

GEYSERS SPOUT AND ROAR

*A great volcano dreams beneath the earth's surface.
Fiery magma forms the giant's heart.
Rainwater slips down through cracks and fissures.
The magma heats the water, sending it steaming
back up, up, and up.* —**VOLCANO DREAMS**

In this description of a geyser in Yellowstone, heat is turning the water into a gas. What is the gas form of water? Steam! The gas or steam takes up more and more space in the fissure until it is forced back up the fissure to the surface. Whoosh!

*Steam vents hiss and gurgle.
Geysers spout and roar.* —**VOLCANO DREAMS**

Let's try and see what this amazing process looks and feels like. We will use a simple chemical reaction to simulate the boiling water becoming steam under pressure. Why the simulation? Because real steam can burn you!

TOOLS TO GATHER:

1. Very warm water
This simulates heated rainwater.
2. Small bottle with narrow neck
The narrow neck simulates the fissure leading to a lower chamber in the rock or the lower part of the bottle.
3. Liquid dish soap
4. Alka-Seltzer tablets
The tablets will release carbon dioxide gas into the soapy water, making bubbles and foam. This simulates water becoming gas or steam.
5. Large tub or sink
6. Towels for clean-up
These two things will help contain the chemical reaction.

STEPS TO TAKE:

1. Fill the bottle almost to the top with very warm water.
2. Add a few drops of liquid soap.
3. Set the bottle in a large container or sink.
4. Break the Alka-Seltzer tablets up into small pieces on a piece of paper. (cont.)



VOLCANO DREAMS

This activity is based on the picture book by Janet Fox and illustrated by Marlo Garnsworthy (Web of Life Children's Books) and inspired by the Geyser Riser activity produced by AAAS.

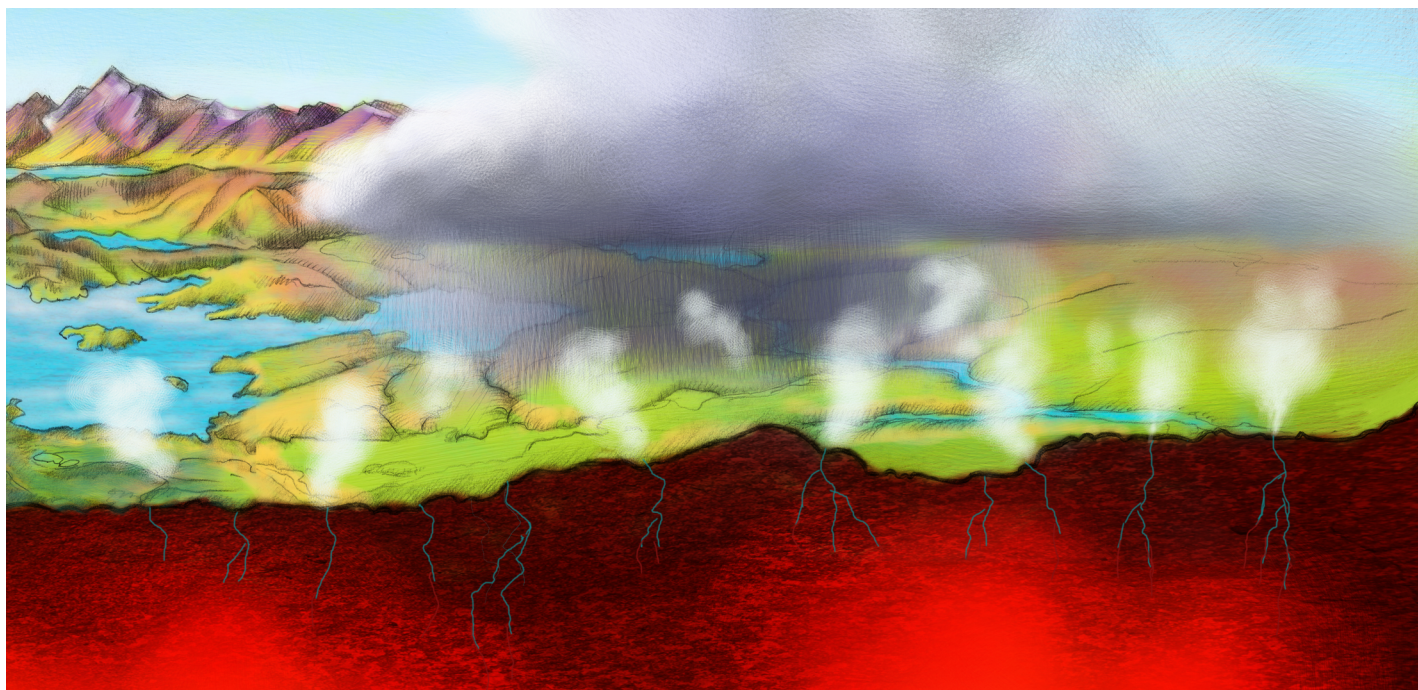


Image © Marlo Garnsworthy

STEPS TO TAKE (CONT.):

5. Gently lift either end of the paper and funnel the Alka-Seltzer bits into the bottle.
6. Quickly and firmly cover the top of the bottle with the palm of your hand.

You now have simulated rainwater heated in a fissure in the earth. What will happen next?

Do you feel a pressure under your hand? Does the pressure increase or decrease?

7. Pull your hand away quickly.

What happens when the pressure is released? Is there a sound? What do you think makes the sound? How is this like a geyser?

8. Repeat the experiment and vary the amount of soap or tablets. How does the reaction change?

CALDERA is a large crater-like depression that is created when an emptied volcano collapses in on itself after erupting. —**VOLCANO DREAMS**

THERMAL FEATURES OF YELLOWSTONE

Yellowstone National Park is home to thousands of thermal features like geysers and hot springs. The thermal features are there because Yellowstone is actually an immense volcano—even though it does not have the cone-shaped mountain we usually associate with volcanoes. All we see of the volcano are the thermal features and **caldera**, but deep beneath the park is a huge magma chamber.

When the Yellowstone volcano erupts it is so large and explosive that we call it a “supervolcano.” The Yellowstone supervolcano is now dormant (currently inactive). The most recent eruption happened about 640,000 years ago, and the 1,500-square-mile Yellowstone caldera was formed when the volcano collapsed.

The mud pots, hot springs, geysers, and steam vents are made when rainwater is superheated by the Yellowstone magma chamber. Algae that lives in the hot springs and geysers creates brilliant colors. Geysers like Old Faithful can shoot thousands of gallons of water up to hundreds of feet in the air with each eruption. —**VOLCANO DREAMS**

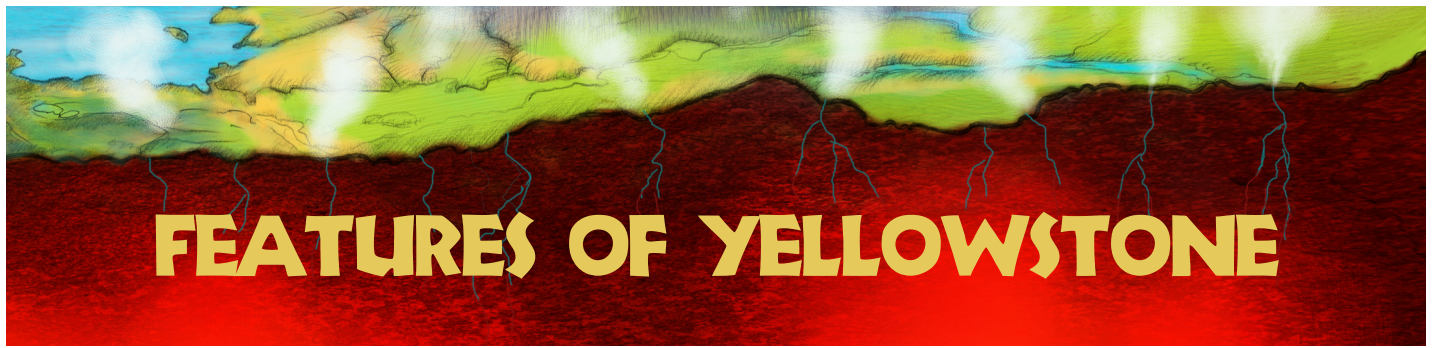


Image © Marlo Garnsworthy

RESEARCH & REPORT: Research the Yellowstone volcano and how it forms the various features within the park. Choose one feature (mud pots, steam vents, geysers, hot springs) to research and report on. Make sure your report includes your own understanding of your research, your own writing and drawings, and a list of the sources you used for information. **Explore these and other questions selected by your teacher in your research:**

<p>Which feature have you chosen to research? Why?</p>	<p>How was this feature formed by the volcano?</p>
<p>What part does it play in the park's ecosystem?</p>	



The volcano sleeping under Yellowstone is not the only volcano in the world. Use your geology and geography skills to find the locations of volcanoes in North America and Asia and make some observations. While you are observing volcano locations, look for a volcano that you are curious about for a future Volcano Report.


- 1) Visit: <https://www.volcanodiscovery.com/volcano-map.html>
- 2) Explore the key at the top of the map. How do you show all volcanoes?
- 3) Look at the locations of volcanoes in America.
- 4) Move west across the Pacific Ocean. Look at the locations of the volcanoes situated between the United States and the Asian continent.
- 5) Write down your observations on the locations of volcanoes, what questions you have about the locations of volcanoes, and what ideas you might have about where volcanoes are situated around the globe and how they affect the landscape around them.

OBSERVATIONS	QUESTIONS	IDEAS



Image © Marlo Garnsworthy

As a geologist and as the author of **Volcano Dreams**, Janet Fox had to do lots of research on the volcano sleeping under Yellowstone to create her picture book. As you study your chosen volcano, use this sheet to take notes. Remember to keep track of your sources as you conduct your research.

VOLCANO:	FACTS:
LOCATION: 	
SOURCES:	

No Volcano Report would be complete without a picture or pictures. Look at the Picturing Volcanoes sheet for ideas from **Volcano Dreams** creators Janet Fox and Marlo Garnsworthy on depicting these geological giants.



It is time to put the “A” in this STEM exploration and make some STEAM. What are some best practices for making a strong picture of a volcano? Author Janet Fox and illustrator Marlo Garnsworthy, both of whom studied Geology in college before working in children’s books, offer you some tips.

HOW TO DRAW A VOLCANO (STEAM)

Author Janet Fox says that when people are asked to draw a volcano, they most often draw a cone shape with lava spewing out of the top. Are all volcanoes cinder cones? No, some are shields, composites, or calderas. Before you start your own volcano picture, let’s do what Janet Fox the former geologist did - research how each type of volcano is made and what it looks like.

WHAT MARLO SAW (OBSERVATION)

When artist Marlo Garnsworthy was asked to illustrate the picture book **Volcano Dreams**, she packed her bag and headed to Yellowstone National Park. Marlo hiked through the park for a week with her camera and with her sketchbook, making observations of the volcano’s features (mud pots, steam vents, geysers, and hot springs), the animals, and the landscape of the park.

Could Marlo see the Yellowstone volcano? Why or why not?

WHAT MARLO FOUND OUT (RESEARCH)

How did Marlo learn what the volcano sleeping under Yellowstone looked like? By doing research just like you. She read research online and in read library books. In much of her research, Marlo was looking at cross-sections of Yellowstone National Park.

What is a cross-section? Why are illustrations of cross-sections so important in understanding volcanoes?

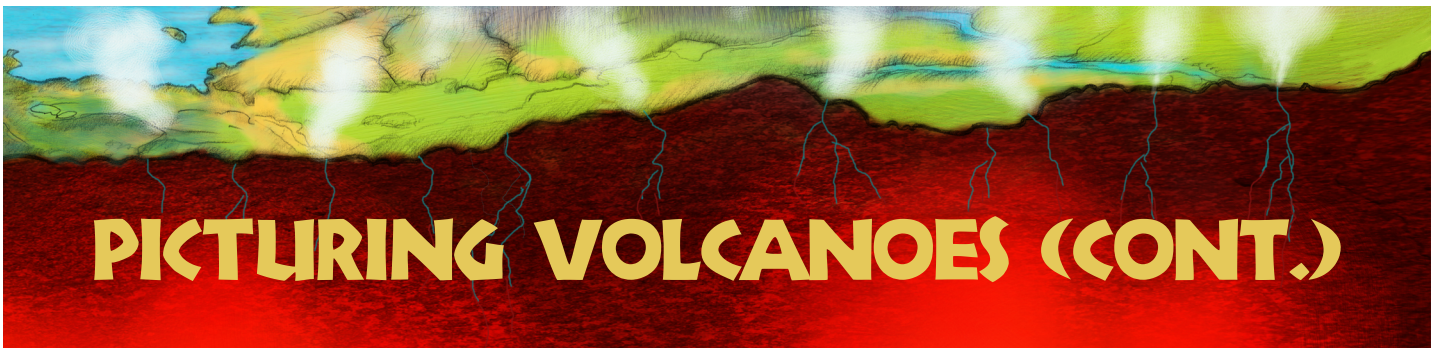
When planning to make your volcano picture, Marlo suggests you look at your paper and decide what parts of your picture will be above the ground and what parts will be below. Think about which direction your paper should go. There is no right answer - you are the artist!

HOW MARLO ILLUSTRATED THE VOLCANO (ART TECHNIQUE)

Marlo Garnsworthy started her volcano pictures with what you have on your desk right now - paper and a pencil. She used pencil and graphite to make sketches of what she wanted to paint and use in collages.

What is a sketch? Do you want to make some sketches before you start to paint?

When Marlo was satisfied with her sketches, she opened her watercolor paints...



HOW MARLO ILLUSTRATED THE VOLCANO (ART TECHNIQUE) (CONT.)

Knowing what you know about Yellowstone, why do you think Marlo used a paint that uses so much water?

Marlo says that watercolors can be hard to work with and suggests you might want to use pastels or tempera paint for your volcano picture.

Did you notice that Marlo does not recommend colored pencils or markers? Look at Marlo's depictions of lava. Why do you think it is important to have an art medium that allows you to blend colors?

There are a lot of rock surfaces in Yellowstone. Marlo used actual pictures of rocks and incorporated them with her paintings in a collage to help show the texture of the different rock types.

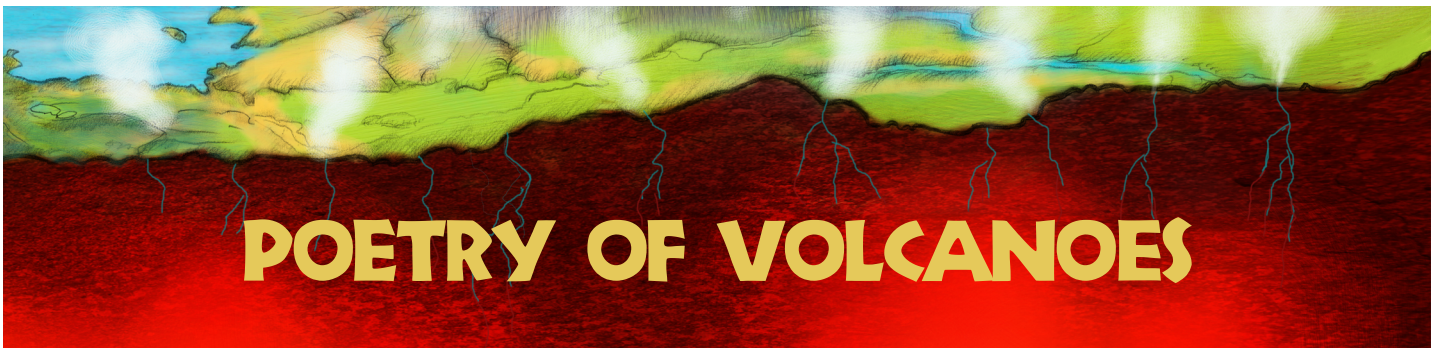
What rocks did Marlo illustrate that were a result of the volcano?

Marlo says that you do not need to go to Yellowstone to capture the unique textures of rock surfaces. Try making rubbings. A rubbing happens when you put a piece of paper over a surface and then rub a pencil, charcoal, or pastel stick over the paper. The pencil or other art medium should pick up some of the texture of the stone beneath. Imagine incorporating those rubbings into your volcano illustration!

What rock surfaces can you find in or near your school?

After doing your research like author Janet Fox and getting art tips from illustrator Marlo Garnsworthy, do you feel ready to start a volcano picture?

If you get an adult's permission, share your photograph of your volcano online with the hashtag **#VolcanoDreams**. Always ask an adult for the best way to showcase your work, but protect your privacy!



If you have been studying volcanoes, you know that some volcanoes are dormant and some are active. In **Volcano Dreams**, author Janet Fox uses language about sleeping and wakefulness to poetically describe the volcano under Yellowstone. *What is the status of your featured volcano? Can you create a poem about the volcano that compares it to something or someone that sleeps in your house or in the wild?*