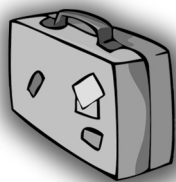




The Mystery at
**Yellowstone
National
Park**



Teacher's Guide
by
Carole Marsh

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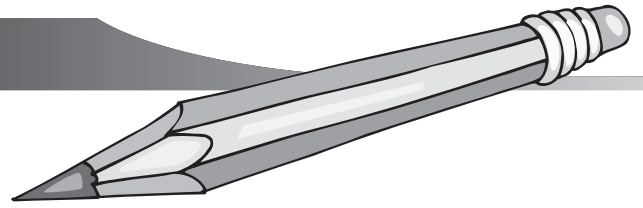
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Dear Teacher,

In 1979, I began writing children’s mysteries set at historic sites that still existed—primarily so that kids could go and see what they had read about. Frankly, I found no more fun, educational, and stress-free (actually, just plain joyful!) activity to do with my then school-age children than to visit a fascinating historic site!

When the trappers and fur traders in the early 1800s told stories of the boiling waters and rising steam in the land we now know as Yellowstone, no one believed them. Today, these same “unbelievable” thermal features attract thousands of tourists every year to the world’s very first national park!

Not only is Yellowstone National Park a tourist attraction, it is also a science and history lesson all rolled into one breathtaking place! Who could not be mesmerized by the beauty of Old Faithful Geyser erupting into the sky or fascinated by the volcanic activity that bubbles underneath the park? No matter what season, it is a place to be visited at least once!

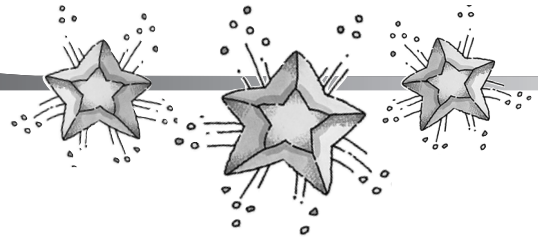


One of the things I like most about writing these kinds of mysteries is helping kids and adults learn together. Reading and going and seeing and doing is what education is all about. And sometimes, “adopting” a subject or place leads to a lifelong interest in an era, a place, or a people.

Enjoy your mudpot-boiling, geyser-spewing Yellowstone adventure!

Carole Marsh

Table of Contents



Page-by-Page Guide	4
Page-by-Page Guide	5
Page-by-Page Guide	6
Page-by-Page Guide	7
Page-by-Page Guide	8
Page-by-Page Guide	9
Page-by-Page Guide	10
Page-by-Page Guide	11
Page-by-Page Guide	12
Discussion Questions	13
Geography: Find It!	14
Mathematics: Calculate It!	15
English: Write It!	16
Vocabulary: Use It!	17
Art: Create It!	18
Science: Cook It!	19
Become a Park Ranger for a Day! Activity	20
Word Search	21
Chapter 1-4 Worksheet	22
Chapter 5-8 Worksheet	23
Chapter 9-11 Worksheet	24
Chapter 12-15 Worksheet	25
Chapter 16-19 Worksheet	26
Chapter 20-23 Worksheet	27
Vocabulary End-of-Unit Quiz	28
Character Matching End-of-Unit Quiz	29
Fill-in-the-Blank End-of-Unit Quiz	30
True or False End-of-Unit Quiz	31
Answer Key	32

Page-by-Page Guide

<i>Page #</i>	<i>Subject</i>	<u>EXPLORE!</u>
11	Geology	A supervolcano is a volcano that is so enormous and its eruption so large that instead of creating mountains and landscapes, it destroys them. No supervolcano has erupted during recorded human history. Discuss two other differences between volcanoes and supervolcanoes.
13	Technology	A video camera can be a great tool to tell a story. Why? Name two careers that rely on video to tell stories.
14	Geography	Cody, Wyoming has a rich cowboy and western heritage. The city was named after William Fredrick Cody, or as he is better known, "Buffalo Bill." The Buffalo Bill Historical Center is a popular attraction for tourists coming to or from the east gate of Yellowstone.
15	Weather	Since Yellowstone receives hundreds of inches of snow each winter, some of the main roads in and around the park are closed to wheeled vehicles for the winter. The roads close on November 1st and some do not reopen until mid-May.
15	Transportation	A snowmobile is a vehicle that travels over the snow. It moves forward because of rotating tracks in the back of the vehicle and is steered by skis in the front.
17	History	After extensive explorations of the land at Yellowstone in the mid 1800s, the idea was born that the land should be saved from settlement and declared a national park. The bill establishing Yellowstone as a national park was signed into law in the spring of 1872 by President Ulysses S. Grant.
18	History	Trappers, hunters, and explorers had been telling tales of the incredible sights of Yellowstone for years and many were not believed. Not until an artist and photographer accompanied an expedition in 1872 and returned with drawings and pictures, did people truly believe that the descriptions of Yellowstone were true.
19	Vocabulary	To commandeer a vehicle is to take it and put it to use.

Page-by-Page Guide

- 21 Plants Algae is a plant, usually located underwater, that doesn't have roots, stems, or leaves. Algae tends to cling to rocks or debris in the water.
- 22 Vocabulary Continuously means without stopping.
- 22 Transportation A snow coach is a passenger van or taxi on skis! It allows the passengers to explore snow-covered roads in the comfort of a heated vehicle.
- 25 Geothermal A hot spring is one type of thermal feature. The magma flowing beneath the earth's surface heats the spring's water to the point of steaming or bubbling.
- 26 Vocabulary To specialize in something means to learn a specific task or job and perform it very well.
- 26 Landmark Gunny and his father are entering Yellowstone through the north entrance. The Roosevelt Arch, built in 1903, is located at the north entrance of Yellowstone. What is the quote on the Roosevelt Arch?
- 27 Heritage Gunny refers to his great-great grandfather James. Adding the prefix "great" to "grandfather" refers to the parents of grandparents, or the next generation. How many generations from Gunny is his great-great grandfather James?
- 27 Vocabulary "Gunny" is a coarse fabric made of jute or hemp. A gunny sack is a bag made of this fabric.
- 29 Animals Wildlife is abundant in Yellowstone. The animals living in Yellowstone today are the same species that lived there before it became a national park. The animals coexist in balance with the remarkable landscape of the park.
- 30 Geothermal The smoke Grant sees rising from the fields is actually steam rising from vents in the ground. The heat from the magma mixes with ground water and steam vapor is emitted into the air.

Page-by-Page Guide

- 30 Fires Grant mistakenly thinks the snow-covered fields are on fire. In fact, there are forest fires in Yellowstone every year. Fires are an important part of the lifecycle of the national park. The lodgepole pines produce a cone whose seeds can be released only when fire melts the resin shutting the seeds in the cone.
- 30 Vocabulary A steam vent (or fumarole) is a small opening in the ground that allows steam and gas to exit from under the surface, sometimes even creating a hissing or roaring sound.
- 31 Landmark Yellowstone Lake is surrounded by 110 miles of shoreline. In some spots it is 390 feet deep. In recent years, researchers have sent small submarines to the bottom of Yellowstone Lake to explore the geography and wildlife underwater.
- 32 Vocabulary A caldera is the basin or depression left from an exploding volcano.
- 32 Geology Magma is the molten material that runs underneath the earth's surface. In Yellowstone, the magma is closer to the earth's surface than anywhere else in the world.
- 37 Vocabulary To decipher something means to determine or interpret the meaning of it. Gunny needs help understanding the clues on his great-great grandfather's treasure map.
- 39 Vocabulary Simultaneous means that two or more things happen at the same time.
- 41 Vocabulary Park ranger Magnus stared at Gunny with a menacing look. Menacing means threatening.
- 43 Safety Visitors to Yellowstone National Park are required to use the boardwalks and trails for their safety. The hot springs and pools are boiling hot and people have died after falling into them.
- 44 Geology The colors in the springs of Yellowstone are caused by bacteria and algae that have specially adapted—and thrive—on the scalding waters of the hot springs and pools.

Page-by-Page Guide

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|----|---------------------|--|
| 44 | Geothermal Features | There are four different types of geothermal features found at Yellowstone: geysers, hot springs, fumaroles, and mudpots. Each feature is distinguishable by the temperature at the site and the amount of water present. |
| 47 | Landmark | Boiling freshly caught fish in Fishing Cone was a popular attraction for thousands of tourists until the practice was banned by health officials due to concern about the safety of the cooked fish. |
| 48 | Literature | The book <i>Death in Yellowstone</i> , by Lee H. Whittlesey is a history of all of the accidental deaths that have occurred in Yellowstone since 1870. The book showcases the dangers of the park's natural features and wildlife to tourists and explorers. |
| 51 | Geothermal Feature | The colors of the mud in paint pots are determined by hot water boiling through different minerals. For example, sulfur causes the mud to turn yellow, arsenic creates orange, and clay minerals lead to pink mud. |
| 52 | Figure of Speech | Christina sees red flags as they start their search for treasure in Yellowstone. What does this mean? |
| 53 | Wildlife | Chipmunks, pika, and squirrels are rodents. Rodents make up almost 50 percent of the wildlife in Yellowstone, or 27 out of the 60 total species of animals in the park. |
| 53 | Landmark | The Continental Divide does not run in a straight line through North America. In fact, the Grand Loop Road that circles Yellowstone crosses the Continental Divide no less than three times. |
| 53 | Trees | The most common tree in Yellowstone is a lodgepole pine. It can grow in wet soil and is able to quickly reproduce after a forest fire. It is called a lodgepole pine because it is stick-straight and the Native Americans used them to support teepees and other dwellings. |
| 57 | Insects | Even in winter, the flies that thrive on the bacteria in the hot water are still active, though they tend to stay close to the heated mats of bacteria floating on the water. |

Page-by-Page Guide

- 58 Technology The rare bacteria found in the heated pools has been used by scientists and medical researchers. A billion-dollar technology industry has been created from the use of Yellowstone geothermal bacteria. What would it be like to be a scientist who collects bacteria from thermal pools?
- 59 Vocabulary To tolerate means to accept or allow. The kids just accepted the bad smell at the Fountain Paint Pots.
- 60 Geothermal Feature The smell of rotten eggs at geysers and mudpots is caused by the presence of hydrogen sulfide.
- 62 Vocabulary Mortified means humiliated or shamed. Why do Mimi and Papa expect Grant and Christina to use caution around the park?
- 63 Architecture Dormer windows are a structural element of a building. The upright window protrudes from a sloped roof.
- 63 Landmark The Old Faithful Inn opened in 1904, 10 years prior to the first tourist visiting Yellowstone by car. The inn barely missed being burned by a forest fire in 1988.
- 64 Construction Over 500 tons of stone were used to build the lobby fireplace in the Old Faithful Inn.
- 66 Vocabulary Melancholy means a gloomy state of mind.
- 66 Careers Robert Reamer was the architect of the Old Faithful Inn as well as approximately 20 other structures in Yellowstone. What does it mean to be an architect?
- 69 Flora Hayden Valley is covered in lush grass for bison to graze but no trees grow there. Why? Hayden Valley used to be covered by Yellowstone Lake. The ground is now so dense with layers of clay, silt, and sand that water drainage and tree rooting are not possible there.
- 70 Wildlife As the transcontinental railroad was built through the West, the great herd of bison was reduced from 30-60 million to just a few thousand. Discuss endangered animals. How did the Yellowstone National Park protect bison?

Page-by-Page Guide

- 70 Vocabulary To be gored by a bison horn means to be pierced by its horns. Approximately five people are injured by bison every year in Yellowstone.
- 70 Prairie Life Pioneers and Native Americans used dried bison dung as fuel for fires. The dried dung contains large amounts of grass from the bison’s diet and burns easily.
- 74 Vocabulary The Native American woman beckoned Grant and Christina to join them. To beckon means to summon or entice.
- 74 Native Americans Shoshone Indians were native to the region around Yellowstone. Several Yellowstone landmarks are named after this tribe of Native Americans.
- 75 Vocabulary Authentic means real or genuine. The Native American woman wanted the pemmican to taste just as it did when the Shoshone Indians made it centuries ago.
- 77 Word Usage A group of bison is called a herd. A group of mule deer is called a pack. A group of fish is called a school. What are other names of groups of animals?
- 79 Vocabulary Treacherous means dangerous or hazardous.
- 82 Science Acids are created by a chemical reaction between the chemical compound itself and water. There is high acidity in the ground at Yellowstone, but only a very few places where the acidity is high enough to destroy solid substances.
- 85 Government Park rangers work for the National Park Service, a government agency responsible for the care and upkeep of U.S. National Parks. Its mission is to “care for special places saved by the American people so that all may experience our heritage.”
- 88 Animals Cutthroat trout are native to Yellowstone. Beginning in 1994, a larger, non-native trout has been found in Yellowstone Lake and is a threat to the cutthroat. How does the introduction of a non-native species into an ecosystem upset the balance of that ecosystem’s food chain?
- 89 Vocabulary A powwow is a Native American word that means a gathering.

Page-by-Page Guide

- 92 Seismology Seismology is the scientific study of earthquakes and their effects. What is the name of the scale seismologists use to rate the strength of earthquakes?
- 94 Responsibility Visitors to national parks show responsibility by leaving the park the same way they found it. That means that they should never take anything naturally occurring in the park and never leave trash behind. Why is it important to leave the park as you found it?
- 95 Vocabulary A switchback path is a path that has hairpin or zigzag turns.
- 96 Science A fossil is the preserved remains of animal, plant, or other substances from the past. If “petrified” means preserved as stone, what is a petrified fossil?
- 97 Animals It is a mistaken notion that bears hibernate in the winter and do not wake up until spring. Bears sleep lightly and will wake up from hibernation when their body temperature drops to a certain point to warm up.
- 99 Geology There are more than 40 square miles of petrified forests in Yellowstone. It is thought that more than 27 layers of forest have been buried by volcanic ash in 50 million years.
- 100 Vocabulary Grant sees the petrified tree—a tree that has been preserved like stone by volcanic ash. Grant is petrified by the bear, meaning he was frozen in fear.
- 102 Geology Travertine, limestone deposits formed by hot springs, was used to build buildings in Italy. The Colosseum in Rome is built mostly of travertine. Are there any other famous buildings made of travertine?
- 102 Mythology Minerva Terrace was named after the Roman goddess of artists. Why do you think this is so? What is Minerva’s Greek name?
- 103 Body
Language Why are Gunny and Christina fearful of Magnus? What signals does he give them without even speaking?

Page-by-Page Guide

- 105 Writing The author writes that the kids are “trapped like rats in a maze!” What figure of speech is this description? Write two other examples describing the feeling of being trapped.
- 108 Landmark Fort Yellowstone is a former military base used in the late 1800s. Today it is the location of the administrative offices of the park.
- 108 Vocabulary A stockade is a military prison.
- 108 Weather What does the description that the “wind and snow whipped around the buildings and trees” say about the weather the kids are experiencing? Discuss how these descriptions paint a picture of the setting.
- 109 Vocabulary Grant gives Ranger Magnus a smirk that means he gives him a smile that conveys a sense of superiority or confidence. The fear he felt with Ranger Magnus disappears when he reunites with Mimi and Papa.
- 111 Etiquette Christina wants to act like the young lady that Mimi expects her to be. What does that mean? What are some ways to show proper etiquette?
- 112 Vocabulary Rustic describes something that is made to look rural, outdoorsy, or natural. The Old Faithful Inn is famous for its very rustic interior décor.
- 112 Science The moon goes through a full lunar phase approximately every 29.5 days. Can you name the phases of the moon? If Christina notices a full moon on January 26th, what would be the approximate date of the next full moon?
- 113 Geothermal feature A geyser is like a giant pressure cooker. Ground water is heated by the magma underneath the earth’s surface. The pressure created by the heating eventually pushes the water up and out of the geyser’s hole in the ground. About one-half of the geysers in the world are located in Yellowstone National Park.

Page-by-Page Guide

- 114 Feelings Christina and Grant are excited to discover that the treasure they have been seeking is right next to them at Old Faithful, yet they are upset that the blizzard could make it impossible for them to find it. They feel two conflicting emotions. Have you ever felt opposite emotions at the same time?
- 117 Vocabulary Sarcasm means to express something in a taunting or ironic manner. Sometimes it can be used harshly and sometimes it can be used in amusement. Christina replies to Grant with amusement!
- 119 Park Regulations Park tourists have carelessly tampered with many of Yellowstone's natural features. By throwing rocks or debris into the pools, springs, geysers, and vents, the tourists change the make-up of the thermal features. There are many geysers that no longer erupt and pools and springs that have lost their vibrant colors. Tourists should always follow the rules of the National Park Service to protect the parks for years to come.
- 119 Math If the park worker pulled a total of 700 pennies out of Blue Star Pool in 15 minutes, how many pennies per minute did he average?
- 121 Landmark Morning Glory Pool is one of Yellowstone's most popular attractions because of the colors of the water.
- 120 Animals Moose antlers grow in size due to the nutrition of the moose, not its age. Moose shed antlers each winter and grow new ones in the summer.
- 122 History In the early 1900s, it was common for tourists to hand feed the bears in Yellowstone, causing a surge in injuries to tourists and bears. The National Park Service stopped this danger by increasing tourist education.
- 127 Direction A compass uses the pull of the magnetic poles to point the directions of north, south, east, and west. Discuss how the compass works.
- 129 Vocabulary To take precaution means to take action to prevent danger.

Discussion Questions

1. Why was it important that President Grant and the U.S. government set aside land like Yellowstone to be a national park? What are the benefits of a national park system?
2. What is the difference between a volcano and a supervolcano? Discuss how the land in and around Yellowstone formed because of volcanic eruptions.
3. Discuss the four types of thermal features found at Yellowstone and the characteristics of each.
4. In what ways would Grant and Christina's visit to Yellowstone have been different if they had come in the spring or summer, instead of winter? What role does weather play in the story?
5. Discuss the impact that the railroad and the automobile have had on Yellowstone, its land, and its wildlife. List two positive impacts and two negative impacts. Which has had more influence, positive or negative?
6. Discuss life cycles at Yellowstone. Track the life cycle of the wildlife food chain or the life cycle of the land, plants, and forest fires. Discuss park policies such as "Let It Burn." Why is it important for humans to not try to control the natural course of a park such as Yellowstone?

Bonus Info!

Yellowstone Trivia!

- Yellowstone National Park is larger than the states of Rhode Island and Delaware combined!
- The Yellowstone caldera is the largest location of ongoing volcanic activity in the world.
- There are approximately 10,000 thermal features throughout the park, with more than 300 active geysers—more than any other place in the world.
- Bison injure an average of five tourists each year, making bison the most dangerous animal in the park.
- Approximately 2,000 earthquakes are recorded in Yellowstone each year. In the U.S., only California records more earthquake activity than Yellowstone.
- Lightning starts an average of 22 forest fires in Yellowstone each year.
- Cars were first permitted in Yellowstone in 1915.
- Old Faithful spews about 8,500 gallons of water in each eruption.

Geography: Find It!

1. Almost one-half of all the geysers in the world are located in Yellowstone National Park. On a map or globe, identify three other locations on Earth aside from Yellowstone where geysers can be found.
2. Draw a map of Yellowstone. Include the Grand Loop, entrance roads, Yellowstone Lake, and at least four places Christina and Grant visited on their trip. Research other places in Yellowstone that you would like to visit on a trip there. Why did you choose those places?
3. List some of the geographical features of Yellowstone. How do these features support the wildlife that lives there?
4. Yellowstone National Park is primarily located in what state? Name the other U.S. states that include parts of Yellowstone.
5. What resource can you use to find the latitude and longitude of a particular location? What is the latitude and longitude of Yellowstone Lake?
6. Christina and Grant traveled to Yellowstone from Cody, WY; Molly Jane traveled from Jackson Hole; and Gunny came from Bozeman, MT. Using the online website GoogleEarth, determine who had the longest trip to the entrance of Yellowstone.

Bonus Info!

Forest Fires in Yellowstone

Fires play an important role in the lifecycle of Yellowstone National Park. Fires are nature's way of removing dead timber, releasing nutrients into ground and water, and creating new grazing areas for wildlife. The destruction caused by fire leads to the rebirth of trees, plants, and flowers. Interestingly, lodgepole pinecones have seedlings released only when heated by high temperatures caused by fire.

In the summer of 1988, a massive series of fires burned through Yellowstone, causing the most destruction in 300 years. Modern firefighting techniques helped to save some important buildings, but almost 45 percent of the park was burned in some way. Within days, new grasses were sprouting through the ash as nature continued its cycle of life. Yellowstone was reborn!

Mathematics: Calculate It!

1. Mimi and Papa's snowmobiles travel at a rate of 30 miles per hour. How many minutes would it take them to travel the entire 142 mile Grand Loop and take two 7-minute rests to allow bison to cross the road in front of them? How many hours?
2. If Old Faithful geyser erupts on average once every 65 minutes, how many times per day will it erupt for tourists to watch?
3. The Lower Falls at Yellowstone is 308 feet high. If a ladder is eight feet tall, how many ladders would have to be used to climb from the bottom of the falls to the top? Convert the measurement of the Lower Falls to metric measurement. How many centimeters high is the Lower Falls? (Hint: 1 foot equals 30.48 centimeters.)
4. Create a bar graph showing the wildlife Grant sees at Yellowstone! Grant sees the following: 17 bison, 14 pika, 6 moose, 11 cutthroat trout, 1 bald eagle, 8 coyotes, and 2 bear.
5. President Ulysses S. Grant declared Yellowstone to be the United States' first national park in 1872. How many years ago was our first national park established?
6. Before the blizzard, the snow drift in front of the Old Faithful Inn was 16 inches tall. After the blizzard, the snow drift was 34 inches tall. How many inches of snow fell during the blizzard?

Bonus Info!

Know Your Thermals!

There are four types of thermal features found throughout Yellowstone. Each is defined by the temperature and amount of water present.

- **Geyser:** Ground water is heated by magma beneath the earth's surface. The weight and pressure of the water builds until the steam released from the heating sends the water shooting up out of the opening in the earth. Then the heating cycle begins again.
- **Hot Spring:** Water heated by the magma constantly releases steam and heat through boiling or evaporation.
- **Fumarole:** Limited amounts of heated groundwater turn to steam and emit from cracks in the earth's surface.
- **Mudpot:** Steam rises through groundwater that has dissolved rock into clay, in some cases causing it to bubble. Different minerals in the clay cause different colors and smells!

English: Write It!

1. Write a letter to your teacher or a friend telling them about Christina and Grant's trip to Yellowstone. Include something funny that happened, something scary that happened, and something you learned that you did not know before reading the book.
2. Create an acrostic of the word YELLOWSTONE describing the land and the wildlife that live in the national park.
3. Park rangers have to educate tourists about respecting national parks so that people may enjoy them for generations to come. Pretend you are a Yellowstone park ranger beginning a tour of the park. Write a brief script telling your group of tourists why it is important "to leave the park just as you found it."
4. When explorers first told of the wonders of geysers and mudpots at Yellowstone, people did not believe them. From an early explorer's point of view, write a story describing an erupting geyser or stinky, bubbling mudpot to convince others what you have seen.
5. Consider all five senses: seeing, hearing, tasting, touching, and smelling. List one experience Christina and Grant had with each sense at Yellowstone.

Bonus Info!

Wildlife Habitats

The wildlife at Yellowstone is one of the most popular attractions of the park. The park provides very different habitats for almost 400 species of animals. For example:

- Bison and elk: lush grasslands and open valleys
- Bighorn sheep: rocky cliffs and mountainous areas
- Eagles: lakes and marsh
- Trout: lakes and rivers
- Moose: river and marshlands
- Bears: forests

It is important that non-native species are not introduced into Yellowstone's wildlife habitats to protect the animals currently living and thriving there. Yellowstone is home to some endangered animals such as the grizzly bear, the bald eagle, the peregrine falcon, and the whooping crane.

Art: Create It!

1. Research the wildlife tracks for the following animals in Yellowstone: bison, moose, coyote, pika, bald eagle, and bear. Draw or trace a picture of the animal on the left side of a piece of poster board and write the animal's name underneath it. Draw the track mark of each animal in a different order on the right side of the poster. Ask classmates to match the animal on the left to the correct track mark on the right.
2. Draw a diagram of each of the four types of thermal features found in Yellowstone: geyser, hot spring, fumarole (vent), and mudpot.
3. Use modeling clay to create a replica of the Roosevelt Arch or a petrified tree.
4. Illustrate a short comic book about Grant and Christina's visit to Yellowstone. Pick 3 of your favorite scenes from the book to illustrate, including scenery, characters, and dialogue.
5. Create paper bag puppets of some of the animals found in Yellowstone, such as bison, bears, trout, or moose. Supplies: paper bag, glue, construction paper, yarn, toothpicks, felt, googly eyes. Use the puppets to tell stories of what life is like for these animals living in their Yellowstone habitats.

Bonus Info!

Colors of Yellowstone!

Different temperatures and the presence of minerals can create amazing colors in the thermal features of Yellowstone.

In mudpots, minerals cause different colors:
Yellow—sulphur
Brown—iron oxides
Orange—arsenic
Pink—clay minerals

In hot springs and pools, different temperatures cause different colors of algae to live in the water:
Green—120°F
Brown—130°F
Orange—145°F
Yellow—160°F
Pink—180°F

Some of Yellowstone's colorful thermal features are changing because tourists throw rocks or debris into the thermal feature, blocking the vents. This causes a change in temperature or mineral make-up, thus changing its vibrant colors.

Science: Cook It!

Yellowstone was created by a volcanic eruption. You can make your own real working volcano!

Supplies:

salt dough
red food coloring
plastic soda bottle
liquid detergent
baking pan
baking soda
vinegar

1. Create salt dough. Mix 6 cups flour, 2 cups salt, 4 tablespoons cooking oil, and 2 cups of water in a large bowl. Work the ingredients with your hands until smooth and firm. Add more water to the mixture if needed.
2. Stand the soda bottle in the baking pan. Mold the salt dough around the bottle. Do not cover up the bottle mouth or drop any dough into the bottle.
3. Fill the bottle $\frac{3}{4}$ of the way with warm water mixed with 3-4 drops of red food coloring. Put 6 drops of the liquid detergent into the bottle. Add 2 tablespoons of baking soda. SLOWLY pour vinegar into the bottle.
4. The mixture of the baking soda and vinegar causes the “lava” to flow out of the volcano. Mixing baking soda and vinegar produces a chemical reaction in which carbon dioxide gas is created—the same gas that exists in a real volcano. The gas bubbles build in the bottle, forcing the liquid “lava” mixture out of the bottle and down the sides of the volcano!

Bonus Info!

The Yellowstone Volcano

Volcanic eruptions dating as far back as 18 million years ago are responsible for the Yellowstone National Park we know today. The most recent super eruption in Yellowstone itself happened 640,000 years ago causing worldwide effects. Since it is still active, many question whether the Yellowstone volcano will erupt again?

For the past 30 years, scientists at the Yellowstone Volcanic Observatory have monitored volcanic activity at Yellowstone National Park. Currently, there is no evidence that another volcanic eruption (large or small) is imminent. The researchers believe that they would be able to detect activity weeks and perhaps months before an eruption would occur, in the form of strong earthquake swarms and rapid ground deformation.

Become a Park Ranger for a Day!

The national parks in the United States employ rangers from the National Park Service who help take care of the parks and educate visitors about their unique features and attractions. Select one U.S. National Park and become its park ranger! Research and study its history, statistics, natural features, weather, flora and fauna. Create a project that showcases your park and highlights the attributes that make it special.

1. Make a diorama of the landforms at your park. Mountains? Forests? Cliffs? Underwater coral reefs?
2. Describe the climate at your national park. How does the weather affect the plants and animals that live there? How does the weather affect the tourists who visit?
3. Make a model of Native American ruins that may exist in your park. You can use clay or papier-mâché.
4. Research the wildflowers, edible plants, poisonous plants, and trees that live in your park. Draw pictures of these plants or create a display that shows their unique features. Create a matching game matching the leaves of the plant to their correct name.
5. Show the types of animals that live in your park and which types of shelters or homes they live in. Make a clay model of one animal and create a natural-looking habitat.

Activities

Search for the mysteriously hidden words below!

L	K	O	T	M	M	L	T	W	G	E	N	T	R	Q
D	U	N	N	A	U	R	E	N	R	L	S	V	A	N
C	E	F	G	A	E	D	I	B	S	I	M	O	Q	B
V	U	M	H	A	C	R	P	S	I	B	A	L	O	H
J	A	T	S	T	P	L	A	O	X	O	E	O	R	M
X	K	U	T	S	I	P	O	R	T	M	T	D	A	E
U	R	W	T	H	M	A	C	V	V	W	S	G	N	K
E	O	O	U	O	R	X	F	X	C	O	O	E	G	O
F	H	N	C	E	C	O	R	D	C	N	V	P	E	L
G	E	Y	S	E	R	O	A	N	L	S	G	O	R	A
D	R	A	Z	Z	I	L	B	T	V	O	K	L	R	M
R	A	E	B	Y	L	Z	Z	I	R	G	B	E	U	R
K	C	U	V	X	N	O	S	I	B	B	R	Z	G	E
V	B	B	O	M	R	S	N	E	F	O	T	J	F	H
W	D	R	D	C	P	E	T	R	I	F	I	E	D	T

WORD BANK

BISON	GRIZZLYBEAR	MUDPOT	STEAM
BLIZZARD	HOT SPRING	OLD FAITHFUL	THERMAL
COMPASS	LODGEPOLE	PETRIFIED	TREASURE
CUTTHROAT	MAGMA	RANGER	VENT
GEYSER	MOOSE	SNOWMOBILE	VOLCANO

Chapter 1-4 Worksheet

NAME: _____

DATE: _____

Do you know what these words mean? Write their definitions in the space provided.

1. commandeer
2. continuously
3. fumarole
4. caldera

Answer the following questions using complete sentences.

5. What method of transportation did Christina and Grant take to visit the park?
6. How did Gunny's great-great grandfather die?
7. What did Grant and Christina see everywhere in the fields as they traveled into Yellowstone?
8. What natural feature created Yellowstone?

Write T for True and F for False.

9. ____ Molly Jane was excited to take her first trip to Yellowstone.
10. ____ Papa explained that Yellowstone was the United States' first national park.

Chapter 5-8 Worksheet

NAME: _____

DATE: _____

Do you know what these words mean? Write their definitions in the space provided.

1. decipher
2. menacing
3. “red flags”

Answer the following questions using complete sentences.

4. What event caused Christina and Grant to meet Gunny and Molly Jane?
5. The first clue led the kids to what Yellowstone location?
6. What was the surprising benefit of Fishing Cone to fishermen in the past?
7. What is the name of the ridge that separates the eastern-flowing streams from the western-flowing streams?
8. Why do thermal mudpots stink?

Write T for True and F for False.

9. _____ Molly Jane’s father had a book about how people have died in Yellowstone National Park.
10. _____ The flies that live on water in hot springs feast on a bacteria that has been part of important scientific discoveries.

Chapter 9-11 Worksheet

NAME: _____

DATE: _____

Do you know what these words mean? Write their definitions in the space provided.

1. melancholy
2. gore
3. beckon
4. treacherous

Answer the following questions using complete sentences.

5. Whose ghost is rumored to roam around Old Faithful Inn?
6. List one way a pioneer in the Old West could use a dried bison patty.
7. What food did the Native American visitors to Hayden Valley share with Grant and Christina?

Write T for True and F for False.

8. ____ Scientists believe that bison are the only mammal that cannot suffer from cancer.
9. ____ The Old Faithful Inn is made of brick and looks like a fortress.
10. ____ There is no difference between a bison and a buffalo.

Chapter 12-15 Worksheet

NAME: _____

DATE: _____

Do you know what these words mean? Write their definitions in the space provided.

1. powwow
2. switchback
3. petrified

Answer the following questions using complete sentences.

4. What caused Papa's pants to disappear at Sulphur Caldron?
5. The children learned that the clue "Cutthroat and Trumpeter" refers to what?
6. What did Mimi, Papa, and the kids experience while eating their lunch at the picnic area near the Upper Falls?
7. What animals did Grant and Papa run into while visiting the Petrified Tree?

Write T for True and F for False.

8. ____ The kids found a clue to the treasure while visiting the Petrified Tree.
9. ____ Earthquakes are very common in Yellowstone National Park, but can't always be felt by humans.
10. ____ The Lower Falls is as tall as the Statue of Liberty.

Chapter 16-19 Worksheet

NAME: _____

DATE: _____

Do you know what these words mean? Write their definitions in the space provided.

1. stockade
2. rustic

Answer the following questions using complete sentences.

3. What geothermal deposit is created from heat, limestone, water, and air and looks like stair steps at Minerva Terrace?
4. Where did Ranger Magnus take the children to meet up with Mimi and Papa? Why was Papa appreciative?
5. What type of weather moved into Yellowstone right after Christina, Grant, Mimi, and Papa arrived back at Old Faithful Inn?
6. What type of geothermal feature is Old Faithful? Why is it so popular with tourists?
7. Why does Minute Geyser no longer erupt like it used to?

Write T for True and F for False.

8. ____ Christina, Grant, and their friends were happy to take a snow coach ride with Ranger Magnus.
9. ____ Old Faithful is the biggest, most spectacular geyser in all of Yellowstone National Park.
10. ____ Tourists at Yellowstone have carelessly destroyed some of the natural features of the park.

Chapter 20-23 Worksheet

NAME: _____

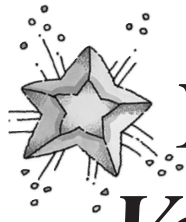
DATE: _____

Answer the following questions using complete sentences.

1. Grant thought the colors in Morning Glory pool made it look like what body part?
2. What event did Christina and Grant attend with their grandparents at Old Faithful on their last night in the park?
3. What treasure did Grant find in the woods near Old Faithful? What treasure did Christina find in the woods near Old Faithful?
4. How did Grant help his sister get away from the black bear?
5. What was the treasure of Gunny's great-great grandfather?

Write T for True and F for False.

6. ____ The clues to the treasure led the children to Old Faithful.
7. ____ It snowed while Christina and Grant were searching for the treasure.
8. ____ Ranger Magnus tried to keep the kids safe during their visit to Yellowstone.
9. ____ Gunny took his great-great grandfather's treasure home with him.
10. ____ Christina vowed never to return to Yellowstone again.



The Mystery at Yellowstone National Park Vocabulary End-of-Unit Quiz



NAME: _____

DATE: _____

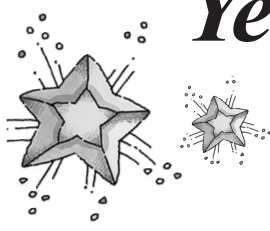
Using the word bank, fill in the correct vocabulary word in the sentences below.

WORD BANK

TOLERATE	SPECIALIZE	MENACE	SIMULTANEOUSLY	CONTINUOUSLY
COMMANDEER	DECIPHER	TREACHEROUS	RUSTIC	PETRIFIED

1. The inside of Old Faithful Inn is decorated with wood, stone, and other natural objects, giving it a very _____ look.
2. The snow fell _____ all night, never stopping for even one minute.
3. Christina was _____ with fear when she turned and saw the black bear standing right in front of her.
4. Tourists must be cautious around Yellowstone's _____ nature trails and features so they do not get hurt.
5. Christina and Grant helped their friends _____ the symbols and clues on the treasure map.
6. Park rangers must _____ in the history and unique features of their national park so they can share that information with visitors and tourists.
7. The water at the top of Yellowstone Lake is frozen while _____ the water at the bottom of the lake is boiling from the magma flowing beneath.
8. The taste of the pemmican was hard for Grant to _____, because it tasted bad!
9. Because some of the wildlife at Yellowstone can be a _____ to the tourists, park rangers tell visitors to keep their distance.
10. After the fender-bender, the Edwards and Mr. Mitchell had to _____ new snowmobiles to travel around the park.

The Mystery at Yellowstone National Park Matching Characters End-of-Unit Quiz

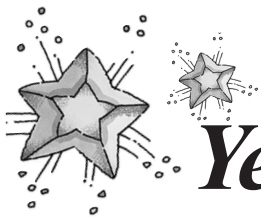


NAME: _____

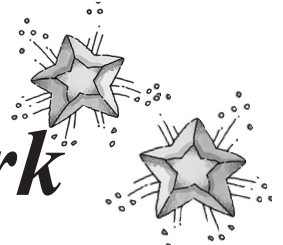
DATE: _____

Match the mystery characters with their descriptions.

- | | |
|-----------------------------|--|
| _____ 1. Papa | A. Visited the park many times. |
| _____ 2. Mimi | B. Brought a treasure map to Yellowstone |
| _____ 3. Grant | C. Saved the day using moose antlers |
| _____ 4. Christina | D. Specialized in wildlife in the West |
| _____ 5. Molly Jane | E. "Obsessed" with Yellowstone |
| _____ 6. Gunny | F. Mystery book writer |
| _____ 7. Ranger Magnus | G. Found the treasure |
| _____ 8. Mr. Mitchell | H. Cowboy pilot who loved the West |
| _____ 9. Mr. & Mrs. Edwards | I. Wanted to keep the park tourists safe |



The Mystery at



Yellowstone National Park

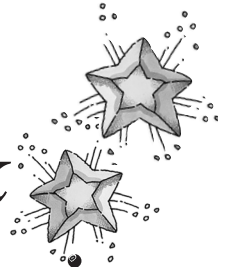
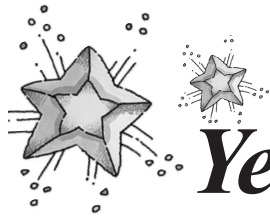
Fill-in-the-Blank End-of-Unit Quiz

NAME: _____

DATE: _____

Fill in the blanks to complete the following:

1. Yellowstone National Park was created by an eruption of this natural feature.
____ O ____ C ____
2. Ulysses S. Grant declared Yellowstone the United States' first:
____ T ____ ____ R ____
3. This can be seen rising from the earth all over Yellowstone. Grant thinks it is smoke.
____ ____ A ____
4. This is Yellowstone's most popular and famous attraction.
____ D ____ ____ H ____
5. A herd of these animals is known to stop traffic in Yellowstone while they cross a road!
____ ____ S ____
6. These thermal features are the smelliest ones at Yellowstone!
____ U ____ ____ T ____
7. This ridge runs through the continent of North America and separates the eastern-flowing rivers and the western-flowing rivers.
____ ____ T ____ ____ ____ ____ V ____
8. These trees are most common in Yellowstone. They were used to build Native American dwellings.
____ ____ G ____ ____ ____ ____ N ____
9. These people teach tourists about the national park and help keep them safe while they are visiting.
____ A ____ ____ ____ G ____
10. Gunny's great-great grandfather left this treasure buried at Yellowstone.
C ____ ____ P ____



The Mystery at Yellowstone National Park True or False End-of-Unit Quiz

NAME: _____

DATE: _____

Write T for True and F for False.

1. ____ Mimi and Papa had taken snowmobiles through Yellowstone on a previous trip.
2. ____ Gunny's great-great grandfather died after being attacked by a bear in Yellowstone.
3. ____ The children persuaded Ranger Magnus to help them with their treasure hunt.
4. ____ Christina and Grant met the ghost of Robert Reamer at the Old Faithful Inn.
5. ____ While visiting Hayden Valley, Christina and Grant ate dried bison meat.
6. ____ The park's administration buildings are located at Fort Yellowstone.
7. ____ A huge snowstorm hit the park during Christina and Grant's visit.
8. ____ Old Faithful is the most predictable geyser at Yellowstone National Park.
9. ____ Christina came face to face with a moose while searching for the treasure near Old Faithful.
10. ____ National park rangers pulled coins out of Morning Glory Pool that had been thrown in by tourists.

Answer Key

Page 15 Mathematics: Calculate it!

1. 298 minutes or 4.97 hours; 2. 22.15 times per day; 3. 38.5 ladders; 9,387.84 centimeters; 4. answer will vary; 5. answer will vary; 6. 18 inches

Page 17, Vocabulary: Use It!

1. gunny; 2. vent; 3. menace; 4. decipher; 5. gore; 6. caldera; 7. melancholy; 8. treacherous; 9. powwow; 10. petrified

Page 22, Chapter Worksheet (1-4)

5. snowmobiles; 6. fell into a hot spring; 7. white steam and mist; 8. volcano; 9. F; 10. T

Page 23, Chapter Worksheet (5-8)

4. snowmobile fender-bender; 5. West Thumb Geyser Basin; 6. cook fish in Fishing Cone hot spring; 7. Continental Divide; 8. presence of hydrogen sulfide; 9. T; 10. T

Page 24, Chapter Worksheet (9-11)

5. Robert Reamer, architect of the inn; 6. to use to fuel a fire; 7. pemmican; 8. T; 9. F; 10. F

Page 25, Chapter Worksheet (12-15)

4. acid trapped in the ground; 5. trout that live in Yellowstone River; 6. earthquake; 7. bear and moose; 8. F; 9. T; 10. T

Page 26, Chapter Worksheet (16-19)

3. travertine; 4. Fort Yellowstone; It gave Mimi and Papa some “alone time.”
5. blizzard; 6. it is a geyser and erupts on regular basis; 7. tourists threw rocks and debris into its vent; 8. F; 9. F; 10. T

Page 27, Chapter Worksheet (20-23)

1. eyeball; 2. Full Moon Celebration; 3. Grant found moose antlers, Christina found a camp pack; 4. pretended to be a moose and distracted the bear; 5. a compass; 6. T; 7. F; 8. T; 9. F; 10. F

Page 28, Vocabulary End-of-Unit Quiz

1. rustic; 2. continuously; 3. petrified; 4. treacherous; 5. decipher; 6. specialize; 7. simultaneously; 8. tolerate; 9. menace; 10. commandeer

Page 29, Character Matching End-of-Unit Quiz

1. H; 2. F; 3. C; 4. G; 5. A; 6. B; 7. I; 8. D; 9. E

Page 30, Fill-in-the-Blank End-of-Unit Quiz

1. volcano; 2. national park; 3. steam; 4. Old Faithful; 5. bison; 6. mudpots; 7. Continental Divide; 8. lodgepole pines; 9. park rangers; 10. compass

Page 31, True/False End-of-Unit Quiz

1. T; 2. F; 3. F; 4. F; 5. T; 6. T; 7. T; 8. T; 9. F; 10. T