

Landforms From Lava and Ash

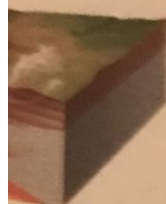
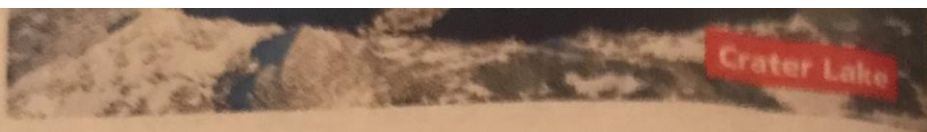
 Volcanic eruptions create landforms made of lava, ash, and other materials. These landforms include shield volcanoes, cinder cone volcanoes, composite volcanoes, and lava plateaus. Look at Figure 12 to see these features. Another landform, called a caldera, results from the collapse of a volcanic mountain.

Shield Volcanoes At some places on Earth's surface, thin layers of lava pour out of a vent and harden on top of previous layers. Such lava flows gradually build a wide, gently sloping mountain called a **shield volcano**. Shield volcanoes created the Hawaiian Islands and the Medicine Lake volcano in northern California.

Cinder Cone Volcanoes If a volcano's lava is high in silica, it may produce ash, cinders, and bombs. These materials build up around the vent in a steep, cone-shaped hill or small mountain called a **cinder cone**. For example, Parícutín in Mexico erupted in 1943 in a farmer's cornfield. The volcano built up a cinder cone about 400 meters high.

Composite Volcanoes Sometimes, lava flows alternate with explosive eruptions of ash, cinder, and bombs. The result is a composite volcano. **Composite volcanoes** are tall, cone-shaped mountains in which layers of lava alternate with layers of ash. Examples include Mount Fuji in Japan and Mount Shasta and Lassen Peak in California.

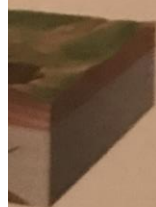
Lava Plateaus Some eruptions of lava form high, level areas called lava plateaus. First, lava flows out of several long cracks, or fissures, in an area. The thin, runny lava travels far before cooling and solidifying. Again and again, floods of lava flow on top of earlier floods. After millions of years, these layers of lava can form high plateaus. Examples include the Columbia Plateau in Washington, Oregon, and Idaho, and the Modoc Plateau in northeastern California.



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Calderas The huge hole left by the collapse of a volcanic mountain is called a **caldera** (kal DAIR uh). The hole is filled with the pieces of the volcano that have fallen inward, as well as some lava and ash.

How does a caldera form? Enormous eruptions may empty the main vent and the magma chamber beneath a volcano. The mountain becomes a hollow shell. With nothing to support it, the top of the mountain collapses inward, forming a caldera.

In Figure 13 you can see steps in the formation of Crater Lake, a caldera in Oregon. Crater Lake formed about 7,700 years ago when a huge explosive eruption partly emptied the magma chamber of a volcano called Mount Mazama. When the volcano exploded, the top of the mountain was blasted into the atmosphere. The caldera that formed then filled with water from rain and snow.

In California, the Long Valley caldera formed after a huge eruption about 760,000 years ago. Geologists have detected the release of carbon dioxide gas and earthquakes centered near the caldera. These events are signs that volcanic eruptions might someday occur in the same area.

Soils From Lava and Ash Why would anyone live near an active volcano? People often settle close to volcanoes to take advantage of the fertile volcanic soil. The lava, ash, and cinders that erupt from a volcano are initially barren. Over time, however, the hard surface of the lava breaks down to form soil. When volcanic ash breaks down, it releases potassium, phosphorus, and other substances that plants need. As soil develops, plants are able to grow. Some volcanic soils are among the richest soils in the world. Rich soil is fertile, or able to support plant growth.

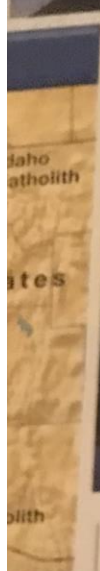
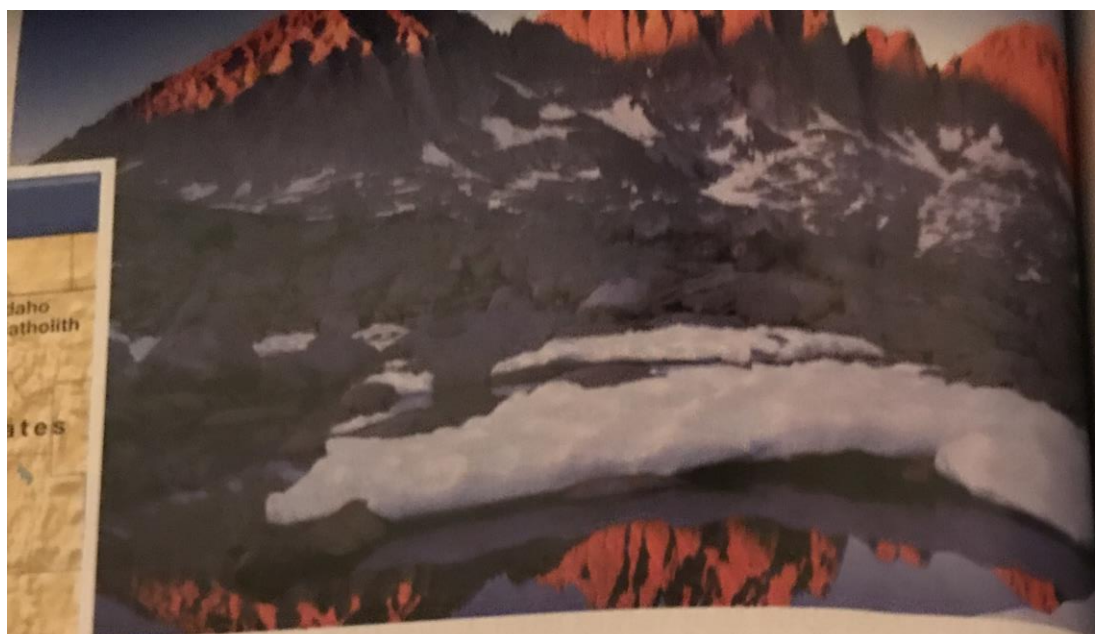
Landforms From Magma

Sometimes magma forces its way through cracks in the upper crust, but fails to reach the surface. There the magma cools and hardens into rock. Over time, the forces that wear away Earth's surface—such as flowing water, ice, or wind—may strip away the layers above the hardened magma and finally expose it.  **Features formed by magma include volcanic necks, dikes, sills, and batholiths.**

Volcanic Necks A volcanic neck looks like a giant tooth stuck in the ground. A **volcanic neck** forms when magma hardens in a volcano's pipe. The softer rock around the pipe wears away, exposing the hard rock of the volcanic neck. Ship Rock in New Mexico, shown in Figure 14, is a volcanic neck.

Dikes and Sills Magma can force its way across or between rock layers. Magma that forces itself across rock layers hardens into a **dike**. Sometimes, a dike can be seen slanting through bedrock along a highway cut. When magma squeezes between horizontal layers of rock, it forms a **sill**.

Dikes and sills are examples of igneous intrusions. An **intrusion** forms when magma hardens underground to form igneous rock. An intrusion is always younger than the rocks around it.



Batholiths Large rock masses called batholiths form the core of many mountain ranges. A **batholith** (BATH uh lith) is a mass of rock formed when a large body of magma cools inside the crust. The map in Figure 15 shows just how big batholiths really are. The Sierra Nevada batholith extends for roughly 600 kilometers along the eastern side of California. The photograph shows how a batholith looks when the layers of rock above it have worn away.

Assessment



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c. **Predicting** After millions of years, what landform forms from hardened magma in the pipe of an extinct volcano?

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