Your Subscription Includes:

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- Teacher’s Guides  
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MINDSET OF AN EXPLORER

KEY FOCUS AREAS

A ——— Attitudes

National Geographic kids are:
CURIOS 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.
Lord of the Wings

LANGUAGE ARTS

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

Resources
• Vocabulary Assessment Master (page 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
• dynamic soaring
• force
• friction
• gravity
• kinetic energy
• 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.

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. For example, gravity and lift are opposing forces. Instruct students to write four sentences, using two 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.

READ
Write the words reasons and evidence on the board.
Then ask: What’s the difference between these two words? Invite students to share their ideas. Guide the class to understand that a reason tells why something happened. Evidence shows how.

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

Display pages 2-3 of the projectable magazine. Instruct students to then examine the illustration while a volunteer reads aloud the headline and deck.

Say: Sometimes when you read an article, you have to get a paragraph or two into the text before you can identify key points the writer is trying to make. In this article, the writer hints at a key point in the headline. She calls the wandering albatross “Lord of the Wings.” In the deck, she points out that the wandering albatross can fly for months without touching land. The deck gives a supporting reason that makes the key point made in the headline clear: The wandering albatross is a superior flier.

Give each student a copy of the Language Arts Assessment Master. Then have students read the article on their own. As they read, encourage them to search for reasons and evidence that support the identified key point. Then challenge them to record two more key points the writer makes in the text. Encourage students to record reasons and evidence that support each key point.
Lord of the Wings

LANGUAGE ARTS

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? (in Earth’s southern oceans) Why have scientists studied this sea bird? (They want to know how it can fly for so long without touching land.) 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 with a partner. Encourage them to identify and discuss similarities and differences in their sentences to get an even deeper understanding of the vocabulary words.

- Identifying Reasons and Evidence After reading the article, remind students that reasons tell why something happened. Evidence explains how. Invite students to share their Language Arts Assessment Masters with a partner. Challenge them to examine one another’s results to determine whether or not all reasons are valid, all evidence is solid, and both support the key points made in the text.

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

- What is a force? What are some examples of different forces and what do they do?

- What is life like for a wandering albatross when it is on land?

- What surprised you about what you read?
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 put their wings to good use. They spend most of their lives in flight. Unlike most birds, they don’t constantly 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 analyze how the albatross’s body is built for flight, recognize the forces of flight, and understand how dynamic soaring allows the seabird to use wind energy to fly.

EXPLAIN
Analyzing 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 wings lock in place so it doesn’t have to flap its wings. This keeps the bird’s muscles from getting tired.) Encourage students to explain how other parts of the albatross’s body help the bird fly and live at sea.

Recognizing the Forces and Flight
Display page 5 of the projectable magazine. Review the section “Forces of Flight” as a class. Say: Gravity is a force that pulls objects toward Earth’s center. Have students identify the other forces of flight (lift, drag, thrust). Discuss how each force affects a bird in flight. (Gravity pulls the bird down, lift pushes it up, drag slows it down, and thrust propels it forward.)
Lord of the Wings

EXPLAIN (continued)

Understanding Dynamic Soaring
Inform students that most birds can fly because the shape of their wings splits air into two directions. Faster-moving air travels over the wings. Slower-moving air goes under. This gives birds the lift they need to overcome gravity. Flapping their wings creates thrust. As long as their thrust is more than the drag of head winds, they can move forward. Say: The albatross is different. It doesn't flap its wings. It locks them in place and angles them. Then it turns directly into the wind. Instead of slowing the bird down, this allows the albatross to capture the kinetic energy of wind and soar upward. Inform students that this technique is called "dynamic soaring." Assign each student a partner. Have pairs examine the information about dynamic soaring on page 6 of their student magazines. Then give each student a copy of the Content Assessment Master. Instruct students to show and tell how dynamic soaring works. Then challenge them to explain, in their own words, why dynamic soaring allows the albatross to stay in the air for such a long time.

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
Remind the class that each of the 22 albatross species is categorized as vulnerable, threatened, near threatened, or endangered by conservationists. Point out to students that there are natural threats, such as predatory fish. But the biggest danger for the albatross comes from longline fishing. As a class, identify solutions fishing companies have tried. Discuss reasons why the solutions could work. Brainstorm other ideas the companies could try.

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)
- What is kinetic energy? (the energy an object has due to its motion, such as wind or moving water)
  Which direction does kinetic energy help an albatross fly? (up)
- What is dynamic soaring? (a flying technique used to gain energy from the wind)

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.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
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Write four sentences showing how the vocabulary words above are connected. Use two different vocabulary words in each sentence.

1. ____________________________________________________________

2. ____________________________________________________________

3. ____________________________________________________________

4. ____________________________________________________________
**LANGUAGE ARTS ASSESSMENT: Lord of the Wings**

Record reasons and evidence that support this key point the writer makes.

<table>
<thead>
<tr>
<th>Key Point: The wandering albatross is a superior flier.</th>
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<tbody>
<tr>
<td><strong>Reasons</strong></td>
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</table>

Identify two more key points in the article. Record reasons and evidence that support each.

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<th>Key Point:</th>
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<td><strong>Reasons</strong></td>
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<tr>
<td><strong>Reasons</strong></td>
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</table>
CONTENT ASSESSMENT: Lord of the Wings

Draw a diagram to show dynamic soaring works.

Put these sentences in the correct order to tell how dynamic soaring works.

_____ The albatross glides back down to the sea to gain speed.
_____ The wind lifts the bird.
_____ The cycle repeats.
_____ An albatross flies low over the waves. Then the bird turns into the direction of the wind.

In your own words, explain why dynamic soaring allows the albatross to stay in the air for such a long time.
Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What are the four forces of flight?
   - drag, friction, gravity, and kinetic energy
   - lift, thrust, drag, and gravity
   - thrust, drag, lift, and friction

2. What causes wind to slow down as it meets ocean waves?
   - gravity
   - kinetic energy
   - friction

3. What gives an albatross the kinetic energy it needs to soar upward?
   - water
   - land
   - wind

4. Where does a wandering albatross spend most of its life?
   - in the air
   - on land
   - on the sea

5. How does dynamic soaring work?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
Orchids

Standard Supported
• Determine the main idea of a text and explain how it is supported by key details; summarize the text. [CCSS.RI.4.2]

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
• column
• lip
• nutrient
• petal
• sepal

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. Discuss how the vocabulary words are related. Then challenge students to create a diagram that illustrates how the words are connected. Have students label each term in their drawings. Then invite students to share their ideas with the class.

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 that what they just attempted to identify was the main idea or overall topic of the article. Tell students that everything in the article is connected to the main idea. The main idea is supported with key details in the text.

Display pages 10-11 of the projectable magazine. Model how to identify the main idea of the article. Say: To figure out what this article is about, I need to look for clues. The first clues are the photos. Each photo shows a different flower. The headline tells me that these flowers are all orchids and that they grow in the forest. Does that mean the article will talk about how and where orchids grow? To know for sure, I need to look for more clues. Invite a volunteer to read aloud the deck. Say: This is extremely useful information. This article will tell me about all types of orchids. It will explain why orchids are such special flowers. As I read the article, I’m sure I’ll find many interesting details that support this idea.

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 record key details in each section.
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 so valuable in the past? (They grow in the tropics and subtropics. It was dangerous and expensive to find them.) Why are they easier to find now? (People grow them in greenhouses.) Have students share other facts they learned about orchids.

• Identify Main Ideas Remind students that the article has a main idea, and the main idea is supported by key details found in the article. Assign each student a partner. Have pairs review the key details they recorded on their Language Arts Assessment Masters. Based on those details, challenge partners to identify the main idea of the article.

• Summarize the Text Tell students that summarizing is also a good strategy to check their understanding of a text. 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 just read. Based on the details they recorded, instruct each student to write a brief summary of the article on their Language Arts Assessment Masters. Then have students turn and talk with their partners to share the summaries they wrote. 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.

• Do you think orchids are special? Why or why not?

• Why was it dangerous to search for orchids in the past? Why are orchids easier to find today?

• What surprised you about what you read?
Science Background

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.

ENGAGE

Tap Prior Knowledge

Give each student a piece of plain white paper and access to crayons or colored pencils. Then ask each student to draw a picture of a flower. Compare and contrast the results. Point out the variety of colors, sizes, and shapes. Then point out that, more likely than not, students’ drawings represent different species of flowers. **Ask:** Do you think it’s possible for one species of flower to have this much variety? Encourage students to share their opinions.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Read aloud the headline and deck. **Say:** Each flower you see here is an orchid. According to the deck, orchids come in nearly every shape, size, and color. **Ask:** How would you describe the orchids you see in these photos? Invite students to share their descriptions.

Set a Purpose and Read

Have students read the article in order to identify the common parts of most orchids, compare and contrast different orchid traits, and understand how orchids get what they need to survive.

EXPLAIN

Identifying the Anatomy of an Orchid

Inform students that most orchids have common characteristics. One example is the flowers’ parts. Display page 13 of the projectable magazine. Review the diagram to identify those parts (sepal, petal, column, lip). Then have students examine the section “Anatomy of an Orchid” on page 12 of their student magazines for more information about each flower part. Divide the class into pairs. Instruct partners to review the article’s photos. Challenge them to identify the sepal, petal, column, and lip on as many orchids as they can. Rejoin as a class to compare results. Give each student a copy of the Content Assessment Master. Instruct students to draw a picture of an orchid and label its parts.
EXPLAIN
(continued)

Compare and Contrast Orchid Traits
Point out to the class that while most orchids have common characteristics, orchid species vary in many ways. Say: Orchids come in nearly every shape, size, and color. That’s what makes these flowers so special. Display pages 16-17 of the projectable magazine. As a class, compare and contrast the shapes, sizes, and colors of the orchids shown here. Then have students take out their Content Assessment Masters. Based on what they’ve seen and read in the article, instruct students to describe similarities and differences in the shape, size, and color of different orchid species.

Understand How Orchids Survive
Remind students that a nutrient is a substance that is needed for healthy growth, development, and functioning. Say: You get the nutrients you need from the food you eat. Most plants grow in soil. They absorb nutrients from the soil through their roots. Some orchids grow this way. Others don’t. Display page 14 of the projectable magazine. Inform students that this orchid grows on a tree. Say: Growing on a tree lets this orchid reach more sunlight. Ask: But how can the flower’s roots, which are nowhere near the ground, help the orchid get what it needs to survive? (The roots are surrounded by a spongy covering that absorbs nutrients, moisture, and air, while preventing the true roots inside from drying out.) As a class, discuss how other orchids have adapted to live in places where they can get what they need to survive. (Orchids that need constant water grow in wet bogs. Those that need constant shade grow near tall trees.)

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. Assign each student a partner. Instruct pairs to conduct research to identify several orchid species that share a common trait, such as those featured in the “Look-Alikes” diagram on pages 16-17 of the article. Encourage partners to create a poster with pictures and captions comparing the different orchids in this way. Have pairs share their posters with the class.

Extend Your Thinking About Orchids
Remind students that people grow millions of orchids in greenhouses each year. But orchids are still rare and hard to find in the wild. Many species are close to extinction because their habitats are disappearing and people are collecting them illegally. As a class, discuss reasons why it is important to protect wild orchids. Challenge students to identify ways this could be done.

EVALUATE

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

- What is the purpose of the column in an orchid flower? (reproduction) How do you know? (The column combines the male and female parts of the flower.)

- Which part of an orchid flower helps attract pollinators? (the lip) How? (It is usually colorful or has a special shape.)

- How have people used orchids in practical ways? (People have used orchid to make vanilla, glue and medicines.)

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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<thead>
<tr>
<th>Word</th>
<th>Definition</th>
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</table>

Create a diagram that shows how each vocabulary word is connected to an orchid. Label each part of your drawing.
Use this organizer to key details in each section in the article.

<table>
<thead>
<tr>
<th>Subhead</th>
<th>Key Details</th>
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<tbody>
<tr>
<td>Introduction</td>
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<td>Good to Grow</td>
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<tr>
<td>From Big to Small</td>
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<tr>
<td>Anatomy of an Orchid</td>
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<tr>
<td>How Does the Garden Grow?</td>
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<tr>
<td>Not Just for Show</td>
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<tr>
<td>Big Business</td>
<td></td>
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<tr>
<td>Look-Alikes</td>
<td></td>
</tr>
</tbody>
</table>

What is the main idea of the article? ____________________________________________________________

Summarize the article. ____________________________________________________________
Draw an orchid and label its parts. Describe similarities and differences in the shape, size, and color of orchids.
COMPREHENSION CHECK: Orchids

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

1. Which part of an orchid absorbs nutrients?
   - A the flower
   - B the leaves
   - C the roots

2. Where do orchids grow?
   - A rain forests
   - B deserts
   - C the Arctic

3. Which orchid part is designed to attract pollinators?
   - A the lip
   - B the column
   - C the sepal

4. Which of these statements is true?
   - A An orchid’s bloom can last up to a year.
   - B Some orchids look like the pollinators they are trying to attract.
   - C Orchid flowers have separate male and female parts.

5. How does an orchid that grows on a tree get the nutrients it needs to survive?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
River of Elk

BUILD VOCABULARY AND CONCEPTS
• camera trap
• data
• ecosystem
• GPS collar
• 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. Have them scan the article to locate each bold word in the text.

Instruct students to find and record text and visual clues in the article related to each vocabulary word. Then have each student 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. Encourage them to compare the definitions they wrote with the definitions from the text.

READ
Tell students that as they read, they will come across many facts that are stated clearly in the text. These facts are explicit statements. But they will also encounter clues that require them to make an inference, or educated guess. To do this, they must combine what the text says with what they already know to reach a logical conclusion.

Display pages 18-19 of the projectable magazine. Read aloud the headline. Then model how to identify an explicit statement and make inferences. Say: According to the headline, the animals you are going to read about in this article are elk. That is an explicit statement, or a stated fact. But the headline is “River of Elk.” What does that mean? To figure it out, I’ll have to search for clues.

Say: A river is a long, flowing body of water. The top photo shows a line of elk. Rivers are long. So based on the reference to a river, I can infer—or make a logical guess—that the line of elk is a lot longer than what we see here. I can also guess that the line is constantly moving, just like a river. To find out if my inferences are correct, I’ll need to read the article.

Give each student a copy of the Language Arts Assessment Master. Instruct students to read the article on their own. As they do, encourage them to record five explicit statements and make five inferences about elk.
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? (That’s where they find fresh, green grass in summer.) Why are the researchers following the elk? (They want to identify the elk’s migration patterns.)

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.

**Making Inferences** Remind students that making inferences is a strategy that can help them understand what they read. 

**Say:** Understanding what you just read is important. But interpreting information from a writer’s clues takes practice. If you can’t follow the clues, you might need to reread the text. Have students compare their Language Arts Assessment Masters with a partner. Did students identify the same explicit statements? Did they find the same clues? If so and they developed different inferences, encourage students to review the text once again. Challenge students to identify the clues they used to make each inference and explain how the clues led them to reach each logical conclusion.

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 do animals like elk migrate? Describe the elk’s migration route.
- How can it help elk if people know their migration route to Yellowstone?
- What surprised you about what you read?
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 encounter. 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 migrate to Yellowstone. 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 perception and memories guide elk as they migrate and how technology helps people track and record animal movements.
**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 resources they need to survive. **Ask:** But how do the animals know where to go? Encourage students to share their ideas. Then challenge the class to find two sentences in the article that explain this phenomenon. (Page 22, column 2, paragraph 2: But this was the route the elk had always traveled. It was the route they knew.) As a class, discuss how memories and perceptions guide elk’s actions as they migrate to Yellowstone each year.

**Using Technology to Learn About Migration**
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 researchers were right there with them. **Ask:** How was this possible? (The researchers put GPS collars on the elk so they could track their movements. Local people told them where the elk would travel next, which gave them time to set up camera traps before the elk got there.) **Ask:** Why do you think the researchers relied on these methods to collect information about the elk? (Possible response: They had tried other things before. These methods yielded the best results.) Give each student a copy of the **Content Assessment Master**. Instruct students to draw a picture of elk as they would appear from a distance. Then have them draw that same scene close up, or like a picture taken with a camera trap. Instruct students to explain how camera traps help people learn more about elk.

**ELABORATE**

**Find Out More**
Inform students that photos provided valuable information about elk migration to Yellowstone and the return trip. They showed researchers when and where elk move and how that affects the overall ecosystem. Remind students that elk are just one of many animals with an annual migration. Divide the class into small groups. Tell groups to select another animal that migrates each year. Instruct them to conduct research to track the animal’s migration route. Challenge them to identify when and where the animals go and how their movement affects the overall ecosystem.

**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.
- What does GPS mean? (Global Positioning System)
- What did data from GPS collars reveal about the Yellowstone elk? (When and where they go)
- Why did the researchers use camera traps? (To capture images of the animals without getting too close or disturbing them)

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>Text Clues</th>
<th>Visual Clues</th>
<th>What I Think the Word Means</th>
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</thead>
<tbody>
<tr>
<td>River of Elk</td>
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</table>
Record five explicit statements and make five inferences about elk.

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<tr>
<th>Explicit Statements</th>
<th>Inferences</th>
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<td>5.</td>
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<table>
<thead>
<tr>
<th>What the Text Says</th>
<th>What I Already Know</th>
<th>Inferences I Can Make</th>
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<td>Camera Trap</td>
<td>Distance</td>
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Explain how camera traps help people learn more about elk.

Draw a picture of elk from a distance. Draw that same scene close up, or like a picture taken with a camera trap.
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. What can data collected by a GPS collar reveal?
   - why an elk migrated  
   - where an elk went  
   - how an elk found food

2. How often do elk migrate to Yellowstone?
   - once a week  
   - once a month  
   - once a year

3. Why is a river crossing a good place to set up a camera trap?
   - The elk speed up.  
   - The elk slow down.  
   - The elk end their migration.

4. What triggers a camera trap to take a photo?
   - light  
   - motion  
   - sound

5. How does migration help elk survive?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
Understanding Maps

EUROPE

EXPLAIN

Explore the Physical Map
Display the Europe Physical Map poster. Read aloud the text in the "Landforms" box. Have students 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. Have students create a physical or political map of Europe. Then have them conduct research to find and record four 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.

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.

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)
- Europe Physical Map poster (teacher’s edition)
- Europe Political Map poster (teacher’s edition)

ENGAGE

Tap Prior Knowledge
Give students three minutes to list facts about Europe. Review the lists. Which items were recorded most often? Which 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 four new facts about Europe.

1. 
2. 
3. 
4.
Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. Where is Europe’s highest peak located?
   - Switzerland
   - Italy
   - Russia

2. Which city is located in both Europe and Asia?
   - Dublin, Ireland
   - Kiev, Ukraine
   - Istanbul, Turkey

3. What is the longest river in Europe?
   - Volga River
   - Danube River
   - Rhine River

4. Which of these European countries is an island?
   - Spain
   - Great Britain
   - France

5. Write three facts about Europe.

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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
dynamic soaring: a flying technique used to gain energy from the wind
force: a push or a pull
friction: the force that slows down objects when they rub against each other
gravity: the force that causes objects to fall toward the center of Earth
kinetic energy: the energy an object has due to its motion, such as wind or moving water
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
Students should identify reasons and evidence that support the writer’s point that the wandering albatross is a superior flier. Answers may vary, but they should all come directly from the text. Other answers will vary depending on which key points students identify.

Assess Content, page 9
Draw: Students should create a diagram like the one on page 6 of the article.
Sequence: The order of events is: 3, 2, 4, 1.
Explain: With dynamic soaring, the albatross uses the energy of the wind to glide. It doesn’t have to flap its wings to stay in the air, so it doesn’t get tired. That allows it to fly for a long time without stopping.

Comprehension Check, page 10
1. B; 2. C; 3. C; 4. A; 5: Possible response: An albatross flies low over the waves. Then the bird turns into the direction of the wind. The wind lifts the bird. The albatross glides back down to the sea to gain speed. The cycle repeats.

Orchids

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

column: the fused male and female parts of an orchid
lip: a type of petal designed to attract pollinators
nutrient: a substance that is needed for healthy growth, development, and functioning
petal: one of the brightly colored leaf-like parts of a flower
sepal: one of the parts forming the outer covering of a flower

Diagrams should show an accurate connection between the words. All terms should be labeled in the diagram.

Assess Language Arts, page 16
Key details and for each section may vary. Main ideas should be directly related to the content of each section. The main idea and summary of the article should reflect that orchids are diverse and special flowers.

Assess Content, page 17
Students should draw an image of an orchid like the one on page 13 of the article and label the sepal, petal, column, and lip. Descriptions will vary, but students should note similarities and differences in the shape, size, and color of different orchids.

Comprehension Check, page 18
1. C; 2. A; 3. A; 4: B; 5: The roots of orchids that grow on trees have a spongy covering that absorbs nutrients, moisture, and air.
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. C; 2. C; 3. A; 4. B; 5: Facts will vary but should come from the Europe Physical or Political Map posters.

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 in calculating, reasoning, or planning
ecosystem: includes all of the living things in a given area interacting with each other and also interacting with the non-living parts of that environment
GPS collar: GPS stands for Global Positioning System. These collars are used to track the movement of wildlife.
migration: the regular passage 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 should record five explicit statements and five inferences. Inferences may vary but should be logical and directly relate to information in the text.

Assess Content, page 25
Students should draw the same scene of elk along the migration route close up and from a distance. They should explain that camera traps allow people to capture images of the animals without getting too close or disturbing them. The close-up images would show exactly what elk were doing while distant shots would just show a long line of elk on the move.

Comprehension Check, page 26
1. B; 2. C; 3. B; 4. B; 5: Migration allows elk to find plenty of food in the summer and shelter from snow in the winter.