

Geothermal Features of Yellowstone
Brenda Block, Chillicothe High School, 9-12, Special
Education
July 2005

Teaching Traditional American History Program

Funded by U.S. Department of Education

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<http://www.chillihistoryproject.com/>

Lesson Overview: Introduce students to the geothermal features of Yellowstone National Park. Information about geothermal features of Yellowstone are given through lecture with visual presentation and discussion.

Objectives: After completing this lesson the student will be able to:

Define a geothermal feature.

List the four different geothermal features presented.

Recognize the different between each geothermal feature.

Have visual reference of each geothermal feature.

Materials: Information and notes taken from the following sources as presented in the attachment.

Smart Board with projector by Smart Technologies.

Yellowstone, National Park Foundation Official Guide, 2005/2006, Geology, by Adam Jones p.32, 58-60.

1. <http://www.americanparknetwork.com>
2. <http://www.nps.gov/yell/slidefile/geothermalfeatures/index.html>
3. <http://www.nationalgeographic.com/features/97/Yellowstone/scout/index.html>
4. <http://www.nps.gov/yell/oldfaithfulcam.htm>(WebCam)

Personal Digital Camera Shots from trip to Yellowstone

Class Time: 55 minutes

Teacher Input: Opening- Q.-What was the first National Park established in the United States? A.-*Yellowstone*. Q.-What do you think of when you think of Yellowstone? A-*Student answers will vary.*

Presentation of lecture from attached information.

While giving the oral presentation you pull up pics from visual presentation from websites and personal shots on SMART Board. There are numerous different visuals on websites you may choose the pics you prefer to use. The website from National Geographic has sound effects.

Hand out summary sheet and go over with students.

Pull up Old Faithful on webcam and students can watch it go off. Webcam updates every 20 seconds.

Activities: The Smart Board will be used to present pics from websites 2 and 3. The pictures are larger and students will be able to have better visual knowledge of geothermal features.

Questions for review: Q-All geothermal features must have P2hew, any guesses what this might be, and I'll give you a hint, it doesn't have to do with the rotten egg smell? A- Pressure, Plumbing, Heat, Earth, Water

Closure: Briefly Summarize the four different features presented.

Fumaroles-a small steam vent in the ground.
Mud Pots-acidic hot springs with bubbling wet clay mud.
Geysers-eruption of hot water shooting in the air.
Hot Springs- colorful hot spots filled with microscopic organisms.

Assessment: Student demonstrate knowledge of geothermal features by answering questions on summary sheet.

Extension: None

Reference:

Yellowstone, National Park Foundation, Official Guide, 2005/2006, Geology, by Adam Jones p.32, 58-60.

1. <http://www.americanparknetwork.com>

2. <http://www.nps.gov/yell/slidesfile/geothermalfeatures/index.html>

3.<http://www.nationalgeographic.com/features/97/Yellowstone/scout/index.html>

Graphics:

<http://www.nps.gov/yell/oldfaithfulcam.htm>(WebCam)

Introduction

Geothermal activity results when surface water seeps down to meet the heat of the earth's molten rock. Because molten rock may be as close as three to eight miles below the surface in Yellowstone, the park has the largest and most varied collection of geothermal features on Earth.

Inside a Geothermal Feature

Yellowstone has the largest and most varied collection of geothermal features on Earth. Geysers, hot springs, sulfur pools and fumaroles bubble, gurgle, hiss and spout throughout the area. The presence of so many thermal features and earth tremors indicates that there is molten rock just beneath the earth's surface.

Geothermal features are caused by water and molten rock on the earth's crust. Much of Yellowstone's precipitation seeps into the earth via the porous volcanic rock. Some of the water stops at the water table, returning to the surface through cold springs. The rest, however, continues deeper into the earth. The water seeps down several thousand feet (more than a kilometer) where it is heated. As a result of this water being heated by molten rock, its temperature far exceeds the boiling point, perhaps more than 400°F. Because of the tremendous pressure, it cannot boil or turn to steam, so the water escapes through a "plumbing system" deep within the earth. As it rises through the porous rock channels, its pressure goes down, and the water boils at last.

Fumaroles are Yellowstone's hottest surface features. Their underground channel systems reach down into the hot rock

masses, but contain very little water. When water does drain into the fumarole's plumbing, it converts instantly to steam. Hot springs are closely related to geysers, but the difference is that the underground channel systems are not constricted. Water circulates to the surface where heat escapes through evaporation or runoff. The cooler water returns to the underground system, keeping it in equilibrium.

Hot Springs

The major factors that contribute to the colors in a hot spring or thermal pool are the water's temperature, minerals, algae, selective reflections, absorption of light by colloidal particles and water itself, and combinations of the above. Colors range from orange to blue to black. Grand Prismatic Spring is the park's largest hot spring.

Geysers

A special kind of hot spring with constrictions in its plumbing, a geyser, periodically erupts violently as pressure mounts in the large volume of hot water stored deep under the surface. Some geysers erupt every minute while others are inactive for months or even years. The park has more than 300 geysers and each continues to change its pattern of activity.

Mud Pots

Another type of acidic hot spring, a mud pot, forms as limited amounts of heated water mixes with clay and other undissolved mineral matter. Depending on the minerals present, it can be quite colorful, earning it the nickname "paint pot."

Fumaroles

Water vapor and other gases expelled from holes in the ground create a kind of steam vent, or "dry geyser," called a fumarole. Often the expulsion is so forceful that the ground trembles, producing a strong roaring sound like thunder.

Mammoth Hot Springs

Few of Yellowstone's geothermal features have the sheer grace and beauty of Mammoth Hot Springs. Mineral-laden hot water from deep beneath the earth's crust finds its way to the surface and builds tier upon tier of cascading, terraced stone. Begun thousands of years ago, the sculpting of the terraces continues as thousands of gallons of water well up and deposit up to two tons of travertine daily.

Old Faithful

Of the approximately 10,000 hydrothermal features in the park, the best known is Old Faithful. Thousands of gallons of steaming water thunder into the sky with each eruption. Old Faithful has rarely missed its eruptions during its more than 120 years of observation. Currently, the geyser erupts an average of every 92 minutes.

Norris and Firehole River Geyser Basins

Norris Geyser Basin, just 21 miles south of Mammoth Hot Springs, and three geyser basins along the Firehole River, have the largest display of geysers. Steamboat Geyser, at Norris, is the world's tallest geyser and has infrequent, unpredictable eruptions reaching 400 feet. Both a short water phase and a longer steam phase occur, lasting up to 12 hours. Depending on the wind, Echinus Geyser, once predictable, now varies its eruptions from one to four hours, sometimes sending a spray of air-cooled water over the viewing platform.

Grand Prismatic Spring

Yellowstone's largest hot spring, at 370 feet in diameter, is accessed by taking the Midway Geyser Basin boardwalk. The deep-blue color of the pool and the rings of yellow- and orange-colored bacteria surrounding it combine to produce a beautiful prism effect.

Morning Glory Pool

This pool gets its name because of its resemblance to the morning glory flower. It is no longer as deep blue as it once was because its vent is becoming clogged by debris that visitors have thrown into it.

Summary Sheet

1. How many geothermal features are there in Yellowstone National Park?
2. What are the four geothermal features discussed ?
3. Which geothermal feature is the most colorful of the four features shown?
4. Which geothermal feature actually bubbles continually?
5. Which geothermal feature is generally the hottest?
6. Which geothermal feature periodically erupts large amounts of hot water?
7. Name the best known geothermal feature in Yellowstone National Park?