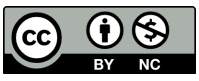
Types of Volcanoes

To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-content, web-based collaborative model termed the **FlexBook®**, CK-12 intends to pioneer the generation and distribution of high-quality educational content that will serve both as core text as well as provide an adaptive environment for learning, powered through the **FlexBook Platform®**.

Printed: August 10, 2014

flexbook
next generation textbooks



CHAPTER 1

Types of Volcanoes

Lesson Objectives

- Describe the basic shapes of volcanoes.
- Compare the features of volcanoes.
- Describe the stages in the formation of volcanoes.

Vocabulary

- caldera
- cinder cone
- composite volcano
- shield volcano
- strata
- supervolcano

Introduction

Some volcanoes are tall, cone-shaped mountains. They may be covered by snow or even glaciers. Some volcanoes are huge, gently sloping mountains. Many volcanoes are very small cones. Volcanic eruptions can come through cracks in the ground. Thin, fluid and runny lava forms gentle slopes. Thicker lavas build tall, steep volcanoes. Volcano types are discussed in this section.

Types of Volcanoes

A composite volcano forms the tall cone shape you usually think of when you think of a volcano. Shield volcanoes are huge, gently sloping volcanoes. Cinder cones are small, cone-shaped volcanoes.

Composite Volcanoes

Figure 1.1 shows Mt. Fuji, a classic example of a composite volcano. **Composite volcanoes** have broad bases and steep sides. These volcanoes usually have a large crater at the top. The crater was created during the volcano's last eruption.

Composite volcanoes are also called stratovolcanoes. This is because they are formed by alternating layers (strata) of magma and ash (**Figure** 1.2). The magma that creates composite volcanoes tends to be thick. The steep sides form because the lava cannot flow too far from the vent. The thick magma may also create explosive eruptions. Ash and pyroclasts erupt into the air. Much of this material falls back down near the vent. This creates the steep sides of stratovolcanoes.

FIGURE 1.1

Mt. Fuji is a well-known composite volcano.

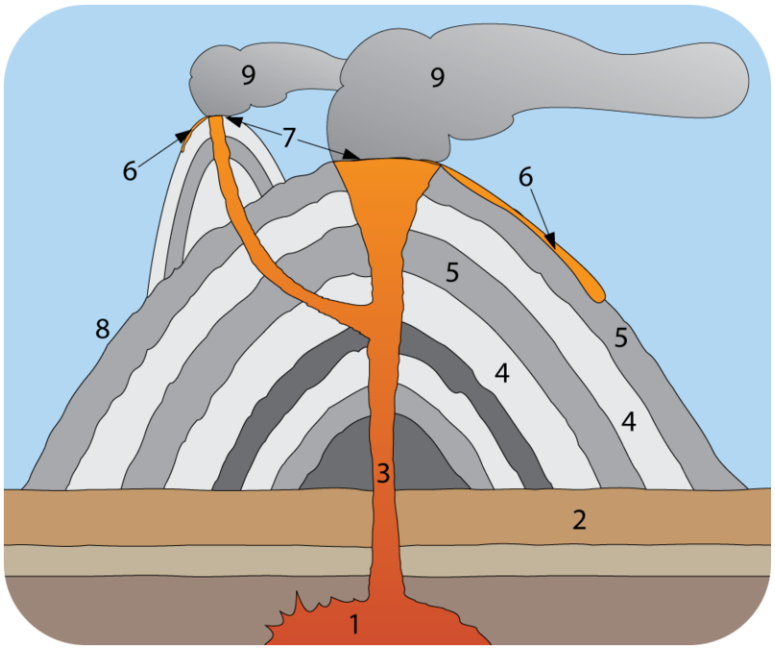


FIGURE 1.2

A cross section of a composite volcano reveals alternating layers of rock and ash: (1) magma chamber, (2) bedrock, (3) pipe, (4) ash layers, (5) lava layers, (6) lava flow, (7) vent, (8) lava, (9) ash cloud. Frequently there is a large crater at the top from the last eruption.

Composite volcanoes are common along convergent plate boundaries. When a tectonic plate subducts, it melts. This creates the thick magma needed for these eruptions. The Pacific Ring of Fire is dotted by composite volcanoes.

Shield Volcanoes

Shield volcanoes look like a huge ancient warrior's shield laid down. **Figure** 1.3 shows the Kilaeua Volcano. A shield volcano has a very wide base. It is much flatter on the top than a composite volcano. The lava that creates shield volcanoes is reltively thin. The thin lava spreads out. This builds a large, flat volcano layer by layer. Shield volcanoes are very large. For example, the Mauna Loa Volcano has a diameter of more than 112 kilometers (70 miles). The volcano forms a significant part of the island of Hawaii. The top of nearby Mauna Kea Volcano is more than ten kilometers (6 miles) from its base on the seafloor.

FIGURE 1.3
This portion of Kilauea, a shield volcano in Hawaii, erupted between 1969 and 1974.

Shield volcanoes often form along divergent plate boundaries. They also form at hot spots, like Hawaii. Shield volcano eruptions are non-explosive.

Cinder Cones

Cinder cones are the smallest and most common type of volcano. Cinder cones have steep sides like composite volcanoes. But they are much smaller, rarely reaching even 300 meters in height. Cinder cones usually have a crater at the summit. Cinder cones are composed of small fragments of rock, called cinders. The cinders are piled on top of one another. These volcanoes usually do not produce streams of lava. Cinder cones often form near larger volcanoes. Most composite and shield volcanoes have nearby cinder cones.

Cinder cones usually build up very rapidly. They only erupt for a short time. Many only produce one eruption. For this reason, cinder cones do not reach the sizes of stratovolcanoes or shield volcanoes (**Figure** 1.4).

FIGURE 1.4
A cinder cone volcano in Lassen National Park.

Calderas

During a massive eruption all of the material may be ejected from a magma changer. Without support, the mountain above the empty chamber may collapse. This produces a huge **caldera**. Calderas are generally round, bowl-shaped formations like the picture in **Figure** 1.5.

FIGURE 1.5

Crater Lake, Oregon is the remnant of Mount Mazama. After an enormous eruption the mountain collapsed, forming a caldera. Crater Lake should actually be named Caldera Lake. Wizard Island, within the lake, is a cinder cone.

Supervolcanoes

Supervolcanoes are the most dangerous type of volcano. During an eruption, enormous amounts of ash are thrown into the atmosphere. The ash encircles the globe. This blocks the Sun and lowers the temperature of the entire planet. The result is a volcanic winter.

A supervolcano eruption took place at Lake Toba in northern Sumatra about 75,000 years ago (**Figure** 1.6). This was the largest eruption in the past 25 million years. As much as 2,800 cubic kilometers of material was ejected into the atmosphere. The result was a 6- to 10-year volcanic winter. Some scientists think that only 10,000 humans survived worldwide. The numbers of other mammals also plummeted.

The most recent supervolcano eruption was in New Zealand. The eruption was less than 2000 years ago. For a supervolcano eruption it was small, about 100 cubic kilometers of material. A much larger super eruption in Colorado produced over 5,000 cubic kilometers of material. That eruption was 28 million years ago. It was 5000 times larger than the 1980 Mount St. Helens eruption.

The largest potentially active supervolcano in North America is Yellowstone. The caldera has had three super eruptions at 2.1 million, 1.3 million and 640,000 years ago. The floor of the Yellowstone caldera is slowly rising upwards. Another eruption is very likely but no one knows when.

The cause of supervolcano eruptions is being debated. Enormous magma chambers are filled with super hot magma. This enormous eruption leaves a huge hole. The ground collapses and creates a caldera.

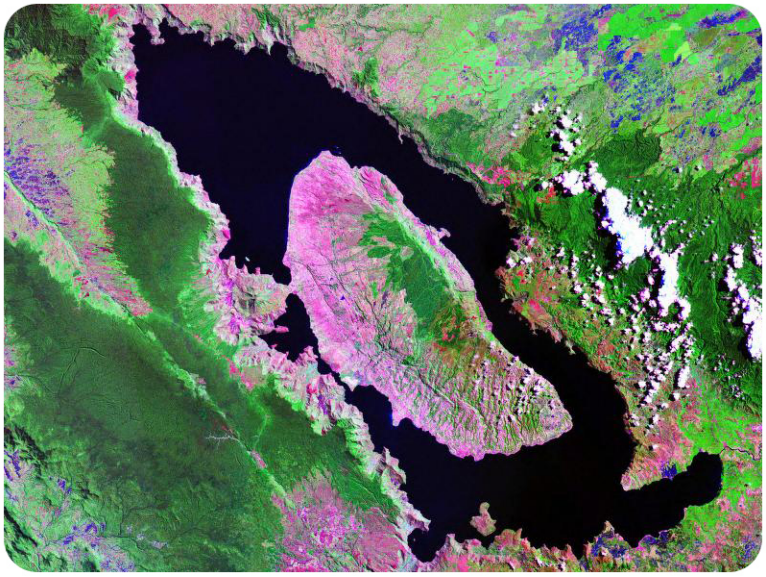


FIGURE 1.6

Lake Toba is now a caldera. It was the site of an enormous super eruption about 25 million years ago.

Lesson Summary

- Composite cones, shield volcanoes, cinder cones and supervolcanoes are some of the types of volcanoes formed.
- Composite cones are steep sided, cone shaped volcanoes that produce explosive eruptions.
- Shield volcanoes form very large, gently sloped volcanoes with a wide base.
- Cinder cones are the smallest volcanic landform. They are formed from accumulation of many small fragments of ejected material.
- A caldera forms when an explosive eruption leaves a large crater when the mountain blows apart.
- Supervolcanoes are tremendously devastating types of volcanoes that could destroy large areas when they erupt.

Lesson Review Questions

Recall

1. Describe a composite volcano and how it forms.
2. Describe a shield volcano and how it forms.
3. Describe a cinder cone and how it forms.

Apply Concepts

4. You have been told to visit an erupting volcano. Since you value your life, which type do you choose to visit and why?
5. How does the composition of magma affect the type of volcano that forms?

Think Critically

6. Scientists have only recently recognized the existence of supervolcanoes. Why were they the last type of volcano discovered?

7. The largest volcano in the solar system is not on Earth. What is needed for there to be an enormous volcano? What does this tell us about planets with enormous volcanoes?

Points to Consider

- Composite volcanoes usually have craters on the top. Why are the craters sometimes "U" or horseshoe-shaped?
- A shield volcano is relatively flat, and a composite volcano is relatively steep because of the type of magma that creates them. What type of lava might create a volcano that is steeper than a shield volcano but not as steep as a composite volcano?
- Some people believe there would be a worldwide catastrophe if a huge asteroid hits the Earth. How might an asteroid impact and a supervolcano eruption be similar?

References

1. Flickr:skyseeker. http://commons.wikimedia.org/wiki/File:Mt._Fuji.jpg . CC BY 2.0
2. Zachary Wilson. CK-12 Foundation . CC BY-NC 3.0
3. Graeme Churchard (Flickr:GOC53). http://www.flickr.com/photos/graeme/5587431742/ . CC BY 2.0
4. Courtesy of LassenNPS. http://www.flickr.com/photos/lassennps/8368094653/ . CC BY 2.0
5. Flavia (Flickr:Flavia_ff). http://www.flickr.com/photos/mistressf/788501243/ . CC BY 2.0
6. Courtesy of NASA. http://commons.wikimedia.org/wiki/File:Toba_zoom.jpg . Public Domain