SESSION

Mapping the Unknown

FOCUS QUESTION

How do people create maps of new places?

NOTICE AND WONDER

Look at the three texts you will read in this lesson. What do you notice? What do you wonder? Discuss your ideas with a partner.

CREATE A WORD WEB

What are some words that are related to maps? Add words to the word web below. Then, discuss your choices with a partner.





©Curriculum Associates, LLC Copying is not permitted.

LESSON 10 | Mapping the Unknown 179

Downloaded by A. Gaines at OAK GROVE CENTRAL ELEM SCHOOL. This resource expires on 6/30/2024.

Marie Maps the Sea

- 1 Young Marie Tharp thought her dad had the best job ever. During the 1920s, he traveled around the Midwest, making maps. His maps were special—they revealed details about the soil that helped farmers know what to plant. He taught Marie to draw maps too.
- 2 In college, Marie took art, music, and math classes. She also took geology, the study of Earth's surface and how it has changed over time.
- One day, Marie's geology teacher pointed to a big map of Earth. Almost three-quarters of it was plain blue ocean. What was under all that water? Was the sea floor flat, like a beach? Or were there mountains and valleys, as on land? No one knew. Marie Tharp was intrigued.
- 4 After college, in 1948, Tharp got a job in New York with a group of geologists who were studying the oceans. Women weren't allowed on research ships back then, so her job was to stay in the office and keep track of data that ships sent back. One number she often recorded was how deep the water was in different places.
- 5 Tharp noticed there were huge books in the office that listed how deep the ocean was along routes where ships had sailed in the past. The numbers gave her an idea. Could she use them to make a map of the whole sea floor?
- Tharp recorded the numbers as dots on a graph. When she connected the dots, each line showed the changing depth of the water. She put the graphs together, like slices of bread, and created a 3-D view of the ocean floor.

intrigued = curious about something

SESSION

READ

Stop & Discuss

What was Tharp curious about in her college geology class?

Underline details in the text.

180

Tharp wanted to know more information about _

UNIT 3 | Exploring



- 7 Another geologist, Bruce Heezen, collected more numbers to add to the map. Ocean scientists from other countries shared their measurements. Finally, in 1957, the first map of the ocean floor was complete.
- 8 This new map showed that the bottom of the ocean was full of mountains and valleys. A long mountain range went down the middle of the Atlantic Ocean. Running through the mountain range was another surprise—a crack, or rift, right down the center. That rift helped solve an old puzzle.
- 9 In 1912, a geologist named Alfred Wegener had suggested that the continents move. Most people laughed at or ignored his idea. But Tharp's map proved that Wegener was right. The Earth's crust is made of huge, rocky, slowmoving plates. Where the plates pull apart, magma bubbles up and hardens, forming new mountains. In other places, the plates move toward each other and crunch together.
- 10 Today, satellites can measure the continents moving—very slowly, a few centimeters a year. And Marie Tharp's map showed the way.

Marie Tharp (*left*) looks at the map of the sea floor that she created (*right*). The circled area shows a long rift through the Atlantic Ocean.

magma = liquid rock deep within Earth

satellites = objects in space that collect and send information

Stop & Discuss

What new information did Tharp's map provide?

Discuss details from the text with a partner.



Make Inferences

An **inference** is an idea about the text that makes sense based on details in the text and what you already know.

What the Text Says	+ What I Know	=	Inference
"What was under all that water? Was the sea floor flat, like a beach? Or were there mountains and valleys, as on land? No one knew. Marie Tharp was intrigued." (paragraph 3)	Asking questions is what you do when you are trying to learn something.		

Reread/Think

Reread "Marie Maps the Sea." Complete the chart to make inferences.

What the Text Says	+ What I Know	=	Inference
"Young Marie Tharp thought her dad had the best job ever."			
"He taught Marie to draw maps too." (paragraph 1)			
"Women weren't allowed on research ships back then." (paragraph 4)			

Talk Share your chart with a partner. Discuss your inferences and the background knowledge you used to support them. Take turns sharing your thinking and then make changes to your chart if needed. I had a similar/different I used what I know about idea. I thought ____. _to infer that ___. Write 55566668757 Reread paragraphs 1 and 2 of the text. How did Marie Tharp's WRITING CHECKLIST father influence her career? Use text evidence to support ☐ I made an inference your response. in response to the question. ☐ I included text evidence. □ I used complete sentences. ☐ I used correct spelling, punctuation, and capitalization.

LESSON 10



SESSION

Stephen Bishop as a young man.

domes = rounded shapes

Stop & Discuss

Why did Bishop first enter and then keep returning to Mammoth Cave?

Underline details in paragraphs 2 and 3 that tell why Bishop did both things.



- One evening in the mid-1800s, enslaved 17-year-old Stephen Bishop entered the yawning entrance to Kentucky's Mammoth Cave to begin his night's work. He lit his kerosene lantern, raised it high, squeezed through a narrow passageway, and disappeared into darkness.
- 2 Bishop first entered Mammoth Cave in 1838 as an enslaved Black teenager. Frank Gorin, Bishop's enslaver, had purchased the cave to make it a tourist attraction. Gorin made Bishop work as a cave guide.
- 3 Bishop knew little about caves, but this changed as he began to explore them. It wasn't long before he knew the eight miles of the original cave routes. Soon, he began giving tours. Unlike white tour guides, however, Bishop wasn't paid for his work. Enslaved people were forced to do hard jobs every day without pay.
- 4 With only a lantern and a rope, Bishop spent many hours in Mammoth Cave. During his tours, he often spotted trails off the main routes. Later, he would explore beyond the known trails. He climbed up slick walls and high **domes** and down into deep pits. He saw rocks that looked like icicles growing down from the cave ceilings and up from the cave floor. He also discovered cave rooms filled with sparkling crystals shaped like roses.

184 UNIT 3 | Exploring



- 5 The Bottomless Pit, however, was one part of the cave that Bishop had not explored beyond. The pit was so wide and deep that no one had ever dared to cross it—until one day a visitor challenged Bishop to cross over the pit with him.
- 6 After placing a long, shaky ladder across the pit, Bishop carried a lantern between his teeth as he and the man made the journey to the other side. They entered a part of the cave that no one had ever seen.
- 7 Bishop returned again and again to this part of the cave. He discovered new creatures hiding in the walls and swimming in underground rivers. Bishop was becoming known for his explorations and findings. It was because of him that scientists traveled from all over the world to see animals they had never known existed. There, they saw eyeless cave fish and different kinds of bats.
- Bishop discovered many miles of new passageways, domes, pits, and caverns. He gave his discoveries names like Snowball Room, Haunted Chamber, Giant's Coffin, and Gothic Avenue. These interesting names helped him remember details about each place.

caverns = large caves

Gothic = a style of building known for extremely high walls and pointed ceilings

Stop & Discuss

What happened as a result of Bishop crossing the Bottomless Pit?

Discuss with a partner what happened because Bishop crossed the pit.

When Bishop crossed the pit, ___.



update = add new information to

accomplishments = great actions

Stop & Discuss

Why was it unusual for Bishop to get credit for mapping the cave?

Discuss with a partner what was unusual about Bishop receiving credit.

- 9 After only a year of owning Mammoth Cave, Gorin sold the cave—and Bishop—to John Croghan. Because of Bishop's knowledge and the discoveries he had made, in 1842 Croghan told to him to update the map of the cave. He spent two weeks sketching the map without using any notes or drawings. Someone else wrote in the names of Bishop's findings. It was against the law for enslaved people to read and write.
- 10 Copies of the map were made available at the cave, and the map was later published in a book. Bishop was given full credit for his accomplishments, which was unusual for an enslaved person to receive.
- 11 Stephen Bishop is known as Mammoth's greatest cave explorer of all time. While this is amazing, it is still important to remember that, as an enslaved person, Bishop had no choice but to work in that cave. Imagine the exciting things Bishop might have done if he was free to follow his own dreams.







Make Inferences

When explaining or writing about an inference, use text details to support the inference. This provides evidence to back up your ideas.

Inference	Supporting Detail
Mammoth Cave includes long, narrow tunnels.	(paragraph 1) "squeezed through a narrow passageway, and disappeared into darkness."
	(paragraph 3) "It wasn't long before he knew the eight miles of the original cave routes."

Reread/Think

Reread "Braving the Cave." Complete the chart by supporting the inferences with details from the text.

Inference	Supporting Detail
Bishop wanted to discover new things.	(paragraphs 4 and 7)
Bishop had a detailed memory of the cave.	(paragraph 9)

SESSION PRACTICE Talk Share your chart with a partner. Compare your responses and explain how the text details support each inference. Then discuss your own inferences about Bishop. I think Bishop ___because the text The text says ___. This shows says ___. that Bishop ___. Write 5556 Using inferences in the chart and what you discussed with your WRITING CHECKLIST partner, what can you infer about Bishop? Support your response ☐ I answered the with text details. question. ☐ I included details from the text. □ I used complete sentences. ☐ I used correct spelling, punctuation, and capitalization.

LESSON 10



SESSION

READ

- 1 The rainforests of northern Guatemala hide a secret: ruins of ancient cities stretch across the forest floor. Pyramids, palaces, and roads built more than a thousand years ago tell the story of a large empire that once spread throughout Central America and Mexico. Some of the largest buildings rise above the trees. But thick forest has grown over other parts, covering up much of the past.
- 2 Today, about six million people trace their roots back to the Maya, the people who built these structures. Yet no one knows for sure why their empire didn't last. Was it disease? War? Archaeologists—scientists who study ancient buildings, tools, and other objects to understand past human life—have been trying for years to figure out what happened. The remains of these cities may give clues. But searching for ruins in a rainforest is slow, difficult work. Luckily, a special technology now allows scientists to take a closer look into areas with heavy vegetation, while also avoiding poisonous snakes, swarms of bees, and hot, moist air.

ruins = what remains after something has fallen apart

empire = kingdom

Some Mayan ruins are tall enough to rise above the rainforests of Central America and Mexico.



LiDAR technology sees through the thick rainforest (*above*) to create a map of the structures that stand within it (*below*).

preserves = takes action to
protect something

scale = size

landscape = everything that makes up an area of land, including buildings, hills, and forests

- 3 The technology is called LiDAR. The letters stand for "Light Detection And Ranging." A helicopter flies over the forest while LiDAR equipment attached to the bottom of the helicopter shoots quick, powerful rays of light at the ground. These laser beams are narrow enough to pass through openings between branches and leaves. They hit the ground and then bounce back. The LiDAR equipment measures the distance the beams travel. When many measurements are put together, they show the shape of the ground and any buildings on it. The result is a 3-D map of the forest floor.
- 4 In 2015, the PACUNAM Foundation, a Guatemalan organization that preserves Mayan culture, teamed up with a group of archaeologists. They began using LiDAR to map the forest floor. By 2018, they had mapped more than 61,000 structures. "The scale of [the ruins] really blew our minds," said archaeologist Thomas Garrison.
- 5 Even when the forest isn't very thick, LiDAR maps make important details easier to see. In 2019, archaeologist Takeshi Inomata was studying a LiDAR map of part of Mexico. It showed 27 large shapes. From the ground, the shapes had seemed like part of the natural landscape. But the LiDAR map showed that they were flat, rectangular structures. They must have been built by humans. Researchers think the early Maya probably used these low platforms for special events and celebrations.
- 6 LiDAR has made mapping ancient ruins easier and faster than ever before. Each newly mapped site helps researchers learn more about the mystery of the Maya.

190 UNIT 3 Exploring



PRACTICE

Respond to Text

Reread/Think

Reread "The Rainforest's Hidden Cities." Choose the best response to each question.

1. PART A

ESSION

According to paragraph 2, why is searching for ruins in a rainforest "slow, difficult work"?

- **A.** It takes years to collect the equipment needed for a search.
- **B.** The region is difficult to explore.
- **C.** Archaeologists must make a map of the area.
- **D.** The Maya buried structures deep inside the thick forest.

PART B

Which key detail from the text **best** supports your answer in Part A?

- A. "... the Maya, the people who built these structures."
- B. "Yet no one knows for sure why their empire didn't last."
- C. "The remains of these cities may give clues."
- D. "... poisonous snakes, swarms of bees, and hot, moist air."
- 2. Which phrase helps you know what *laser beams* means in paragraph 3?
 - A. "attached to the bottom of the helicopter"
 - B. "quick, powerful rays of light"
 - **C.** "narrow enough to pass through openings"
 - D. "the shape of the ground"

Reread/Think

ESSION

- **3.** Why did the PACUNAM Foundation and a group of archaeologists work together to map the forest floor?
 - **A.** Locating Mayan ruins benefited both groups, helping one to preserve the ruins and the other to study it.
 - **B.** Both groups wanted to explore the natural landscape of the rainforest.
 - **C.** One team mapped half of the structures they found, while the other team mapped the other half.
 - **D.** Neither group wanted special events to celebrate the work they did.
- **4.** Which statement describes an idea from paragraph 5?
 - **A.** An archaeologist studied a LiDAR map to prove that 27 shapes in the forest were natural parts of the landscape.
 - **B.** The 27 large structures discovered on a LiDAR map proved that the forest was easy to travel through.
 - **C.** A LiDAR map showed that 27 structures on the ground were probably platforms for Mayan events.
 - **D.** The forest was not very thick, so a LiDAR map was easily able to show 27 large shapes.

Write

Why were the LiDAR discoveries surprising? Use two details from the text in your response.

WRITING CHECKLIST

I answered the question.

6666

- ☐ I provided an introduction and a concluding sentence.
- I included details from the text.
- I used complete sentences.





Respond to the Focus Question

How do people create maps of new places?

Reread/Think

Choose one text from this lesson to reread.

TEXT: _____

What did you learn from your text about how people create maps?

Talk

In a small group, first share your responses from Reread/Think.

WHAT WE LEARNED

Next, as a group, discuss how you would respond to this question:

How do people create maps of new places?



Write

Think about how people create maps for new places. What would you do to create a map for your neighborhood or your school?