



TEACHER'S GUIDE

PATHFINDER AND ADVENTURER | VOL. 20 NO. 3

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LEXILE® FRAMEWORK LEVELS

PATHFINDER

Waiting to Be Discovered 770L

Seeking Solutions 620L

Protector of the Amazon 750L

ADVENTURER

Waiting to Be Discovered 830L

Seeking Solutions 770L

Protector of the Amazon 870L

STANDARDS SUPPORTED

- Common Core State Standards (CCSS)
 - Next Generation Science Standards (NGSS)
 - C3 Framework for Social Studies State Standards (C3)
- See each lesson for the specific standard covered.

Educational consultant **Stephanie Harvey** has helped shape the instructional vision for this Teacher's Guide. Her goal is to ensure you have the tools you need to enhance student understanding and engagement with nonfiction text.



Visit EXPLORERMAG.ORG to access digital issues of Explorer magazine in **English** and **Spanish**. Engage students with digital read-alouds, videos, and interactive activities.

NATIONAL GEOGRAPHIC LEARNING FRAMEWORK

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.

MINDSET OF AN EXPLORER: KEY FOCUS AREAS

ATTITUDES



CURIOSITY An explorer remains curious about how the world works throughout his or her life. An explorer is adventurous, seeking out new and challenging experiences.

RESPONSIBILITY An explorer has concern for the welfare of other people, cultural resources, and the natural world. An explorer is respectful, considers multiple perspectives, and honors others regardless of differences.

EMPOWERMENT An explorer acts on curiosity, respect, responsibility, and adventurousness and persists in the face of challenges.

SKILLS



OBSERVATION An explorer notices and documents the world around her or him and is able to make sense of those observations.

COMMUNICATION An explorer is a storyteller, communicating experiences and ideas effectively through language and media. An explorer has literacy skills, interpreting and creating new understanding from spoken language, writing, and a wide variety of visual and audio media.

COLLABORATION An explorer works effectively with others to achieve goals.

PROBLEM SOLVING An explorer is able to generate, evaluate, and implement solutions to problems. An explorer is a capable decision maker—able to identify alternatives and weigh trade-offs to make a well-reasoned decision.

KNOWLEDGE



THE HUMAN JOURNEY An explorer understands where we came from, how we live today, and where we may find ourselves tomorrow.

OUR CHANGING PLANET An explorer understands the amazing, intricate, and interconnected systems of the changing planet we live on.

WILDLIFE AND WILD PLACES An explorer reveals, celebrates, and helps to protect the amazing and diverse creatures we share our world with.

Fourth Grade Standard Supported

- **CCSS Reading Informational Text:** Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-7)

Fifth Grade Standard Supported

- **CCSS Reading Informational Text:** Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 5 topic or subject area*. (5-4)

What You Will Need

- “Waiting to Be Discovered” (*Explorer*)
- Think Sheet (Teacher’s Guide, pages 5–6)
- Pencils

CONNECT & ENGAGE (5 minutes)

Display the first two pages of the article “Waiting to Be Discovered.”

Say: Today we are going to be reading about scientist Analyn Cabras. We are going to learn more about her work with beetles. To get us started, I’m going to read aloud the text on the first pages.

Read aloud the text on the first two pages.

Say: Now take a look at the photo of Analyn Cabras and all of the beetles. What do you notice about the beetles? Take some time to look carefully at all of the beetles, and then turn and talk about what you notice.

Kids should share some of their observations about the beetles, such as their shapes and sizes, their various colors and markings, and some of their body parts that are similar or that vary from beetle to beetle.

MODEL (10 minutes)

Say: I’m going to read aloud this next page. It tells more about Analyn Cabras’ work. As I’m reading, look at the photos and the map.

Read aloud the text.

Say: The text tells me a lot about Cabras and the many scientist hats she wears—biologist, taxonomist, conservationist, and so on. The text says that Cabras looks for beetles in Mindanao, an island in the Philippines. I don’t know a lot about the Philippines, so seeing the picture and looking at the map gives me good information about what the landscape looks like and where in the world the Philippines is located. This is very helpful.

Say: I have also learned from the text how careful Cabras has to be in her work. If she isn’t careful, the beetles will be hard to find. There are three different beetles pictured on these pages. I’m wondering if these are some examples of beetles Cabras has found. I’m guessing they might be, or at least they might be similar to the types of beetles Cabras finds and studies.

Say: There is more text on this page that seems to be kind of a special feature. It tells the many different roles Cabras plays as a scientist. I think this is really interesting. I’m going to read these aloud to you, then I’d like you to turn and talk about these different roles.

Read the text and then let kids turn and talk.

Say: I don’t want to forget about that photo of Cabras where she is looking at a beetle up close. That gives me a lot of information, too. I see she has a magnifying glass. That must be an important tool for her when she is working in the field. It magnifies the beetle so she can see more details.

Say: This is important stuff to keep track of, if we want to use everything in the article to help us make meaning out of what we are viewing and reading. I’m going to use this Think Sheet chart to write down how the photos, map, and the text help me understand.

Show kids the three-column Think Sheet chart. In the Image column, write “photos and map”; in the Text column, write the page numbers of the text you read aloud; and in the How They Help Me Understand column, write “help me figure out more about Cabras’ work and where she does it.”

GUIDE (10 minutes)

Make sure kids have access to their own Think Sheets.

Say: I'm going to read aloud the text on the next page. Then we'll look at the photos on the next two pages together. Those photos go with the text I will be reading. Look at them while I read aloud.

Read the text aloud on the next page.

Say: Okay, the text tells us more about how Cabras works and more information about the beetles she finds. The photos on these pages help us see more, too. Let's take a closer look at those images. Look at and talk through each of the photos with a partner. Read the captions, too.

Kids turn and talk about the photos with a partner. They should take note of the beetle that became important to Cabras' work and may wonder why. They may be able to infer why from the text. They may also notice that the photo of Cabras using a microscope is evidence of another tool she uses to study the beetles she finds.

Say: Now, with your partner, write your thoughts on your Think Sheets.

COLLABORATE (25 minutes)

Say: Now it's time for you to read with a partner. Go through the rest of the article together, using the photos and text to make meaning. As you are viewing and reading, stop to write down your thoughts about the text and the images on your Think Sheets. And don't forget to write how they help you understand.

Partners read the rest of the article together, stopping to write their thoughts on the Think Sheets. Confer with partners to answer any questions they have.

Kids should note that the photos helped them understand the concept of mimicry and how the mimics truly resemble the models. It is also helpful to view one of Cabras' clay models to see how she went about experimenting to learn whether or not predators would attack her model that used the warning colors.

SHARE THE LEARNING (10 minutes)

Say: Let's get together and talk about what we learned. I learned that the text and images work together to help us make meaning as we read. Who else would like to share something they learned? Look at your Think Sheets to find examples you would like to share.

Allow time for kids to share their learning.

Say: We learned so much today about using the text and different kinds of images, such as a map and photos, to help us understand and make meaning as we read. What a great job you all did!

THINK SHEET

Write your thoughts in each column.

IMAGES	TEXT	HOW THEY HELP ME UNDERSTAND

HOJA DE PENSAR

Escribe tus ideas en cada columna.

IMÁGENES	TEXTO	CÓMO ME AYUDAN A COMPRENDER

LESSON FRAME Use Images and Text to Make Meaning

This frame is a template of the language arts lesson. It has the instructional moves and language of the lesson, but the specific content has been removed. This way you can use the Lesson Frame for the other articles in the issue or for any nonfiction text you might be teaching.

What You Will Need

- Nonfiction text
- Think Sheet template
- Pencils

CONNECT & ENGAGE (5 minutes)

Display the first page(s) of the article.

Say: Today we are going to be reading about We are going to use the images and the text to help us understand more about To get us started, I'm going to read aloud the text on page

Read aloud the text on page

Say: Now take a look at the image(s) [could be photo, map, diagram, etc.].

Say: Take some time to look carefully at the image(s), and then turn and talk about what you notice.

Kids turn and talk about what they notice.

MODEL (10 minutes)

Say: Now I'm going to continue reading aloud. Listen as I read, and look at the image(s) on the page(s).

Read aloud page(s)

Say: What did you notice about the image(s), and how did that help you understand what you were hearing as I read the text? Turn and talk about that with a partner.

Kids turn and talk.

Say: This is important stuff to keep track of, if we want to use everything in the article to help us make meaning out of what we are viewing and reading. I'm going to use this Think Sheet chart to write down how the image(s) and the text help me understand.

Show kids the three-column Think Sheet chart. Write your thoughts in the Image column, the Text column, and the How They Help Me Understand column. Think aloud as you are writing to model for kids how you used the image(s) and text to help you understand and make meaning.

GUIDE (10 minutes)

Make sure kids have access to their own Think Sheets.

Say: I'm going to continue to read aloud. Then we'll look at the image(s) on the page(s) together.

Read the text aloud on page(s)

Say: Okay, the text tells us and the image(s) help us view more about Let's take a closer look at those image(s).

Look at and talk through the image(s). Read any captions and check to see if anyone has any questions about what they are viewing.

Say: Now turn and talk about the text and the image(s) with your partner and write your thoughts on your Think Sheets.

COLLABORATE (25 Minutes)

Say: Now it's time for you to read with a partner. Go through the rest of the article together, using the images and text to make meaning. As you are viewing and reading, stop to write down your thoughts about the text and the images on your Think Sheets. And don't forget to write how they help you understand.

Partners read the rest of the article together, stopping to write their thoughts on the Think Sheets. Confer with partners to answer any questions.

SHARE THE LEARNING (10 minutes)

Say: Let's get together and talk about what we learned. I learned that the text and images work together to help us make meaning as we read. Who else would like to share something they learned? Look at your Think Sheets to find examples you would like to share.

Allow time for kids to share their learning.

Say: We learned so much today about using the text and different kinds of images, such as a map and photos, to help us understand and make meaning as we read. What a great job you all did!

WAITING TO BE DISCOVERED

SCIENCE

Standards Supported

- **NGSS Crosscutting Concepts: Systems and System Models:** A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-2)
- **NGSS Connections to Nature of Science: Science Addresses Questions About the Natural and Material World:** Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)

What You Will Need

- Interactive Digital Magazine
- Content Assessment (English and Spanish) (pages 10–11)
- Article Test (English and Spanish) (pages 18–19)

SCIENCE BACKGROUND

National Geographic Explorer Analyn Cabras is a coleopterist, or scientist who studies and collects beetles. She searches for the insects high up in the rainforests of the Philippines' Mindanao Island.

Identifying beetles isn't always easy. Many species look a lot alike. Cabras suspected there was a reason for that. Some beetles are poisonous or taste bad. Their colors, patterns, sounds, or smells warn predators to stay away. Cabras thought the beetles were mimicking, or copying, each others' traits to stay safe.

To test her hypothesis, she made clay models that looked like a poisonous beetle. Predators avoided the models in places where the beetles were common and attacked them where they weren't. Her test provided new insight into how beetle behaviors and anatomy have evolved to help them survive.

ENGAGE

Encourage students to review the article and turn and talk with a partner to discuss what they see. Invite students to ask questions or share what they know about beetles.

EXPLORE

Display the **"Waiting to Be Discovered"** article with the interactive digital magazine. As a class, brainstorm ideas about how and why Analyn Cabras might be finding more than she bargained for in her search for beetles in the Philippines.

EXPLAIN

After reading, have students examine the definitions in the **"Know Your Scientist"** sidebar. Encourage them to explain how Analyn Cabras incorporates each role into her work studying beetles. In small groups, have students discuss what aposematism is and how it has had a big impact on her work. **Ask:** *What hypothesis did Cabras develop after nearly misidentifying beetle species in the field?* (Beetle species have evolved to resemble each other.) *Why?* (Some beetles are dangerous, foul-tasting, or poisonous. Their colors and patterns warn predators to stay away.) Encourage students to discuss the different types of mimicry. As a class, discuss how Cabras made and used fake beetles to prove her hypothesis. Have students brainstorm ideas about how this discovery impacts other scientists' studies of beetles.

ELABORATE

Remind students that Cabras doesn't just take photos of beetles when she is in the field. She also takes photos of their food plant and habitat. Have students turn and talk ask they discuss why she does this and how the additional information helps other scientists who study beetles and their habitats.

EVALUATE

Have students complete the **Content Assessment** for this lesson. Encourage them to share and compare the results in small groups.



Click here for the Kahoot! quiz:
<https://play.kahoot.it/#/k/e2511a55-08ca-4d12-980e-b43b8af96c01>

Name _____ Date _____

CONTENT ASSESSMENT: WAITING TO BE DISCOVERED

Describe how Analyn Cabras observes and records information about beetles in the field. Summarize what she has discovered.

Observe	Record	Discover

How is her research impacting her field of study?

Nombre _____

Fecha _____

EVALUACIÓN DE CONTENIDO: ESPERANDO A SER DESCUBIERTOS

Describe cómo Analyn Cabras observa a los escarabajos y anota información sobre ellos.
Resume lo que ha descubierto.

Observa	Anota	Descubre

¿Qué impacto ha tenido su investigación en su área de estudio?

SEEKING SOLUTIONS

SCIENCE

Standards Supported

- **NGSS Connections to Science, Engineering and Technology, and Applications of Science: Influence of Science, Engineering and Technology on Society and the Natural World:**

Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

- **NGSS ESS3.C: Human Impacts on Earth Systems:** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

What You Will Need

- Interactive Digital Magazine
- Content Assessment (English and Spanish) (pages 13–14)
- Article Test (English and Spanish) (pages 20–21)

SCIENCE BACKGROUND

Agriculture provides the food we eat, but it is also a major source of water pollution. Fertilizer and animal manure from farms contain high amounts of nitrogen and phosphorus. When these nutrients seep into lakes and oceans, they create dead zones where little can survive.

National Geographic Explorer Marissa Cuevas Flores, has found a way to stem this pollution. She developed an on-farm system that upcycles wastewater so it can be reused. Microalgae in the system feed on the waste. Not only does this clean the water, but when the microalgae photosynthesize it produces a protein that can be processed into food for fish.



Click here for the Kahoot! quiz:
<https://play.kahoot.it/#/k/817d154c-32b1-4041-8211-2f8e473a19e8>

ENGAGE

Encourage students to review the article and turn and talk with a partner to discuss what they see. Invite students to ask questions or share what they know about water pollution.

EXPLORE

Display the "**Seeking Solutions**" article with the interactive digital magazine. As a class, compose a list of ways water can become polluted. Invite students to describe instances of water pollution they have seen.

EXPLAIN

After reading, invite students to share what they learned about wastewater and agriculture. **Ask:** *What is a dead zone?* (a low oxygen zone in a river, lake, or ocean where nothing can live) *How does wastewater from farms cause dead zones to appear?* (Farms use fertilizer. Large amounts of nitrogen and phosphorus in the fertilizer are found in agricultural wastewater. When this wastewater enters a river, lake, or ocean, microalgae in the water absorb excess nitrogen and phosphorus and quickly grow into an algae bloom. When the algae die, the bacteria that decompose the microalgae absorb a lot of oxygen from the water, causing a dead zone.) In small groups, encourage students to discuss how Marissa Cuevas Flores decided to tackle the problem. Challenge them to explain how she upcycled the wastewater in a way that both solved the environmental problem and supplied a cheaper source of food for fish farmers.

ELABORATE

After reading, remind students there are two kinds of environmental scientists. In small groups, have students compare and contrast the two kinds of scientists and discuss how they can work together to find new ways to protect Earth's resources and environments.

EVALUATE

Have students complete the **Content Assessment** for this lesson. Encourage them to share and compare the results in small groups.

CONTENT ASSESSMENT: SEEKING SOLUTIONS

Describe the problem and solution identified in the article.

Problem	Solution

How does the solution both protect the environment and help farmers meet their needs?

Describe an environmental problem you see. Tell how you could solve it.

Problem	Solution

How could your solution help the environment and society at the same time?

EVALUACIÓN DE CONTENIDO: EN BUSCA DE SOLUCIONES

Describe el problema y la solución mencionados en el artículo.

Problema	Solución

¿Cómo la solución propuesta protege el medio ambiente y satisface las necesidades de los acuicultores?

Describe un problema medioambiental que hayas visto. Luego describe cómo lo resolverías.

Problema	Solución

¿Por qué crees que tu solución ayuda al medio ambiente y a la sociedad?

PROTECTOR OF THE AMAZON

SOCIAL STUDIES

Standards Supported

• C3: Human-Environment Interaction:

Place, Regions, and Culture: Describe how environmental and cultural characteristics influence population distribution in specific places or regions. (D2.Geo.6-3-5)

What You Will Need

- Interactive Digital Magazine
- Content Assessment (English and Spanish) (pages 16–17)
- Article Test (English and Spanish) (pages 22–23)

SOCIAL STUDIES BACKGROUND

People of the Waorani nation, an indigenous group of about 5,000 people, have lived in the rainforests of Ecuador for generations. In 2019, led by their young leader Nemonte Nenquimo, the Waorani sued the government of Ecuador in an effort to protect their way of life.

The government wanted to auction off sections of the rainforest, including parts of their territory, to oil companies for drilling. In 2012, government representatives had held short, rushed meetings to inform the Waorani about their intentions. However, many Waorani were unable to attend, the information wasn't presented in a way they could understand, and only positive aspects of the drilling were mentioned.

In a landmark decision, the judges ruled in the Waorani's favor. The verdict protected half a million acres of their rainforest territory. It also recognized that all indigenous people have rights over their territories that must be respected.

ENGAGE

Encourage students to review the article and turn and talk with a partner to discuss what they see. Invite students to ask questions or share what they know about the Amazon rainforest.

EXPLORE

Display the "**Protector of the Amazon**" article with the interactive digital magazine. As a class, read aloud the article's subheads. Then have students brainstorm ideas about why Nemonte Nenquimo needed to protect the Amazon and how she did it .

EXPLAIN

After reading, remind students that the Waorani nation is a group of indigenous people who live in the Amazon rainforest. **Ask:** *Why did the Waorani nation sue the government of Ecuador?* (The government wanted to auction off their ancestral land to oil companies, who would drill there.) *Why were the Waorani so against this?* (They are hunter-gatherers whose lives and culture are entwined with the forest.) In small groups, have students compile a list of ways the Waorani nation depend on the Amazon rainforest. **Ask:** *Why was mapping their ancestral lands such an important project?* (The maps showed their deep relationship with the land and how ingrained it is in their culture.) As a class, discuss reasons why the Waorani's victory in court was also a win for other indigenous people living in the Amazon rainforest.

ELABORATE

Remind students that the Waorani nation went to court to protect its way of life. In small groups, have students conduct research to learn about another indigenous group who has had its culture threatened or destroyed by outsiders. Invite students share what they learn about the group, its culture, and its struggle with the class.

EVALUATE

Have students complete the **Content Assessment** for this lesson. Encourage them to share and compare the results in small groups.



Click here for the Kahoot! quiz:
<https://play.kahoot.it/#/k/d1a86f21-0037-4fce-b136-ae23c18f7245>

CONTENT ASSESSMENT: PROTECTOR OF THE AMAZON

Answer each question about the article.

Who are the Waorani?	
What are three ways their lives are entwined with the rainforest?	
What did the government of Ecuador want to do with their land?	
How did the Waorani nation fight back?	
How did the judge rule? Why?	
Why is the ruling important to other indigenous Amazonian people?	

Do you agree with the judge's ruling in this case? Why or why not?

EVALUACIÓN DE CONTENIDO: PROTECTORA DE LA AMAZONIA

Responde las preguntas sobre el artículo.

¿Quiénes son los huaorani?	
¿De qué tres formas están vinculadas sus vidas a la selva lluviosa?	
¿Qué quería hacer el Gobierno de Ecuador con las tierras de los huaorani?	
¿Cómo se defendió la nación huaorani?	
¿Cuál fue el veredicto del juez? ¿Por qué?	
¿Por qué es importante este veredicto para otros pueblos indígenas de la Amazonia?	

¿Estás de acuerdo con el veredicto del juez? ¿Por qué sí? ¿Por qué no?

ARTICLE TEST: WAITING TO BE DISCOVERED

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

1. In which role does Analyn Cabras study and collect beetles?

- Ⓐ ecologist
- Ⓑ taxonomist
- Ⓒ coleopterist

2. Where does she study beetles?

- Ⓐ Panama
- Ⓑ Philippines
- Ⓒ Pakistan

3. What does aposematism do?

- Ⓐ help predators find an easy meal
- Ⓑ warn predators to stay away
- Ⓒ make it easy for predators to catch prey

4. Why did Cabras make fake beetles from modeling clay?

- Ⓐ to test a theory
- Ⓑ to train beetles
- Ⓒ to attract new species

5. How are Müllerian mimicry and Batesian mimicry alike and different?

PRUEBA DEL ARTÍCULO: ESPERANDO A SER DESCUBIERTOS

Lee cada pregunta. Llena el círculo de cada opción correcta y responde a la última pregunta en los espacios en blanco.

1. ¿A qué área de conocimiento se aplica Analyn Cabras cuando estudia y colecciona escarabajos?

- Ⓐ ecología
- Ⓑ taxonomía
- Ⓒ coleopterología

2. ¿Dónde estudia escarabajos?

- Ⓐ Panamá
- Ⓑ Filipinas
- Ⓒ Pakistán

3. ¿En qué consiste el aposematismo?

- Ⓐ ayuda a los predadores a encontrar comida
- Ⓑ advierte a los predadores de que no se acerquen
- Ⓒ facilita a los predadores atrapar a sus presas

4. ¿Para qué hace Cabras modelos de arcilla de escarabajos?

- Ⓐ para demostrar una teoría
- Ⓑ para adiestrar escarabajos
- Ⓒ para atraer a nuevas especies

5. ¿En qué se parecen y en qué se diferencian el mimetismo mülleriano y el batesiano?

ARTICLE TEST: SEEKING SOLUTIONS

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

1. **About how much of Earth's freshwater goes to agriculture?**
 - Ⓐ 20 percent
 - Ⓑ 50 percent
 - Ⓒ 70 percent

2. **When does the microalgae in an algae bloom become a problem?**
 - Ⓐ when it enters a river, lake, or ocean
 - Ⓑ when it grows quickly
 - Ⓒ when it dies and decomposes

3. **What is there not enough of in a dead zone?**
 - Ⓐ oxygen
 - Ⓑ nitrogen
 - Ⓒ phosphorus

4. **What does upcycling do to wastewater?**
 - Ⓐ fill it with algae
 - Ⓑ make it reusable
 - Ⓒ remove the bacteria

5. **What two environmental problems did Marissa Cuevas Flores solve? How?**

PRUEBA DEL ARTÍCULO: EN BUSCA DE SOLUCIONES

Lee cada pregunta. Llena el círculo de cada opción correcta y responde a la última pregunta en los espacios en blanco.

- 1. ¿Cuánta agua dulce de la Tierra se destina, aproximadamente, a la agricultura y la ganadería?**
 - Ⓐ un 20%
 - Ⓑ un 50%
 - Ⓒ un 70%

- 2. En una floración de algas, ¿en qué momento son dañinas las microalgas?**
 - Ⓐ cuando entran en un río, lago u océano
 - Ⓑ cuando se reproducen rápidamente
 - Ⓒ cuando mueren y se descomponen

- 3. ¿De qué sustancia no hay suficiente cantidad en una zona muerta?**
 - Ⓐ oxígeno
 - Ⓑ nitrógeno
 - Ⓒ fósforo

- 4. ¿Para qué se suprarreciclan las aguas residuales?**
 - Ⓐ para cultivar algas
 - Ⓑ para reutilizar el agua
 - Ⓒ para eliminar bacterias

5. ¿Qué dos problemas medioambientales resolvió Marissa Cuevas Flores?

ARTICLE TEST: PROTECTOR OF THE AMAZON

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

- 1. How long have the Waorani lived in the rainforests of Ecuador?**
 - Ⓐ for 10 years
 - Ⓑ for 100 years
 - Ⓒ for centuries
- 2. Who did the government want to sell their land to?**
 - Ⓐ oil companies
 - Ⓑ loggers
 - Ⓒ environmentalists
- 3. How did the Waorani's prove they have a deep relationship to their land?**
 - Ⓐ They traveled across the land by foot or canoe.
 - Ⓑ They made a map of their ancestral lands.
 - Ⓒ They selected Nemonte Nenquimo as their leader.
- 4. What does their victory in court mean?**
 - Ⓐ Their land will be protected.
 - Ⓑ They gave free consent to the auctioning of their lands.
 - Ⓒ They can build roads through the rainforest.

5. What are the three most interesting things you learned about the Waorani?

PRUEBA DEL ARTÍCULO: PROTECTORA DE LA AMAZONIA

Lee cada pregunta. Llena el círculo de cada opción correcta y responde a la última pregunta en los espacios en blanco.

- ¿Cuánto tiempo llevan viviendo los huaorani en la selva lluviosa de Ecuador?**
 - 10 años
 - 100 años
 - muchos siglos

 - ¿A quién quería vender el Gobierno las tierras de los huaorani?**
 - a compañías petroleras
 - a compañías madereras
 - a compañías ecologistas

 - ¿Cómo demostraron los huaorani una profunda relación con su tierra?**
 - Recorrieron su tierra a pie y en canoa.
 - Hicieron un mapa de sus tierras ancestrales.
 - Eligieron a Nemonte Nenquimo como su líder.

 - ¿Qué significó su victoria en el tribunal?**
 - Sus tierras serían protegidas.
 - Dieron su libre consentimiento para subastar sus tierras.
 - Pudieron construir carreteras en la selva.
- 5. Menciona las tres cosas más interesantes que hayas aprendido de los huaorani.**

PATHFINDER AND ADVENTURER

ANSWER KEY

WAITING TO BE DISCOVERED

Content: pages 10–11

Observe: She carefully walks through the rainforest, sneaking up on beetles so she doesn't startle them and make them run away. She uses a magnifying glass to get a closer look in the field and a microscope to study beetles up close in the lab.

Record: In the field, she takes photographs of the entire scene, including the beetle, its food plant, and its habitat. In the lab, she takes photographs as she dissects the beetles and learns about their anatomy. She records information about their size, color, patterns, and behaviors.

Discover: Some beetles can be dangerous, foul-tasting, or poisonous to predators, so species—harmful and not—mimic each other's colors and patterns to stay safe. Using fake beetles made out of modeling clay, she discovered that predators recognize warning colors and learn to stay away.

Question: Most of her colleagues only see beetle specimens in museums. Cabras's photos show live beetles, in their habitat, on their host plant. They show how physical and behavioral adaptations allow beetle species to mimic each other so they can survive.

Article Test: page 18–19

1. C; 2. B; 3. B; 4. A; 5. Both are forms of mimicry in which species copy traits of other species to protect themselves from predators. But in Müllerian mimicry, two equally harmful things have evolved to resemble each other. In Batesian mimicry, a harmless species protects itself by mimicking a species that is harmful to predators.

SEEKING SOLUTIONS

Content: page 13–14

Part 1: Problem: Water run-off from farms carries nitrogen and phosphorus into rivers, lakes, and oceans, creating dead zones in the water.

Solution: Marissa Cuevas Flores, an environmental scientist, found a way to upcycle the wastewater and make it reusable.

Question: Her process helps stop downstream pollution that will destroy ecosystems. It also creates food for fish, which saves fish farmers a lot of money.

Part 2: Answers will vary.

Article Test: page 20–21

1. C; 2. C; 3. A; 4. B; 5. Agricultural waste and creating cheaper fish food for fish farmers. She invented a process that processes wastewater with a special strain of microalgae. This cleans the water and produces a protein that is made into fish food.

PROTECTOR OF THE AMAZON

Content: page 16–17

1. The Waorani are a group of about 5,000 indigenous people who live on 2.5 million acres of land in the Amazon rainforest.
2. Possible answers: Weapons for hunting are made from wood; traditional huts are made of palm leaves and tree trunks; and plant fibers are woven into baskets.
3. The government wanted to auction off their land to oil companies for drilling.
4. They sued to government to stop the auction.
5. The judge ruled in their favor because they proved that the government had not tried to understand the Waorani and their culture.
6. Other indigenous Amazonian people can now use this case as an example for lawsuits of their own.
7. Answers will vary.

Article Test: page 22–23

1. C; 2. A; 3. B; 4. A; 5. Answers will vary.

PATHFINDER Y ADVENTURER

CLAVES DE RESPUESTA

ESPERANDO A SER DESCUBIERTOS

Contenido: páginas 10 y 11

Observa: Camina cuidadosamente por la selva lluviosa, se acerca sigilosamente a los escarabajos para no asustarlos y evitar que huyan. Utiliza una lupa en sus estudios de campo y un microscopio en el laboratorio para ver de cerca a los escarabajos.

Anota: En sus estudios de campo, Cabras fotografía la escena completa: el escarabajo, su planta nutricia y su hábitat. En el laboratorio hace fotografías, disecciona a los escarabajos y examina su anatomía. Recopila información sobre su tamaño, color, diseño y comportamiento.

Descubre: Algunos escarabajos pueden ser peligrosos, de sabor desagradable o venenosos para sus predadores, por lo que ciertas especies —dañinas o no— imitan los colores y diseños de otras para mantenerse a salvo. Usando escarabajos de arcilla, Cabras descubrió que los predadores reconocen los colores de advertencia y aprenden a mantenerse alejados.

Pregunta: La mayoría de los colegas de Cabras solo pueden ver especímenes de escarabajos en los museos. Las fotografías de Cabras mostraban escarabajos vivos, en sus hábitats, sobre su planta nutricia. Muestran también cómo las adaptaciones físicas y de comportamiento permiten a los escarabajos imitarse entre sí para sobrevivir.

Prueba del artículo: páginas 18 y 19

1. C; 2. B; 3. B; 4. A; 5. Ambas son formas de mimetismo en que unas especies copian rasgos de otras para protegerse de los predadores. Pero en el mimetismo mülleriano, dos especies igualmente dañinas han evolucionado hasta parecerse entre sí. Y en el mimetismo batesiano, una especie inofensiva se protege a sí misma imitando a otra que sí es dañina para los predadores.

EN BUSCA DE SOLUCIONES

Contenido: páginas 13 y 14

Parte 1: Problema: Las escorrentías de las granjas llevan nitrógeno y fósforo a ríos, lagos y océanos, creando zonas muertas en el agua.

Solución: La científica medioambiental Marissa Cuevas Flores encontró una manera de suprarreciclar las aguas residuales y reutilizarlas.

Pregunta: Su método sirve para detener la contaminación aguas abajo, que destruiría los ecosistemas. Además, produce comida para los peces, lo que permite ahorrar mucho dinero a los acuicultores.

Parte 2: Las respuestas variarán.

Prueba del artículo: páginas 20 y 21

1. C; 2. C; 3. A; 4. B; 5. Los residuos agrícolas y la producción de comida para peces más barata para los acuicultores. Inventó un tratamiento de aguas residuales con una cepa especial de microalgas que limpia el agua y produce una proteína que sirve de comida para los peces.

PROTECTORA DE LA AMAZONIA

Contenido: páginas 16 y 17

1. Los huaorani son un grupo de casi 5,000 indígenas que ocupan 2.5 millones de acres (1 millón de hectáreas) de la selva lluviosa amazónica.
2. Respuestas posibles: las armas de caza están hechas de madera; las chozas tradicionales están hechas de hojas de palma y troncos de árboles; tejen canastas con fibras vegetales.
3. El Gobierno quería subastar las tierras de los huaorani a compañías petroleras.
4. Los huaorani demandaron al Gobierno para detener la subasta de sus tierras a compañías petroleras.
5. El juez dictaminó a favor de los huaorani porque demostraron que el Gobierno no se molestó en comprender su cultura.
6. Ahora, otros pueblos indígenas de la Amazonia pueden utilizar el caso de los huaorani como ejemplo para hacer sus propias demandas.
7. Las respuestas variarán.

Prueba del artículo: páginas 22 y 23

1. C; 2. A; 3. B; 4. A; 5. Las respuestas variarán.