

# Life Sciences and Art

## Batiking Yellowstone: Using art to interpret Science!- Student Lab

6-8

Lesson plan by TBI



### BACKGROUND CONTENT

Yellowstone National Park is an area of active volcanism. It contains an active volcano, and has one of the world's largest calderas (a depression left by the eruption activity), measuring 45 miles by 30 miles. A continental hot spot is one theory that explains Yellowstone's volcanic nature. Hot spots are areas where hot semi-fluid rock is close to the Earth's crust. The North American plate, that plate that Yellowstone and most of western North America sits upon is moving in a SW direction at about 1 inch per year. The plate movement has created a series of calderas and lava flows appearing first along the Oregon and Nevada border 16.5 - 15 million years ago tracking to the Northeast to its present location in Yellowstone were the Yellowstone caldera that was created 640,000 years ago. The geography is very visible from satellite photography, showing the remarkable absence of mountain ranges, attesting to their destruction by volcanic eruptions (Picture 1).

Within the Yellowstone caldera and the surrounding area the land is in constant motion, 1000-3000 earthquakes occur annually. Heating and cooling conditions from the magma chamber below expand and

contract the earth's crust. There are two very active regions in YNP the Mallard Lake Dome and the Sour Creek Dome. Ground movement can be as much as 2 inch in just one year (Picture 2). As a result of the underlying geologic activity, the park contains 14,000 thermal features including geysers, hot springs, mud pots and fumaroles (Picture 3). YNP has the largest concentration of geysers in the world with approximately 300 active geysers. Grand Prismatic is the 3rd largest hot spring in the world (Picture 4). Steamboat geyser is the world's tallest active geyser, throwing water 300 feet into the air (Picture 5).

Microorganisms, organisms so small that you can't see them with your naked eye, make up the largest mass of living creatures on earth; more than plants and animals combined (Picture 6). In YNP different kinds of microbial life like bacteria, algae, fungus, viruses, and a relatively new form of life, archaea, form spectacular colorful communities in the thermal features. These communities are visible to us because of the sheer number of individuals present in these protected and extreme environments (Picture 7). The temperature and pH of the

thermal environments dictate the type of microbial community that thrive in different the wide array of thermal habitats present in Yellowstone.

Yellowstone's thermal features support abundant microscopic life that prefers high water temperatures. These heat loving organisms, thermophiles, can often tolerate extreme pH levels, and/or waters laden with heavy metals and elements like arsenic, mercury, sulfur and iron. These organisms also referred to as extremophiles because of the extreme conditions in which they live, have evolved to tolerate and even make a living in these conditions, using various forms of chemicals as an energy or food source (*Picture 8*).

Many of Yellowstone's microorganisms make there energy through the sun's energy and the process of photosynthesis. The first photosynthetic microbe, cyanobacteria, evolved 3.5 billion years ago and is believed to have transformed the largely carbon dioxide atmosphere of early earth into an oxygen rich atmosphere we have today. Cyanobacteria are prevalent throughout YNP in neutral to slightly alkaline hot springs (*Picture 9*).

The goal of environmental education is to get you excited about science, and we use YNP as our backdrop. So view the dramatic color and wonder of the thermal features in YNP, and produce masterpieces of silk (*Picture 10*).

## MATERIALS AND SUPPLIES:

Ice cube tray  
Table salt and/or rock salt  
Vine charcoal (can be purchases at a craft store such as Michael's)  
Image  
Silk dye  
Paint brushes  
Gutta resist in applicator bottle  
Container of water

## ACTIVITY OUTLINE:

1. Determine what will be drawn – a supply of various microbial pictures or thermal features should be readily available.
2. Lightly sketch the picture on the silk using vine charcoal. If you would like, you might want to practice on paper.
3. Using the resist, squeeze a thin line onto the charcoal lines. Remember that the resist will stop the paint from running, so make sure all of the resist lines are closed. Also, if the lines are thick, it will take quite a while to dry which will slow the entire process dramatically.
4. Allow the resist to dry. A blow dryer may be used to speed up the drying process, but use the low setting and dry at an angle so the resist does not run.
5. Paint your picture using the paint provided. Not much paint is needed to do a lot of work so use it sparingly. You may want to test your color on a piece of paper before using it on the silk. The primary colors can be mixed to create any color you want so feel free to experiment. If the colors are too bright, water can be used to lighten the color.
6. Salt can be placed on the paint when it is still wet to give your picture a textured look. We used two different sizes of salt so you may want to experiment.
7. When finished painting, allow the silk to dry completely, and then brush the salt off the silk as much as you can. Set the dye using heat. To heat set, place a cloth over the silk and iron on by moving the iron in a circular pattern, being careful not to scorch the silk. Heat should be applied to all areas of the silk for at least 3 minutes. Sunlight will also set the paint. We put larger banner pieces in the dryer to set which seemed to work well and saved time.
8. Rinse the silk in lukewarm water to remove the charcoal and the resist. Some paint will come off with the salt and resist.
9. Enjoy your artistic science interpretation and hang on the wall or window.

