

Volcano: The Eruption and Healing of Mount St. Helens

by Patricia Lauber

Classroom Favorites

Teacher's Guide by Kathleen Greenholdt

A Perma-Bound Production

General Objectives

1. To learn the causes and effects of volcanic eruptions
2. To understand how things in nature must work together to sustain life
3. To gain a general understanding of the functions of natural science
4. To see a true-life example of how "good" can come from "bad"

Specific Objectives

1. To learn about the natural evolution of Mount St. Helens
2. To understand how the volcanic eruption both hurt and helped its environment
3. To explore the differences between this eruption of Mount St. Helens and other volcanic eruptions

Biographical Sketch

Patricia Lauber was born in New York, New York in 1924. Since graduating with a B.A. from Wellesley College in 1945, she has devoted her life to writing more than sixty fiction and non-fiction books. Ms. Lauber is best known for her natural and social science works, which demonstrate her very readable informational style and her interest in the interdependence of living things. In 1983, Ms. Lauber received the *Washington Post*/Children's Book Guild Nonfiction Award, and in 1987, she won the Eva L. Gordon Children's Science Author Award.

Critic's Corner

Volcano was named a 1987 Newbery Honor Book, an annual award presented by the Children's Librarians Section of the American Library Association for the best children's books written by United States citizens.

Note: This book may be classified as a "science" book. However, it is written in a lively, storybook format that offers easier reading than a textbook. Colorful photographs illustrate each important point along the way, allowing students a visual and contextual view of the volcanic eruption process.

Chapter Summaries

Chapter 1: "The Volcano Wakes"

1. Mount St. Helens was created by eruptions over thousands of years.
2. Volcanoes are caused by build-ups of lava, pumice and ash. Before it leaves the volcano, lava is called "magma." Magma contains gases that are not present in lava.
3. Mount St. Helens is part of the Cascade Range in the Pacific Northwest.
4. Living things did not fear Mount St. Helens. Plants and animals lived on its slopes, and humans enjoyed many forms of recreation on the mountain.
5. An earthquake in March of 1980 signaled the eruption.
6. The big eruption occurred on May 18, 1980.
7. Scientists are usually able to predict eruptions, but this one happened without warning.

Discussion Questions

1. LITERAL - How do magma and lava build up a volcano?
(Many eruptions over a long period of time build the volcano; liquid magma flows out as lava and cools and hardens, or thick magma explodes into pumice and ash.)
2. CRITICAL - Why do you think that people were not afraid of Mount St. Helens before the 1980 eruption?
(The volcano had not erupted for a very long time; scientists predicted that it would erupt again within 100 years, but this was not a definite enough forecast to deter visitors.)

Chapter 2: "The Big Blast"

1. The eruption was caused by an earthquake on the morning of May 18.
2. A huge bulge had been swelling on the north side of the volcano since March and, triggered by the earthquake, it exploded into an avalanche.
3. A blast of steam and rock shot sideways from the opening caused by the avalanche, leveling 150 square miles of countryside. The blast lasted for about fifteen minutes.
4. Following the blast, the volcano began to erupt upward. The vertical plume of ash and rock continued for nine hours.
5. High-speed mudflows also came down from the mountaintop, causing great destruction.
6. The day after the eruption, the volcano was 1,200 feet shorter than it was the day before. Its north side seemed lifeless.

- Subsequent eruptions occurred that year, and lava built a large dome in the crater. During this period, scientists learned to predict the activity of the volcano.

Discussion Questions

- LITERAL** - How did the eruption leave a path of destruction from the north slope through the countryside?
(An avalanche tore open the volcano, unleashing a powerful steam-and-rock blast. The blast leveled forests for 150 square miles; trees just outside the blast zone were killed by scorching heat. An upward column of ash followed the blast, and lightning started in the ash smoke, causing forest fires. Hot mudflows destroyed steel bridges and houses and blocked shipping channels; the north slope was a wasteland.)
- LITERAL** - Scientists learned to predict eruptions of Mount St. Helens. How do they do this?
(They measure movements of magma inside the volcano. They check the dome size to see if it swells; they try to detect earthquakes by using a seismometer; they sample magma gases, looking for increased sulfur dioxide.)
- INTERPRETIVE** - Why was the 1980 eruption of Mount St. Helens different than earlier eruptions of the same volcano?
(This eruption involved a bulge on the side of the mountain that exploded, causing an avalanche; other eruptions exploded vertically, rather than horizontally.)

Chapter 3: "Survivors and Colonizers"

- Although the north side of the mountain appeared to be dead, some plants, animals and insects survived the eruption. They were safe under the ground, beneath the snow, in ice-covered lakes and inside rotting logs.
- Survivors included: chipmunks, squirrels, pocket gophers, ants, spiders, fish, frogs and small plants.
- Many colonizers came to the volcano that first summer after the eruption. Bacteria, fungi, insects, spiders and plant seeds flew in on the wind.
- Some animals just visited the mountain, but did not stay. These included bears, deer, coyotes and elk.
- The survivors and colonizers helped each other grow by providing food and shelter for one another. Even the visitors helped to heal the mountain (example: hoofprints made homes for seeds).

Discussion Questions (Following Chapter 4 Summary)

Chapter 4: "Links and More Links"

- Plants were "islands of life" for survivors and colonizers, offering them food and shelter.
- The decay of dead trees and animals (by microorganisms) and the overturning of soil (by gophers) led to new life by providing shelter for seeds.
- The plants, insects and animals formed "food chains" by serving as nutrition for one another.
- Birds and large life forms were killed during the eruption. The mountain began to heal because small life forms were linked

together in a base that would grow to include more and more kinds of life.

Discussion Questions (Chapters 3 and 4)

- LITERAL** - Even though the north side of Mount St. Helens seemed to be dead, life appeared quickly. How is this possible?
(Small animals, insects and plant roots survived underground, beneath the snow, in uprooted trees and in ice-covered lakes. Colonizers, such as birds and plant seeds, also appeared to heal the mountainside.)
- LITERAL** - Plants served as "islands of life" after the eruption. What does this mean?
(It seemed that the plants were loners in the destruction, but they were not; other tiny forms of life, such as insects and spiders, used them for food and shelter. These creatures then provided food for each other. Discuss "food chains.")
- INTERPRETIVE** - The book gives several examples of how small plants and animals relied on one another to build a base to revive the north slope. What evidence is there that large life will return?
(Several animals already returned, but the food supply was not adequate yet. Two of these were a bear in search of huckleberry bushes and a porcupine in search of tree bark. Other large animals also passed through, such as elk, deer and coyotes; all of these require larger life forms for food, and the base of small life will have to grow.)

Chapter 5: "Volcanoes and Life"

- A new forest will one day cover the north side of Mount St. Helens.
- There are volcanoes on land and on the ocean floor. Some are extinct, some are active and some are dormant.
- Most volcanoes are in two places: encircling the Pacific Ocean as part of the Ring of Fire, and in a belt that stretches from the Mediterranean Sea to Indonesia.
- Volcanic eruptions occur at the places where plates in the earth's crust collide or move apart.
- There are many volcanoes in the Cascade Range because that is the place where a small plate meets a large one.
- Volcanoes can help life, not just destroy it.
- Eruptions put gases in the air, add water to oceans, build land (including big portions of continents) and make soil.

Discussion Questions:

- LITERAL** - How did the Cascade Range develop?
(The Juan de Fuca plate is colliding with a larger plate that holds North America; this action causes eruptions, which build volcanoes. There are many volcanoes in the Cascade Range.)
- CRITICAL** - Volcanoes destroy life, but they also help it by enriching soil, building land, adding gases to the atmosphere and adding water to the oceans. And, after Mount St. Helens erupted, life returned. Relate the beneficial outcome of this disaster to other natural tragedies that end happily.
(Examples: death, hurricanes, and earthquakes. Discuss the themes of life replacing life and people working together to help each other survive.)

Meaning Study

The following words and phrases are used in discussing the natural phenomenon of the volcanic eruption. Consult the book to explain the meaning of each.

1. Natural scientists (p. 25)
Scientists who study the growth of and the relationship between life forms and other natural elements, such as minerals and gases.
2. Geologists (p. 4)
"Scientists who study the earth"; "Geology" is the study of the earth - its history and the life forms on it; much of this study involves the examination of rocks.
3. Atmosphere (p. 55)
The air that envelopes our planet is the earth's atmosphere. air is made of gases, such as oxygen, hydrogen and nitrogen.
4. Avalanche (p. 9)
A huge amount of rock and other natural matter, such as dirt or snow, that tumbles at a high speed down a mountainside.
5. "...the volcano had lost three quarters of a cubic mile of old rock" (p. 16)
"Cubic" refers to three-dimensional measurement: length x width x depth.
6. Bacteria (p. 31)
They are microscopic single-celled plants that live in water, soil, plants and animals.
7. The Pacific Northwest (p. 55)
The name of the northwestern part of the United States that borders the Pacific Ocean
8. British Columbia (p. 2)
A province of Canada that lies above the Pacific Northwest
9. Sea level (p. 9)
A level equal to the height or surface of the ocean
10. Sulfur dioxide (p. 23)
This gas is created when sulfur burns and is found in magma (a combination of sulfur and oxygen: SO₂).

Student Activities

1. Mount Vesuvius erupted in 79 A.D., destroying the city of Pompeii, Italy. The eruption fossilized the city, leaving behind a wealth of information for social scientists and archaeologists. Write a short report about this natural disaster and the knowledge that scientists gained from the fossils at Pompeii. Compare the eruption of Mount Vesuvius to that of Mount St. Helens.
2. In the woods or in an abandoned lot, find a plot of earth and mark off a square measuring two feet wide by two feet long. With a hoe or other garden tool, remove the top layer of grass or weeds that grow in your plot. For the next six weeks, do not disturb the area. Take ten minutes after each school day to watch for signs of life in the dirt, and keep a daily journal that describes what you see. Be careful not to overlook dead insects, plant seeds, droppings, tunnels and tracks.
3. **Class Project: Model of an Erupting Volcano**
Purchase several packages of different-colored modeling clay. Let each color represent a kind of rock. The lower layer will be

igneous, the second layer will be metamorphic, the top layer will be sedimentary. Construct a wood or glass frame for the cutaway of a volcano. Groove the wooden ends and base in order to slip in the glass sides. Leave one side open until the layers are modeled...slip on the other glass side when completed.

Build up a volcanic cone on top [of the layers], leaving a hole or crater. Insert a small metal can in the crater. Combine one teaspoon of fine ammonium dichromate crystals (from a drugstore or science supply house) and several match heads. Put this in the can. It burns when ignited, forming a dark green ash which tumbles over the cone in the same manner that lava flows from a real volcano, gradually building up into a mountain. CAUTION: Do not get any of the ash on your skin. It is an irritating chemical.*

4. Class Project: Seismograph** Simulation

Scientists use a seismograph to record the pattern of waves when an earthquake occurs. A mock-up of this device can be made in the following way.

Purchase a spring from a hardware store. A section from a Slinky toy also would work. Or take a rather stiff wire and wind it around a pencil to form a short spring. Attach it to the crossbar of a wooden support. Mold a ball of Play Dough or clay on the end of the spring. Stick the top of a ball-point pen into the clay ball so that the pen is parallel to the surface of the table. Prop up a piece of white cardboard in front so the point of the pen just touches the cardboard.

Now you need to create an earthquake on the table, which represents the earth. Hit it hard with your fist or blunt object. What happens to the pen? Can you produce an image of vibrations or waves on the cardboard? A real seismograph employs a revolving cylinder which picks up the primary and secondary waves of an earthquake. When these devices are set up in a number of sites, observers are able to locate the position, extent and strength of a quake.*

*From *Activities in the Earth Sciences* by Helen J. Challand, Ph.D. (Children's Press, 1982), Volcano demonstration: page 37. Earthquake demonstration: page 36.

** "Seismograph" is another term for "seismometer."

Related Books

To learn more about the scientific objects covered in this book, refer to the following readings:

Digging Deeper: Investigations into Rocks, Shocks, Quakes, and Other Earthy Matters by Sandra Markle. Lothrop, Lee & Shepard, 1987.

Discovering Nature Indoors by Laurence Pringle (ed.). Published for the American Museum of Natural History, 1970.

Our Restless Earth by Roy A. Gallant. Franklin Watts, 1986.

Partners, Guests, and Parasites: Coexistence in Nature by Hilda Simon. Viking Press, 1970.

The Physical World by Tony Seddon and Jill Bailey. Doubleday, 1987.

Secrets of Animal Survival. Published for National Geographic Society, 1983.

VOLCANO: THE ERUPTION AND HEALING OF MOUNT ST. HELENS TEST

VOCABULARY (30 points)

Choose the vocabulary word in Column II that matches the explanation from Column I.

Column I	Column II
_____ 1. a layer of molten rock below the earth's crust	A. molten
_____ 2. the reproductive process of fungi	B. spore
_____ 3. a scientist who studies the history of the earth through rock forms	C. magma
_____ 4. the outside covering shed by an insect as it grows	D. pumice
_____ 5. the high-speed mass of rock that traveled down the north side of the volcano	E. lava
_____ 6. a flowering, low-growing plant	F. chlorophyll
_____ 7. hot, liquid volcanic rock containing gases	G. molt
_____ 8. a section of the earth's crust	H. lupine
_____ 9. a scientist who studies growth of and relationships between life forms and other physical elements of nature	I. geologist
_____ 10. puffy rock that is formed by volcanic gases	J. mudflow
_____ 11. melted; made liquid by heat	K. mantle
_____ 12. the substance that makes plants green	L. silver fir
_____ 13. liquid rock that has left the volcano	M. avalanche
_____ 14. a type of pine tree	N. plate
_____ 15. the mixture of ash, rocks, dirt, and snow that flowed down the volcano's side	O. natural scientist

FILL IN THE BLANK (20 points)

Fill in each blank with the correct word or phrase missing from the sentence.

1. The geologists used an instrument called a _____ to detect earthquakes.
2. The plants served as _____, providing food and shelter in a wasteland.
3. The active volcanoes that circle the Pacific Ocean are called the _____
_____.
4. We cannot see most of the earth's _____ because oceans and soil hide it.
5. When plates collide, a volcano may _____.
6. Some volcanoes are found on land, while others are located on the floor of the
_____.
7. When a volcano erupts, it adds gases to the air in the earth's _____.
8. Mount St. Helens is one of the volcanoes in the _____ in the Pacific Northwest.
9. Before the eruption, Mount St. Helens was like a _____, storing super-heated water.
10. To predict eruptions, scientists can measure the amount of _____ given off by magma.

TRUE OR FALSE (20 points)

Decide if each statement is true or false, and mark **T** or **F** in the blank.

- _____ 1. A living thing does not need other living things to exist.
- _____ 2. Parasites cause decay by feeding on dead things.
- _____ 3. Mount St. Helens erupted on May 18, 1980.
- _____ 4. Lightning in the ash cloud caused forest fires.
- _____ 5. Gophers were enemies to life on the mountainside.
- _____ 6. The Juan de Fuca plate is sliding beneath a larger plate.
- _____ 7. Minerals cannot be recycled.
- _____ 8. Green plants cannot make their own food.
- _____ 9. Water boils at 212 degrees Fahrenheit at sea level.
- _____ 10. The Mount St. Helens eruption occurred less suddenly than do other eruptions.

ESSAY QUESTIONS (30 points)

Answer each question in paragraph form.

1. Form a survival chain from the following living and non-living things:

Living
plant, human, cow

Non-Living
soil, atmosphere, volcano

2. Several natural disasters have occurred recently in the United States. Choose an earthquake, hurricane or volcanic eruption and compare its effects to the good and bad effects of the Mount St. Helens disaster.

TEST ANSWER KEY

VOCABULARY (30 points)

1. K
2. B
3. I
4. G
5. M
6. H
7. C
8. N
9. O
10. D
11. A
12. F
13. E
14. L
15. J

FILL IN THE BLANK (20 points)

- | | |
|--------------------|--------------------|
| 1. seismometer | 6. ocean |
| 2. islands of life | 7. atmosphere |
| 3. Ring of Fire | 8. Cascade Range |
| 4. crust | 9. pressure cooker |
| 5. erupt | 10. sulfur dioxide |

TRUE OR FALSE (20 points)

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

ESSAY QUESTIONS (30 points)

Answers will vary.



**PERMA-BOUND
VANDALIA ROAD
JACKSONVILLE, ILLINOIS
62650**

**PHONE
1-800-637-6581**