Arts, page 7

Students should identify reasons and evidence that support the writer's point that people need to save frogs. Answers may vary, but they should all come directly from the text. Students should summarize what they learned in their own words.

Assess Content, page 8

Possible responses include:

Disease: A deadly fungus is spreading around the world; People did not cause this fungus. It occurred naturally; Scientists captured species to save them from extinction. They're searching for a cure.

Habitat Loss: Habitats have been destroyed; People burned land to clear it for crops, built roads through forests, dumped rocks in streams, and dug holes looking for minerals; People can fill holes, plant trees, and restore habitats.

Climate change: There has been an overall change in temperatures and rainfall around the world; No cause is stated in the article. However, some studies indicate a link between human activities and climate change; People can protect habitats and set aside more land for parks and nature preserves.

Comprehension Check, page 9

1. B; 2. A; 3. C; 4: A; 5: The fungus infects their skin and prohibits it from taking in water and certain nutrients the amphibians need to survive.

Moon Madness

Assess Vocabulary, page 14

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

air: a mixture of gases that surrounds a planet

gravity: the force that attracts one mass to another

moon: a world that orbits a planet or asteroid

planet: an object that moves in an orbit around a star such as the sun

solar system: a star plus everything that orbits around it

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

Assess Language Arts, page 15

Students should record the article headline and each subhead. Information regarding main ideas should accurately reflect the content of each section.

Assess Content page, 16

Possible responses include:

1. A planet goes around the sun. A moon goes around a planet or asteroid. Earth circles the sun and Titan circles the planet Saturn. Gravity is the force that keeps planets and moons in their orbits.
2. Jupiter is the largest planet in our solar system. It has more mass and stronger gravity than other planets. Thus, it can hold more moons in its orbit.
3. Gravity keeps air from escaping into space. Most moons don't have enough mass to produce a strong enough gravitational pull to produce an atmosphere. But Titan is really cold, so its air molecules move slowly. This allows the moon's gravity to hold onto the air molecules.
4. Triton did not form with Neptune. It once went around the sun on its own. When Triton got too close, Neptune used its gravity to snatch it away.

Comprehension Check, page 17

1. C; 2. B; 3. C; 4: A; 5: Students may note that Earth's moon is gray, dark, and cratered. It is the only moon people have visited, and it is Earth's only moon. Comparisons will vary depending on which other moon students select.

Adventurer

ANSWER KEY

(continued)

Running the River

Assess Vocabulary, page 22

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

climate change: changes in the patterns of weather in an area over a long period of time

glacier: a large mass of ice that moves very slowly

silt: fine particles, sediment

Sketches should accurately reflect the meaning of each word and how the terms are connected. Students should label all three terms in the larger drawing. Evaluate each response for accuracy.

Assess Language Arts, page 23

Students' notes should accurately reflect the content of the article. Narratives should be written from the first-person perspective.

Assess Content, page 24

Possible responses include:

(The rapids) Problem: There were a series of house-sized boulders, explosions of water, and two huge hydraulic holes; Solution: They hauled each boat up the side of the cliff using ropes and walked along the canyon rim until they found a safe place to return to the river.

(The Pinch) Problem: The river narrowed. There were large, jagged rocks, but the water was so high that they couldn't see where the rocks were. Solution: Before attempting to go down The Pinch, they scouted the river from the air. After they entered The Pinch, they paddled very carefully to avoid the rocks.

Comprehension Check, page 25

1. B; 2. A; 3. B; 4. B; 5: Students should note that as the glacier melts, chunks of ice break off. Larger chunks of ice, or icebergs, still floated in the river.