TEACHER'S GUIDE

In This Guide
This guide contains language arts and science or social studies lessons for articles in this issue of Explorer Pioneer.

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

EXPLORER magazines offer engaging reading opportunities for students with different ability levels in the same class. All articles have been measured using the Lexile® Framework for Reading. Articles in EXPLORER Pioneer will be within the 250-550L range.

For additional resources to extend your students’ learning, visit EXPLORER’s website, NatGeo.org/ExplorerMagazine.

Your Subscription Includes:
• Magazines • Classroom Posters • Projectables
• Teacher’s Guides • Digital Magazines (additional subscription required)
INTRODUCTION

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

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

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

IMPLEMENTATION
Each article in this magazine has a knowledge-based link to the Learning Framework. Students will use the skills and attitudes as they do the activity on the back cover. The activity relates to the article “River of Elk.”

MINDSET OF AN EXPLORER

KEY FOCUS AREAS

A —— Attitudes

National Geographic kids are:

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

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

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

S —— Skills

National Geographic kids can:

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

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

COLLABORATE with others to achieve goals.

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

K —— Knowledge

National Geographic kids understand:

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

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

WILDLIFE AND WILD PLACES inhabit our planet—from the butterflies in our backyards to the lions in Africa.
Standard Supported
• Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (CCSS. RI.2.3)

Resources
• Vocabulary Assessment Master (page 7)
• Language Arts Assessment Master (page 8)

Summary
• The article “Lord of the Wings” reveals how an albatross can travel up to 966 kilometers (600 miles) a day without flapping its wings.

BUILD VOCABULARY AND CONCEPTS
• drag
• force
• glide
• gravity
• lift
• thrust

Display the vocabulary words 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.

READ
Inform students that the purpose of this article is to introduce them to the wandering albatross, a type of seabird. As they read, they’ll learn about how albatross fly and why this makes them unique.

Display pages 2-3 of the projectable magazine. Read aloud the headline and deck. Say: According to this text, an albatross can fly for months without ever touching land. Ask: How do you think an albatross does this? Encourage students to share their ideas. Then explain to students that scientists wondered about this for a long time, too. So they studied the birds and learned about the process they use to fly.

Give each student a copy of the Language Arts Assessment Master. Have students read the article in small groups. As students read, instruct them to search for information that explains how an albatross is able to fly for such long periods of time. Encourage group members to work together to write a chronological description of the process in their own words.

Give each student a copy of the Vocabulary Assessment Master. Instruct students to record each word and its definition. As a class, brainstorm ideas about how the words might be related. For example, gravity causes objects to fall down but lift pushes them up. Instruct students to write three sentences telling how the words are connected, using different vocabulary words in each sentence.

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.
TURN AND TALK
Have students turn and talk to discuss what they learned about the wandering albatross. **Ask:** What is a wandering albatross? [a type of seabird] Where does the wandering albatross live? [near Earth’s southern oceans] What is perhaps the most interesting thing about a wandering albatross? [how far it can fly] Invite students to share what else they learned about the albatross.

**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 in small groups. Encourage students to identify and discuss similarities and differences in their sentences to get an even deeper understanding of the vocabulary words.

**Describing Steps in a Process** Remind students that this article explains how an albatross is able to fly for long periods of time without touching land. The method the seabird uses to do this is a process. In every process, there are steps. For the process to work correctly, the steps must occur in the proper order. Instruct two groups to compare the descriptions they recorded on their Language Arts Assessment Masters. Did they each record all of the steps? Were the steps in the proper order? Did they record the information in their own words rather than copying it directly from the text? If students find differences in their answers, encourage them to review the article one more time. Once all groups are satisfied that their descriptions are accurate, review the process as a class to ensure that all students understand how an albatross flies.

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 does a wandering albatross fly?
- How often does a wandering albatross go to land? What is island life like for this seabird?
- What surprised you about what you read?
Lord of the Wings

SCIENCE

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

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

Science Background

The wandering albatross is a feathered giant. Adults can weigh up to 10 kilograms (22 pounds) and have a wingspan that stretches up to 3.5 meters (11.5 feet). That’s the longest wingspan of any living bird.

These seabirds spend most of their lives in flight. Unlike most birds, they don’t flap their wings to stay aloft. Instead, they stretch out their wings and lock them into place. Then they can glide for hours without rest. This flying technique is known as dynamic soaring.

Dynamic soaring is possible because wind speeds vary with altitude. The albatross flies a constant looping pattern. It gains altitude as it glides up on fast-moving updrafts. It gains speed as it dives back down toward slower moving air at the surface. This allows the bird to take advantage of differences in wind speed and capture energy from wind.

Throughout most of its 60-year lifetime, the wandering albatross flies above or rests on the sea. But adults do return to land to breed. Pairs, which mate for life, build nests on islands just north of the Antarctic Circle.

The female lays a single egg in their mud and grass nest. Both parents care for the egg, and they take turns caring for their offspring after it hatches. After about eight months, the young albatross is ready to fly off. Over the next five to seven years it grows and matures until it, too, is ready to return to land to mate.

ENGAGE

Tap Prior Knowledge
Make a paper airplane. Fly it across the room. Ask students why they think the airplane flew. What kept it in the air? What made it eventually move to the ground? Do students think the airplane would have flown differently if it had larger wings? Encourage them to share their opinions.

EXPLORE

Preview the Lesson
Display pages 2-3 of the projectable magazine. Instruct students to examine the photo. Then read aloud the deck. Point out to students that most birds cannot fly this long without touching land. As a class, brainstorm ideas about how the albatross is able to do this.

Set a Purpose and Read
Have students read the article in order to recognize how the forces of flight affect an albatross and understand how the albatross is built for flight and life at sea.
Lord of the Wings

SCIENCE

EXPLAIN

Recognizing the Forces and Flight
Display page 5 of the projectable magazine. Review the sections “Forces of Flight” and “Fantastic Flying” as a class. **Say:** Gravity is a force that pulls objects toward Earth’s center. So when an albatross flies, gravity pulls it down. **Ask:** What helps an albatross move up? (Wind) **How?** (Wind under an albatross’s wings pushes it up.) Have students identify the other forces of flight (drag and thrust). Discuss how each force affects an albatross as it flies. (Drag slows it down. Thrust moves it forward.) Challenge students to explain how an albatross flies differently than most other birds. (Most birds flap their wings to get thrust. The albatross locks its wings and glides. It gains speed as it glides on the wind.) Then give each student a copy of the **Content Assessment Master.** Challenge students to show what they have learned about the forces of flight and how they impact an albatross as it glides through the air.

Understanding the Albatross’s Body
Display pages 6-7 of the projectable magazine. Zoom in on the sidebar “Built For Life at Sea.” Review the diagram as a class. **Say:** An albatross can fly for months at a time. **Ask:** Why doesn’t it get tired? (The albatross’s wing bones lock in place so it doesn’t have to flap its wings. This keeps the bird’s muscles from getting tired.) As a class, discuss how other parts of an albatross’s body help it fly and live at sea.

ELABORATE

Find Out More
Remind students that the wandering albatross is just one of the 22 different albatross species. Divide the class into small groups. Instruct groups to select one albatross species and conduct research to learn more about it. Invite groups to share and compare what they learned with the class.

Extend Your Thinking About the Albatross
Point out to the class that the wandering albatross is a very large bird. Its wingspan is 3.5 meters (11.5 feet) across. Invite volunteers to measure that distance with a meter stick. As a class, have students compare and contrast the albatross with other birds students have seen.

EVALUATE

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

- **What is a force?** (a push or a pull)

- **Why does an albatross have fewer muscles for flying than other birds?** (It doesn’t flap its wings much so it doesn’t need as many flight muscles.)

- **What does it mean to glide?** (to make unpowered flight)

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

Record each vocabulary word and its definition.

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Write three sentences showing how the vocabulary words above are connected. Use two different vocabulary words in each sentence.

1. __________________________________________
   __________________________________________
   __________________________________________

2. __________________________________________
   __________________________________________
   __________________________________________

3. __________________________________________
   __________________________________________
   __________________________________________
Describe how an albatross flies.

First, __________________________________________
________________________________________________
________________________________________________
________________________________________________

Next, __________________________________________
________________________________________________
________________________________________________
________________________________________________

Then, __________________________________________
________________________________________________
________________________________________________
________________________________________________

Finally, ________________________________________
________________________________________________
________________________________________________
________________________________________________
CONTENT ASSESSMENT: Lord of the Wings

Write each word in the correct box.

| drag | gravity | lift | thrust |

How do forces affect an albatross as it flies? Match each force to the correct sentence.

- gravity: The bird moves up.
- thrust: The bird moves down.
- lift: The bird moves forward.
- drag: The bird slows down.
Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What does an albatross spend most of its life doing?
   - ① sleeping
   - ② eating
   - ③ flying

2. What are the four forces of flight?
   - ① drag, pull, gravity, and push
   - ② lift, thrust, drag, and gravity
   - ③ thrust, drag, lift, and wind

3. Which direction does thrust push an albatross?
   - ① up
   - ② down
   - ③ forward

4. Where do wandering albatrosses live?
   - ① in Europe
   - ② in the southern oceans
   - ③ in the northern Pacific Ocean

5. How do an albatrosses wings help it make long flights?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

COMPREHENSION CHECK: Lord of the Wings
Orchids!

**LANGUAGE ARTS 500L**

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

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

**Summary**
- The article “Orchids: Flowers of the Forest” introduces readers to the unique world of orchids, the world’s largest family of flowering plants.

**BUILD VOCABULARY AND CONCEPTS**
- air plant
- bloom
- nutrient

Display the Wordwise feature 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. As a class, discuss how the vocabulary words are related. Then divide the class into pairs. Challenge partners to draw a picture that shows how the words are connected. Have students label each word in their drawings. Then invite pairs to share their ideas with the class.

**READ**
Display pages 2-3 of the projectable magazine. Give students a moment to examine the headline and photo. Then ask students what they think this article is about and why the writer wrote it. Ask them to describe what they expect to read.

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

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

**LANGUAGE ARTS**

**TURN AND TALK**

Have students turn and talk to discuss what they learned about orchids. **Ask:** What is an orchid? (a type of flower) Why were orchids rare flowers in the 1800s? (Only skilled plant hunters could find them in faraway places.) Why are they easier to find now? (Gardeners create new types of orchids all the time.) Have students share other facts they learned about orchids.

**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.

- Do you think orchids are special? Why or why not?
- How are orchids like other flowers you’ve seen? How are they different?
- What surprised you about what you read?

**Recognizing the Writer’s Purpose** Invite volunteers to reveal whether they thought the writer wrote this article to inform, entertain, or persuade. Encourage them to use the information on their Language Arts Assessment Masters to support their ideas. Then guide the class to recognize that the writer’s intent is to inform. **Say:** In this article, the writer isn’t trying to convince you to do something. And he isn’t trying to entertain you, either. This isn’t a story with characters and a plot. But the writer is giving you lots of facts about orchids. The article talks about how and where orchids grow. It compares the sizes, shapes, and colors of different orchids. It even explains how and why orchids came to be such a big business today. This writer’s intent is to inform. He wants you to learn about orchids. Invite students to share what they most liked learning about orchids.
Recognized for their variety and beauty, orchids are one of the most ancient flowering plants found on Earth. They are also the largest family of plants, with more than 25,000 species. They mostly grow in moist tropical areas.

There are two main types of orchids. Terrestrial orchids grow in loose soils on the forest floor. They get nutrients from decomposing leaves and twigs. Epiphytic orchids grow on trees. They have a spongy covering around their roots. It absorbs the nutrients, moisture, and air they need to survive.

Orchids are nothing if not diverse. Blooms can be as big as your hand or small enough to fit on a pinhead. Flowers may look like a running man or a flying duck. Orchids blossoms often mimic the shape of pollinators they want to attract. And the blooms come in every color except for blue and black.

Despite this variety, most orchid flowers have the same basic parts. The three outermost flower parts are sepals. Inside the sepals lie two petals and a lip. The lip is a specialized petal designed to attract specific pollinators. The column, which combines the flower’s male and female parts, is in the middle.
Orchids!

SCIENCE

EXPLAIN

Explore Orchid Shapes, Sizes, and Colors
As a class, review the images of orchids in the article. Invite students to describe the shape, size, and color of each orchid they see. Encourage students to share interesting facts they learned about these traits as they read the article. Then display pages 16-17 of the projectable magazine. As a class, compare and contrast the shapes, sizes, and colors of the orchids shown here. Challenge students to recognize the animal-like shape exhibited by each orchid.

Understand How Orchids Grow
Display pages 14-15 of the projectable magazine. Highlight the bold word “nutrients” on the second line of text. Remind students that a nutrient is a substance that is needed for healthy growth. Say: You get the nutrients you need from the food you eat. Most plants grow in soil. They take in nutrients from the soil through their roots. Some orchids grow this way. Others don’t. Draw students’ attention to the image of the orchid growing on a tree. Point out that some orchids, like this one, are air plants. They grow on trees. Because the flower grows high up, it can get more sunlight. Ask: But how can the flower’s roots, which are nowhere near the ground, take in the nutrients the plant needs to grow? [The roots are surrounded by a spongy covering that soaks up nutrients from the air.] Give each student a copy of the Content Assessment Master. Instruct students to draw pictures and complete sentences to show and tell how different types of orchids get the nutrients they need to grow. Encourage them to make each orchid a different size, shape, and color.

ELABORATE

Find Out More
Inform students that orchids are the largest family of flowering plants. There are more than 25,000 different species, and each one is unique. Divide the class into small groups. Instruct groups to conduct research to identify several orchid species that have something in common, like the orchids on pages 16-17 of the article that all look like animals. Encourage each group to make a poster with pictures and captions comparing the orchids in this way. Have groups share their posters with the class.

Extend Your Thinking About Orchids
Remind students that, unlike most flowers, orchids come in all different shapes, sizes, and colors. Some orchid flowers even look like animals. As a class, brainstorm ideas about why a plant might have flowers that look like animals. How could this shape help the plant get what it needs to live?

EVALUATE

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

- What do orchids need to live? [air, light, water, and nutrients]
- What is an air plant? [a plant that does not grow in soil]
- How do air plants get the nutrients they need to live? [Their roots soak up nutrients from the air.]

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

Record each vocabulary word and its definition.

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Draw a picture to show how the words are connected. Label each word in your drawing.
Complete each sentence. Then state your own opinion about the article.

I think the writer wrote this article to __________________________ readers.

(inform/persuade/entertain)

The first reason I think this is that ____________________________________________

__________________________________________________________________________

__________________________________________________________________________.

The second reason I think this is that __________________________________________

__________________________________________________________________________

__________________________________________________________________________.

The main reason I think this is that __________________________________________

__________________________________________________________________________

__________________________________________________________________________.

These reasons explain why I think the writer wrote this article. He wanted to

_________________________ readers about ____________________________

(inform/persuade/entertain)

__________________________________________________________________________.
Draw an orchid growing in the ground. Then draw an orchid growing on a tree.

Complete each sentence.

This orchid grows _________. It gets nutrients from _________.

This orchid grows _________. It gets nutrients from _________.

Make each orchid a different size, shape, and color.
COMPREHENSION CHECK: Orchids!

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

1. What is a bloom?
   A. a flower
   B. a plant
   C. a leaf

2. Where do air plants grow?
   A. in the ground
   B. on trees
   C. in water

3. How big are most orchid blooms?
   A. the size of a pinhead
   B. bigger than your hand
   C. about the size of a quarter

4. Which of these sentences is true?
   A. Sponges come from an orchid.
   B. Many orchid flowers are blue.
   C. Some orchids look like animals.

5. How do air plants get the nutrients they need to live?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
River of Elk

Standard Supported
• Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (CCSS. RI.2.1)

Resources
• Vocabulary Assessment Master (page 23)
• Language Arts Assessment Master (page 24)

Summary
• The article “River of Elk,” introduces readers to a researcher and a photographer and explains how and why they are tracking the mass migration of elk in Yellowstone National Park.

BUILD VOCABULARY AND CONCEPTS
• camera trap
• data
• migration

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

Give each student a copy of the Vocabulary Assessment Master. Instruct students to record each vocabulary word from the article. Then divide the class into small groups. Have groups scan the article to locate each bold word in the text. Instruct them to find and record text and visual clues in the article related to each vocabulary word. Challenge each student to record his or her own idea about what each word means.

Invite volunteers to read aloud the definitions from the Wordwise feature on page 23 of their student magazines. Have students record the definitions on their worksheets. As a class, compare the definitions students wrote with the definitions from the text.

READ
Explain to students that good readers ask questions before, during, and after they read. They ask questions, in particular, when they encounter something they don’t understand or something they want to learn more about. Usually, they can find the answer in the text.

Display pages 18-19 of the projectable magazine. Model how to ask and answer questions. Say: When I look at these pages, the first thing I notice is the photographs. There are three of them. One shows some animals close up. The other shows the same animals from far away. The third photo shows two men. What kind of animal is this? To me, it looks kind of like a deer. And where are they going? Who are the men and how are they connected to the animals? Read aloud the headline and deck. Say: This information answered a few of my questions. The animals aren’t deer. They’re elk. And the men are explorers who are following the elk. According to the caption under the photo, their names are Joe Riis and Arthur Middleton. But I still have questions. Where are the elk going? And what do the men hope to learn by following them? To find the answers to those questions, I’ll have to read the article.

Give each student a copy of the Language Arts Assessment Master. Explain to students how they can use the worksheet to record questions and answers they have before, during, and after they read the article.

As a class, brainstorm a list of questions about the article. Instruct students to record the questions in the appropriate section of their worksheets. Then have students read the article on their own. As they do, instruct them to record additional questions and any answers they find in the text. If students still have questions after reading the article, instruct them to record those questions, too.
River of Elk

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about elk. Ask: Where are the elk featured in the article going? [Yellowstone National Park] Why? [They are migrating.] Why are they migrating to Yellowstone? [They are going to get fresh, green grass.] Encourage students to share other interesting facts they learned about elk.

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

• Ask and Answer Questions Remind students that asking and answering questions is a strategy that can help them understand what they read. Say: Even the best readers come across words or ideas they don’t understand. Asking questions is the first step toward figuring those things out. If you ask questions, you know which answers to search for as you read and re-read the text. Have students share and compare their Language Arts Assessment Masters in small groups. Did they have the same questions? Did they find the same answers? If not, encourage them to identify where in the text they found the answer and make any corrections necessary.

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 migration? Describe the elk’s migration to Yellowstone.

• Why do the explorers want to learn about the elk’s migration to Yellowstone?

• What surprised you about what you read?
Science Background

At one time, elk were found across much of North America. But over the years, they were killed off and driven to live in more remote areas. Today, most elk live in western North America, including the mountainous regions of Yellowstone National Park.

Each year, tens of thousands of elk migrate between Yellowstone and the lower altitude areas that surround it. Their route follows the path of freshly sprouted grass. It also takes them across private lands where fences block their way and roads present crossing hazards.

To protect the elk and hopefully prevent more obstructions from being built, wildlife biologist Arthur Middleton and photographer Joe Riis set out to track the elk’s annual migration route.

To do this, the researchers had to capture elk and put GPS collars around their necks so they could track the elk’s movement. That was the easy part. Then they had to follow the elk along a route that went up and down mountains, through deep snow, and across raging rivers. At times, it was impossible to keep up.

That’s where the locals came in. Area residents told the researchers where the elk were going. Middleton and Riis got ahead of the herd and set up camera traps in their path. The data and images they collected, helped them track the elk’s route and showed them how elk get what they need to survive along the way.

ENGAGE
Tap Prior Knowledge
Instruct students to think about a wild animal they commonly see, such as a squirrel. Tell students to imagine that they must follow that animal and document its actions for one day. Challenge students to identify problems they might have as they tried to keep up. For example, how would they keep track of the animal when it went places they couldn’t go? Brainstorm potential solutions for each problem students mention.

EXPLORE
Preview the Lesson
Display pages 18-19 of the projectable magazine. Invite a volunteer to read aloud the headline and deck. As a class, discuss reasons why people might want to follow elk as they move. Brainstorm ideas about what they could learn from the experience.

Set a Purpose and Read
Have students read the article in order to understand how and why elk migrate and how technology helps scientists collect information about elk.

Standard Supported
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people. (NGSS.K-2-ETS1-2)

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

Understanding Elk Migration
Display page 23 of the projectable magazine. Zoom in on the Wordwise feature and review the definition of migration. **Say:** Many different animals migrate. And they always do it for a reason. Animals migrate to get the things they need to live. **Ask:** What thing are the elk in this article going to Yellowstone to get? (fresh, green grass) Zoom in on the map showing the elk’s migration route. Use the map key to help students interpret the information. If necessary, point out that the elk travel to Yellowstone in the summer but away from the park during winter. **Ask:** Why don’t the elk stay in Yellowstone all year long? (In winter there is too much snow here. The elk move back to lower lands where they can find shelter.)

Collecting Information About Elk
Instruct students to examine the article’s photos in their student magazines. Invite volunteers to describe what they see. **Say:** These photos show elk running across highlands, going up and down mountains, and even crossing raging rivers. And the scientists were right there with them. **Ask:** How was this possible? (The men put tracking collars on the elk so they knew where the elk had traveled.) **Say:** According to the article, the photographer set up camera traps. **Ask:** What are camera traps and why were they necessary? (Camera traps are remotely activated cameras. The photographer needed them to take pictures of the animals without bothering them.) **Ask:** Why didn’t the photographer want to bother the elk? (Possible response: Bothering the elk would have changed where the elk went and how they behaved. It would have changed what the men learned about the elk.) Give each student a copy of the **Content Assessment Master.** Instruct students to draw a picture of elk from a distance and a picture close up, like it was taken from a camera trap. Instruct students to write two things people could learn about elk from each picture.

ELABORATE

Find Out More
Inform students that photos provide valuable information about elk migration to and from Yellowstone. They show researchers when, where, and why the elk move and what they do along the way. Inform students that elk are just one of many animals that migrate. Divide the class into small groups. Instruct each group to pick an animal that migrates and conduct research to learn more about it. Challenge them to explain when, where, and why it migrates and what it does along the way.

Extend Your Thinking About Communication
Display the National Geographic Learning Framework feature on the back cover of the magazine. Discuss what communication is and how the researchers in the article “River of Elk” used pictures and words to communicate their findings with others. Then have students go outside. Tell them to take or draw pictures of something they find interesting. Give students time to write about what they saw. Encourage students to share their picture stories with others.

EVALUATE

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

- **How did tracking collars help the scientists learn about elk?** (The collars told the men where the elk had traveled.)
- **How does a camera trap work?** (The cameras have a special sensor inside. When an animal walks, by, a picture is taken.)
- **What did the explorers learn?** (They learned that the elk move to the same places each year.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.
<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
<th>The Word Means</th>
<th>What I Think</th>
<th>Visual Clues</th>
<th>Text Clues</th>
<th>Word</th>
</tr>
</thead>
</table>

Record information from the article about each vocabulary word.
<table>
<thead>
<tr>
<th>Questions</th>
<th>During</th>
<th>Before</th>
<th>Answers</th>
</tr>
</thead>
</table>

Record questions you have about Yellowstone’s elk before, during, and after reading the article.

Search for the answers in the text.

After
<table>
<thead>
<tr>
<th>Camera Trap</th>
<th>Distance</th>
</tr>
</thead>
</table>

Draw a picture of elk from a distance. Draw a picture of elk up close, like a photo taken with a camera trap.

Write two things people could learn from each picture.

1. ________________________
2. ________________________

__________________________

__________________________
COMPREHENSION CHECK: River of Elk

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

1. How often do elk migrate to Yellowstone?
   🗼 once a week
   🗼 once a month
   🗼 once a year

2. Why do elk migrate to Yellowstone?
   🗼 to find snow
   🗼 to find grass
   🗼 to find water

3. Why do they go back to lower lands during winter?
   🗼 to find shelter
   🗼 to rest
   🗼 to be by a river

4. What is data?
   🗼 a camera
   🗼 information
   🗼 a regular movement

5. How did the scientists collect information about elk?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
Understanding Maps

EUROPE

Standard Supported

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

Resources

- Content Assessment Master (page 28)
- Comprehension Check (page 29)
- Europe Physical Map poster (teacher’s edition)
- Europe 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.

EXPLAIN

Explore the Physical Map
Display the Europe Physical Map poster. Read aloud the text in the "Landforms" box. As a class, find the Alps and Balkans on the map. Challenge students to identify and locate other mountain ranges in Europe. Review the other boxes in this same way. Then read aloud the caption for each photo. Invite students to share what the map taught them about the physical characteristics of Europe.

Explore the Political Map
Display the Europe Political Map poster. Invite volunteers to read aloud the captions and text. As a class, find each location mentioned on the map. Challenge students to add another fact they know about each place. As a class, make a list of fun facts students know about European locations.

ELABORATE

Find Out More
Ask students to examine the Europe Physical and Political Map posters. Ask: Why does Europe look larger on the political map? (More area is colored non-gray.) Why is this accurate? (The entire political area of each country is colored on the political map. But physically, only parts of some countries are in Europe. Only those parts are colored on the physical map.) Point out the white line on the political map that divides Europe and Asia.

Extend Your Thinking About Europe
Give each student a copy of the Europe Map Content Assessment Master. With a partner, have students create a physical or political map of Europe. Then have them conduct research to find and record two more physical or political facts about Europe.

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 European geography.

ENGAGE

Tap Prior Knowledge
Give students three minutes to write facts they know about Europe. Review the lists. Which items were recorded most often? What countries could students name? Note questionable items that show students could benefit by learning more about Europe.

EXPLORE

Preview the Lesson
Display the Europe Physical Map poster and the Europe Political Map poster. Cover the captions. Have students examine the photos. As a class, discuss what each photo tells about Europe.

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.
Create a physical or political map of Europe. Record two new facts about Europe.

1.

2.
Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What is the smallest country in Europe?
   ☐ Vatican City
   ☐ Russia
   ☐ Spain

2. What is Stonehenge?
   ☐ a port
   ☐ a monument
   ☐ a mountain

3. What is the Volga?
   ☐ a mountain
   ☐ a river
   ☐ a fjord

4. What is the climate like in western Europe?
   ☐ warm and temperate
   ☐ hot and dry
   ☐ cold and wet

5. Write three facts about Europe.
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
**Lord of the Wings**

**Assess Vocabulary, page 7**
Students should record the words and definitions from the Wordwise feature on page 9.

- **drag**: the force that slows down an object’s movement
- **force**: a push or a pull
- **glide**: make an unpowered flight
- **gravity**: the force that causes objects to fall toward the center of Earth
- **lift**: the force that pushes something upward
- **thrust**: the force that propels something forward

Sentences will vary depending on the connections students identify.

**Assess Language Arts, page 8**
First, an albatross flies low over the water. Next, it turns up into the wind, which lifts it up into the air. Then, the albatross locks its wings and glides back down toward the water. Finally, the bird turns back into the wind to rise again.

**Assess Content, page 9**

- **drag** (left), **lift** (up), **thrust** (right), **gravity** (down)

Gravity = The bird moves down; thrust = The bird moves forward; lift = The bird moves up; drag = The bird slows down.

**Comprehension Check, page 10**
1. C; 2. B; 3. C; 4. B; 5: The bones in an albatross’s wings lock in place so it doesn’t have to flap its wings. This keeps the bird from getting tired so it can make long flights.

**Orchids**

**Assess Vocabulary, page 15**
Students should record the words and definitions from the Wordwise feature on page 17.

- **air plant**: a plant that does not grow in soil
- **bloom**: a flower
- **nutrient**: a substance that is needed for healthy growth

Drawings should show an accurate connection between the words. All words should be labeled in the drawing.

**Assess Language Arts, page 16**
Students should select one purpose and write it on the blank line to complete the first sentence. They should identify three valid reasons for their choice. They should write the same purpose in the final sentence and write the topic about which the writer is trying to inform/persuade/entertain about.

**Assess Content, page 17**
Students should draw pictures of orchids that grow in the ground and on a tree. The orchids should be different sizes, shapes and colors.

**Sentences**: This orchid grows on a tree. It gets nutrients from the soil. This orchid grows on a tree. It gets nutrients from the air.

**Comprehension Check, page 18**
1. A; 2. B; 3. C; 4: C; 5: Air plants have roots with a spongy covering. They soak up nutrients from the air.

**River of Elk**

**Assess Vocabulary, page 23**
Students should record the words and definitions from the Wordwise feature on page 23.

- **camera trap**: a remotely activated camera
- **data**: Information about something that can be used to find out more about something
- **migration**: the regular movement of groups of animals from one region to another for feeding or breeding

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

**Assess Language Arts, page 24**
Students’ questions will vary, but all questions should relate to the article. All answers should come directly from the text.

**Assess Content, page 25**
Students should draw the same scene of elk along the migration route close-up and from a distance. Ideas about what people can learn will vary depending on what students choose to draw.
(continued)

River of Elk

Comprehension Check, page 26
1. C; 2. B; 3. A; 4: B; 5: The scientists put tracking collars on some elk to learn where the elk had traveled. They used camera traps to take photos of the elk without bothering them.

Europe Maps

Assess Content, page 28
Students should create an accurate physical or political map of Europe. Facts will vary, but they should relate to the type of map (physical or political) that the student chose to create.

Comprehension Check, page 29
1. A; 2. B; 3. B; 4: A; 5: Facts will vary but should come from the Europe Physical or Political Map posters.