USGS

VOLCANOES! DEATH AND RECOVERY

LESSON 5

fig. 1

"This is It!"

David A. Johnston, USGS volcanologist, was monitoring Mount St. Helens on a ridge north of the volcano. At 8:30 a.m. on May 18, 1980, he made his last radio transmission: No trace of him or his equipment has ever been found.

The Impact on Plants

The force of the lateral blast from Mount St. Helens' north flank blew down or snapped off trees within a radius of 25 kilometers (15 miles) north of the eruption site. At a distance of 25 kilometers (15 miles) from the blast, the force was no longer powerful enough to mow down trees, but it remained hot enough to kill the trees in its path. Ironically, some of the trees killed were old-growth Douglas firs 200 to 500 years old, which had survived previous eruptions.

Devastation in the wake of the avalanche was equally dramatic, although a few individual plants did survive, sprouting from root fragments that had been swept along on the surface of the debris. Plant survival in the path of the mudflows was likewise sparse. In addition, ashfall, which blanketed the forest to the northeast, smothered small plants and retarded the growth of larger ones.

The Impact on Animals

In the area affected by the blast, almost all wildlife vanished. Animals living above ground in the blast zone had no protection. Birds were particularly hard hit. Even those birds that survived the initial blast and avalanche died because the insects and plants they ate had perished. Insects were heavily affected, particularly by volcanic ash: the insects suffocated because ash clogged their body pores, or they dehydrated because glass-like ash abraded the cuticle that helps them retain moisture. Fewer than one-half of the small mammals species thought to have been living near Mount St. Helens were known to have survived. The death toll was nearly 7,000 large game animals, including deer, elk, and bear. The eruption severely damaged 26 lakes, killing an estimated 11million fish, as well as incalculable numbers of fresh-water invertebrates. The loss of human lives was 57.

Some Organisms Survived

The most surprising discovery following the eruption, however, was that many organisms survived in what appeared to be a lifeless gray landscape. In particular, plants sprouted in areas that had been protected under a snow cover and along stream banks and hillsides where erosion thinned ash deposits. Within a month, fireweed appeared from roots that had survived even though the tops of the plants were sheared off. Animals such as gophers and ants survived in their subterranean homes, while lake-dwelling frogs and salamanders escaped the blast under a protective cover of late winter ice.

The Recovery

Three years after the eruption, biologists had identified the recovery of more than 90 percent of the preeruption species of plants. Many plants owed their lives to gophers. These burrowing animals acted like garden tillers, by bringing the existing soil to the surface and mixing it with nutrient-rich volcanic ash deposited by the May 18, 1980, eruption. As the gophers dug, they also brought seeds, bulbs, and root fragments up to the surface where they could begin to grow. The "tilled" soil was also far more likely to trap seeds blowing across its surface.

In the forests, ash initially retarded the

Rich Volcanic Soils

Active volcanoes are also responsible for some of the world's most fertile soils. Tephra commonly contains potassium and phosphorus, two nutrients essential to plant growth. As tephra weathers, these nutrients are released into the soil, acting as a time-released fertilizer. The benefits of volcanic soils often lure people to risk living in the shadow of active volcanoes.

growth of surviving trees, but as rains washed the ash off leaves and needles, growth recovered. The layers of ash that remained on the ground enhanced growth for several years. The ash had a mulching effect, keeping in check understory plants that normally compete with trees for water and nutrients. Because of its light, reflective color, a coating of ash can help soil retain moisture as well.

Although few large mammals survived in the blast zone, fresh deer tracks were seen within 10 days. Black-tailed and Roosevelt elk were among the game species that moved in from adjacent areas and took advantage of the surviving plants that were beginning to recover. Spirit Lake was black and putrid, but it was not dead—only different. Its waters had been taken over by opportunistic bacteria, feasting on tons of organic matter that had avalanched into the lake. Ten years after the eruption, half a million tree trunks still drifted across the lake's surface; but the recovery had been remarkable. Lake life had almost returned to normal.

Volcanic eruptions are a fact of life for forests at Mount St. Helens. Like wildfires, they are among various natural disturbances that continuously alter the growth of a forest and foster diversity. Without periodic clearing by natural causes, forests could not renew themselves.

45-minute work session

Students learn how to "read" tree rings to determine the date of a volcanic eruption and the effects an eruption has on plant growth.

Key teaching points

1. If you look at the top of a tree stump, you will see a series of concentric rings in the cross section of its trunk. Because a single ***tree ring*** is usually formed each year, tree rings can be used to date the tree.

2. Tree ring boundaries are distinguished by a change in appearance between the small thick-walled cells produced at the end of a growth season and the large thin-walled cells produced at the beginning of the next growth season. The wood between these boundaries is formed during one growth season and constitutes one growth ring. (*fig. 2)*. Once the ring has formed, it remains unchanged during the life of the tree.

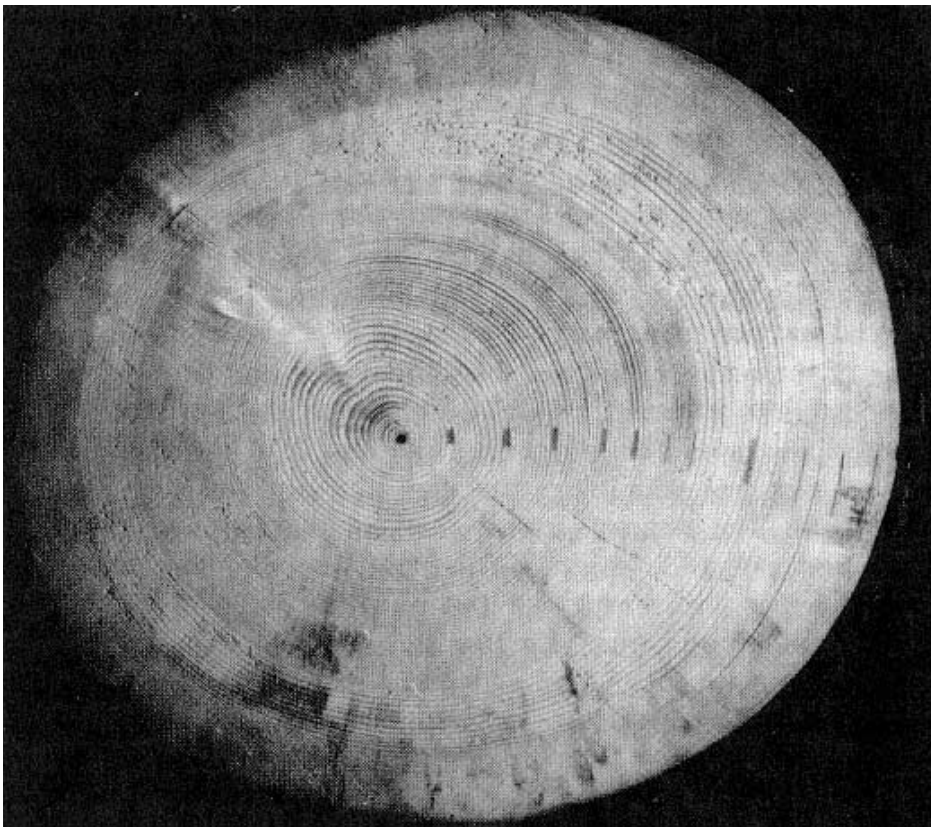
3. Scientists use tree ring data to help them establish the date of volcanic eruptions: the width of each year's growth records evidence of natural events, such as floods, drought, fires, and volcanic eruptions, that increased or decreased the width of that year's ring growth (*fig. 2)*.

4. Tree rings record both the negative and positive effects of volcanic eruptions. After the 1980 eruption of Mount St. Helens, ash that blanketed forests to the northeast of the eruption retarded growth for about 2 years. As rain washed away the ash, the rate of tree growth recovered and actually increased. The effect of the ash was equivalent to putting mulch on garden plants —the mulch reduced competition for water and nutrients by plants in the understory (in a garden mulch helps retain moisture and keep weeds from competing with other plants.)

Materials

1. Activity Sheets 5.1a–b
2. Log with visible tree rings

fig. 2



This 120-year old tree records the 1912 eruption of Mount Katmai, Alaska.

Procedures

1. Using either a piece of cut log or a diagram drawn on the chalkboard of a cross section of a tree, explain what tree rings are and what evidence they record about natural events that occurred during a tree's life.

2. Discuss the impact of the May 18, 1980, eruption of Mount St. Helens on the animal and plant life in the area around the volcano. Use *poster figure 19* to point out that a massive number of trees were killed during the eruption by the lateral blast, by forest fires started by lightning, and by avalanches and mudflows. Trees that survived, however, were charred or had their growth affected by the ash that covered the ground.

3. Distribute Activity Sheets 5.1a–b. Explain to students that they will use tree ring data to determine the date of an eruption of Mount Katmai in Alaska and the effect that the eruption had on the growth of a tree. (The tree's growth decreased for 3 years following the eruption but then increased for 12 years.) As a library assignment, they will make a time line and record on it important events that occurred during the life span of the Mount Katmai tree.

Extension

Have students draw tree ring patterns of their own and trade with other students to interpret.

Activity Sheet 1 Answers

1. 120 years
2. 1842
3. 1912
4. 3
5. 12
6. The ash helped to fertilize the soil

Activity 2 Eyewitness Accounts

45- to 60-minute work session

In a **role-playing exercise**, students use eyewitness accounts to gather and evaluate information about the events of the May 18, 1980, eruption of Mount St. Helens.

Key teaching points

1. Many people who were in the vicinity of Mount St. Helens during the eruption were interviewed to gain information about the nature and sequence of events of the eruption.

2. Although somewhat subjective, these observations were an important component of the scientific investigation of the eruption.

Materials

1. Overhead projector
2. Transparency of Master Sheet 5.2a
3. Master Sheets 5.2a–d
4. Activity Sheets 5.2a–b (photocopy)

Procedures

1. Tell students that on May 18, 1980, people at many locations in the vicinity of Mount St. Helens witnessed the eruption of the volcano. They observed a wide variety of phenomena associated with the eruption, including an earthquake, a massive avalanche, the lateral blast, mudflows, and the fall of airborne materials (tephra, including fine-grained ash). As a review of previous lessons, ask students to name the phenomena they think the eyewitnesses would have seen, heard, or felt.

2. On an overhead projector, show a transparency of Master Sheet 5.2a that shows where the eyewitnesses were located when the eruption occured.

3. Students play the following roles: **reporter(s), eyewitnesses, and scientists** who are serving on a committee investigating the eruption.

4. Distribute one account to each of the eyewitnesses (see Master Sheets 5.2b–d). Ask eyewitnesses to read the accounts in preparation for being interviewed by a reporter. Encourage students to use props to help them relay their accounts. When they are interviewed, the students should answer questions in their own words.

5. Distribute Activity Sheets 5.2a–b to the scientists. Tell the scientists to take notes while listening to the interviews. After hearing all the interviews, they should list the similarities and differences among the accounts on their Activity Sheet.

6. Divide the scientists into groups of four to six students and ask each group to discuss their recollections of the eyewitness accounts. Eyewitnesses should circulate among the groups of scientists to answer questions. Each group of scientists should prepare a written summary that attempts to reconcile the eyewitness accounts.

This teaching packet was originally published and printed in 1997. The online edition contains full text from the original publication. Some images have been modified or added to improve the scientific visualization of informaiton. This document has undergone official review and approval for publications established by the National Mapping Division, U.S. Geological Survey.