U.S. Department of the Interior
U.S. Geological Survey

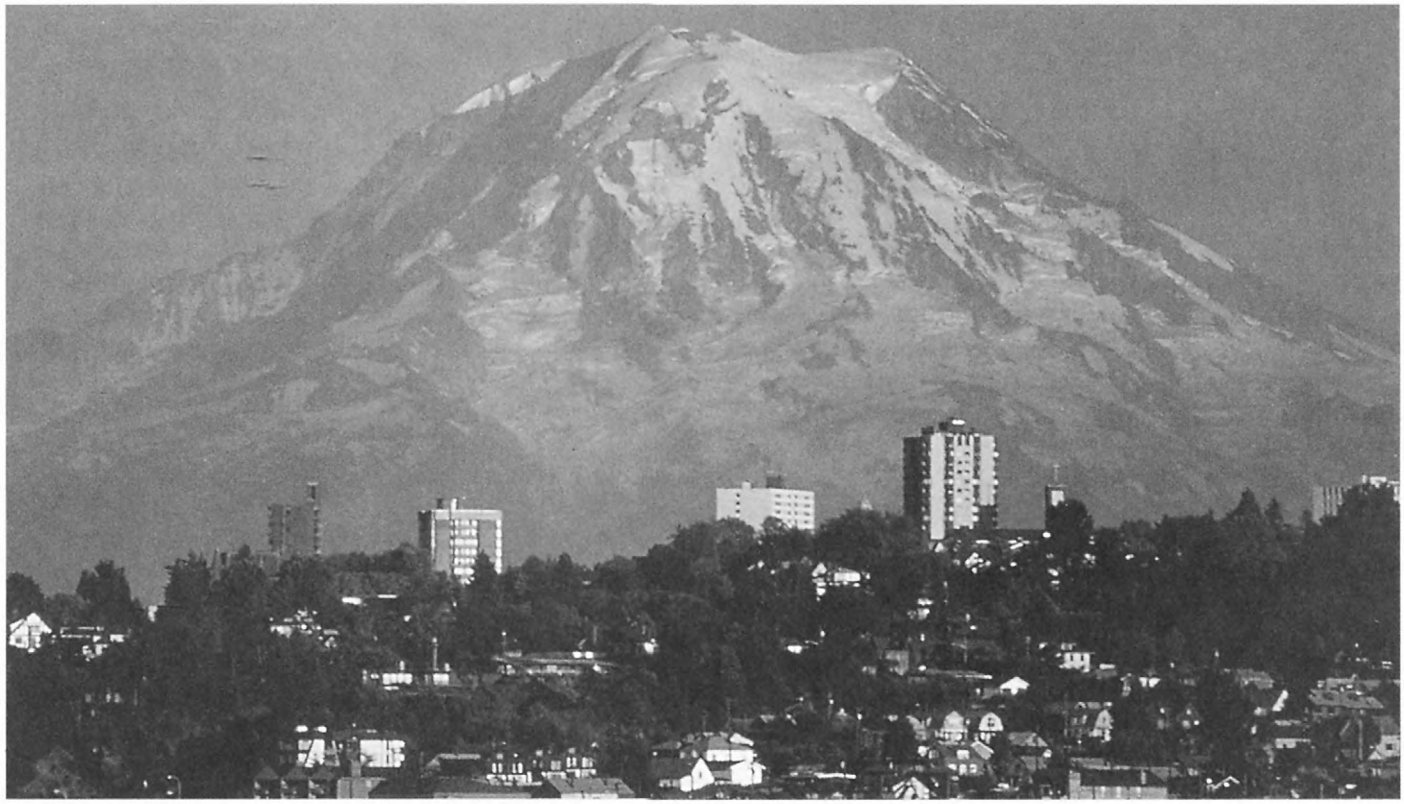
# VOLCANOES AND PEOPLE

# VOLCANOES!

# LESSON 6

*fig. 1*

**Mount Rainier**



***Snow-capped Mount Rainier rises behind Tacoma, Washington. Although Mount Rainier has not erupted in the past 500 years, scientists consider it one of the most hazardous volcanoes in the Cascade Range.***

Relative to other types of natural disasters, such as earthquakes, floods, hurricanes, and tornados, volcanic eruptions occur infrequently. Of the 1,500 active volcanoes on land, approximately 50-60 erupt each year. Approximately 1 million people have been killed by volcanic eruptions during the past 2,000 years.

### United States Has Many Active Volcanoes

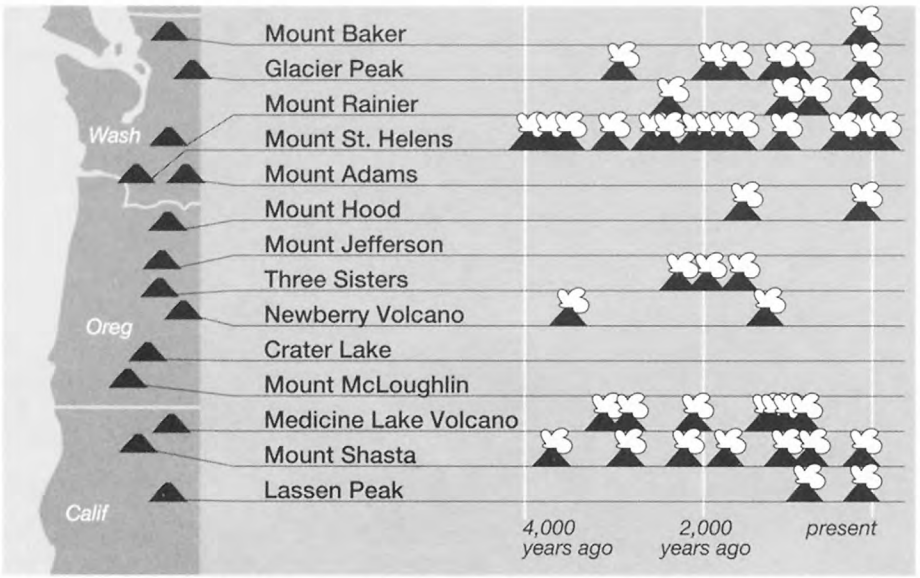
Because many of the most hazardous volcanoes have not erupted during recent historic times, people erroneously consider them extinct. For Mount St. Helens, more than a century had elapsed since a major eruption; most people were not aware of its dangers. Mount St. Helens is one of more than 65 active or potentially active volcanoes in the continental United States, Alaska, and Hawaii. Only Indonesia and Japan have more!

Scientists of the U.S. Geological Survey continue to monitor Mount St. Helens and other volcanoes in the Cascade Range. They know from its past eruptive history that many of Mount St. Helens' eruptions have occurred in concentrated periods of time lasting decades or even centuries. For example, one eruptive phase began in 1480 and lasted for about 300 years. Based on that history, scientists anticipate that Mount St. Helens will continue to erupt episodically for decades to come before it returns to a dormant stage.

The eruption of Mount St. Helens served as a reminder that other dormant volcanoes can come to life again. Mount Shasta in Northern California, for example, probably last erupted in 1786. On a geological time scale, this very recent volcanic activity suggests that magma is

*fig. 2*

## Cascade Eruptions




***Eruptions in the Cascades have occurred at an average rate of one to two per century during the last 4,000 years. Four of those eruptions would have caused considerable damage and loss of life if they had occurred today without warning.***

still present beneath the volcano. On average, it has erupted once every 300 years over the past 3,500 years. The chance is 1 in 25 to 30 that it will erupt in any one decade and 1 in 3 or 4 within a person's lifetime.

### Forecasting Future Eruptions

Scientists have improved their ability to predict the time of a volcanic eruption, but estimating the size and style of an eruption remains a difficult challenge. Despite this challenge, scientists try to assess the potential consequences of a future eruption by reconstructing a volcano's history, which includes the pattern, magnitude, and frequency of its past eruptions. The principal means of developing this history is by mapping and dating the different types of volcanic materials that have been deposited by previous eruptions. Assembled into volcanic hazards maps, this information is vital for communities in volcanically active areas to use for land use and emergency preparedness planning. Knowing a volcano's past is crucial to forecasting its future behavior.

### Benefits Often Overlooked

Because of the destructive nature of a volcanic eruption, we tend to overlook a volcano's benefits. Magma circulates and deposits many valuable elements, such as gold, silver, zinc, sulfur, and copper. Magma heats ground water systems that can be tapped to produce geothermal power. This heated ground water can also result in geysers and hot springs. Volcanoes are also responsible for some of the world's most fertile soils. And volcanoes continuously bring materials from inside the Earth to the surface—recycling on a grand scale.

# Activity 1
## Creating a Legend

*45 minutes*

Students create a legend that explains the existence of Mount St. Helens.

### Key teaching points

**1.** Mount St. Helens has been a fact of life for people living in its shadow ever since humans began populating the Pacific Northwest more than 10,000 years ago. There have been dozens of eruptions during the past 4,500 years.

**2.** Before there were scientific explanations for why volcanoes erupted, people developed stories to explain the presence and behavior of volcanoes.

**3.** The Yakima Indians called the volcano "Tah-one-lat-clah" (Fire Mountain). The Cowlitz people called it "Lawetlatla" (Person from Whom Smoke Comes). Its modern name, Mount St. Helens, was given to the volcano in 1792 by Captain George Vancouver of the British Royal Navy.

### Materials

None required.

### Procedures

**1.** Tell the legend below that was created by the Yakima people. (Before European settlement in the 19th century, the Yakima people had considerable territory on the Yakima and Columbia Rivers in Eastern Washington. Today, descendants of these people live on the Yakima Indian Reservation in south-central Washington.)

*Two tribes lived across the river from one another. Because they were friendly and peaceful tribes, the Great Spirit built a bridge across the river for them. Eventually, however, the tribes began to quarrel. The Great Spirit became angry. To punish the tribes he took away fire. The tribes prayed to the Great Spirit to return fire to them. Finally, the Great Spirit agreed. To restore fire, the Great Spirit had to go to an old woman named Loo-Wit who, because of her goodness, still had fire. Loo-Wit promised the Great Spirit that she would share her fire with the two tribes if the Great Spirit would*

# Activity 2
## There's a Volcano in my Backyard!

*make her eternally young and beautiful. Fire was restored, and the tribes were peaceful for a short time. The chiefs of both of the tribes, however, fell in love with the beautiful Loo-Wit. The chiefs began to quarrel and went to war. Once again, the Great Spirit became angry and in retaliation he turned the two chiefs into mountains. One became Mount Hood and one became Mount Adams. Because Loo-Wit was so beautiful, the Great Spirit made her into Mount St. Helens—that way she could remain beautiful forever.*

**2.** Students discuss how the legend differs from the way we now explain how volcanoes form. Are there similarities between the legend and scientific explanations?

**3.** Ask students to imagine that they live in a time and place where there are no scientific explanations for why there is an active volcano near their community. Students create and present orally a short legend to explain why the volcano exists or erupts.

### Extension

Do research from the journals of George Vancouver, John Fremont, and other explorers to the Pacific Northwest to learn their descriptions of Mount St. Helens and other volcanoes in the Cascade Range. Using these accounts as a basis, students create their own diary entries.

*45-minute work session*
*one followup project*

Using a volcanic hazard map of Mount Rainier, students reach conclusions about the potential hazards of future eruptions. They then create educational materials about these hazards.

### Key teaching points

**1.** Mount Rainier is located 35 kilometers (21 miles) southeast of the Seattle-Tacoma metropolitan area—an area that has a population of 2.5 million.

**2.** Mount Rainier is an active volcano whose last major eruption was approximately 150 years ago.

**3.** Mount Rainier has five times as much snow and glacier ice as all the other Cascades volcanoes combined. Mudflows are the most dangerous hazard.

**4.** Throughout the volcano's history, there have been numerous mudflows. Today, parts of Tacoma, Wash., and many other smaller communities have been built on top of these old flows—evidence that they lie within the reach of future mudflows that could originate from an eruption of Mount Rainier.

**5.** An eruption of Mount Rainier could kill hundreds of thousands of people and cripple the region's economy.

### Materials

Activity Sheet 6.2

### Procedures

**Work Session**

**1. Review with students** that Mount St. Helens is one of a number of active volcanoes in the Cascade Range. Some others include: Mount Baker, Mount Rainier, and Mount Adams in Washington; Mount Hood, Mount Jefferson, and Crater Lake in Oregon; and Mount Shasta and Lassen Peak in California.

**2. On a large map**, locate Mount Rainier and locate cities within 80 kilometers (50 miles) of it.

**3. As a class**, list the major eruptive events (include avalanches, mudflows, and tephra falls) that occurred during the 1980 eruption of Mount St. Helens.

**4. Using an overhead projector**, show students the eruptive history map of Mount Rainier (see Activity Sheet 6.2). Explain that scientists study past eruptions to help them forecast future eruptions. Looking at this map, what type of eruptive events have occurred in the past.

**5. Distribute Activity Sheet 6.2.** Tell students they will look at Mount Rainier's history of volcanic mudflows and forecast if there are any cities that would be at risk during a future eruption.

**6. Discuss:** What cities, if any, would be at risk if there were a future eruption? Is it possible, or practical, to eliminate all risks to these cities? What things can be done to reduce risks to life and property? Conclude that public education is a major activity.

### Followup Project

Students work individually or in teams to develop a range of educational materials and programs for the general public, especially school children. These might include posters; displays for schools, public libraries, and community centers; brochures; public service announcements on TV and radio; and information on the Internet.

## Activity Sheet 2 Answers

**Osceola Mudflow**
2. 70 kilometers
3. Enumclaw

**Electron Mudflow**
2. 50 kilometers
3. Ortig and Puyallup

# VOLCANOES!

## Activity Sheet 6.2
## There's A Volcano in My Backyard!

*Mount Rainier is an active volcano in the Cascade Range. During past eruptions large mudflows resulted. If similar mudflows occurred in the future, would people be in danger?*

### What to do

**Osceola Mudflow**
(occurred about 4,500 to 5,000 years ago)

1. Find the Osceola Mudflow on the map. Trace the course of the mudflow from where it began on the slopes of the volcano to where it ended.
2. How many kilometers did it travel?_____
3. What cities would be in danger if the Osceola Mudflow occurred today?_____

**Electron Mudflow**
(occurred about 550 years ago)

1. Find the mudflow on the map. Trace its course from where it began on the slopes of the volcano to where it ended.
2. How many kilometers did it travel?_____
3. What cities would be in danger if the Electron Mudflow occurred today?_____