

One of the most spectacular shows in nature occurs when a volcano erupts (**Figure 1**). Any opening in Earth's crust through which molten rock and other materials erupt is called a **volcano**.

Volcanoes and earthquakes are proof that, deep within our planet, there are tremendous forces at work. Like earthquakes, most volcanoes are located along the edges of Earth's plates. Only a few volcanoes are found away from the edges of plates.

Some volcanoes erupt frequently and relatively quietly. You can actually watch the lava flow out of these volcanoes from a safe distance. Other volcanoes only erupt once every few hundred years, but with massive explosions. Many volcanoes go unnoticed at the bottom of oceans.

LEARNING TIP

Make a three column K-W-L chart. Record what you already know about volcanoes in the first column. Record what you wonder about them in the second column. After you finish reading this section, write what you have learned in the third column.



Figure 1

Molten lava flows from a Hawaiian volcano into the ocean.

Volcanoes at Divergent Boundaries

When you hear the word “volcano,” you probably think of a volcano on land. However, about three-quarters of all lava produced on Earth comes from eruptions at divergent boundaries on the ocean floor. Magma pushes to the surface where plates are moving apart (**Figure 2**). The lava erupts and cools to form a ridge on each side of the crack on the ocean floor. Some of these ridges may rise high enough to reach the surface, creating islands. Iceland was formed, and continues to be formed, in this way.

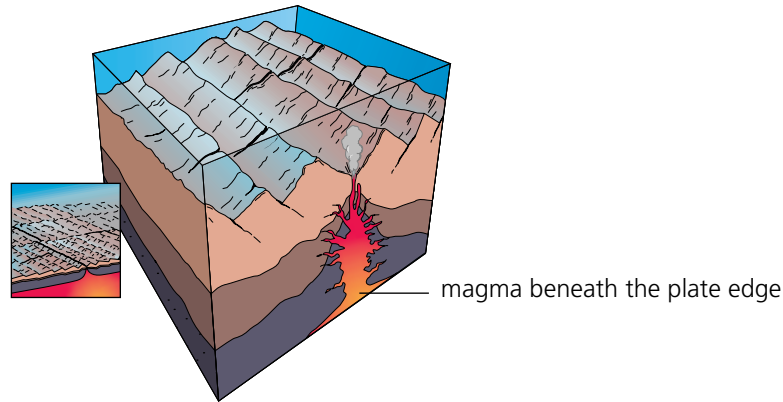


Figure 2

The Mid-Atlantic Ridge was formed by magma pushing two plates apart.

In 1963, plumes of smoke billowed out of the ocean near Iceland (**Figure 3**). Soon a new island appeared, as large amounts of magma flowed out of the ocean rift between the Eurasian and North American Plates. Eventually, the island grew to 150 m above sea level.

Mount Edziza, Hoodoo Mountain, Lava Fork, and Crow Lagoon are volcanoes on a divergent boundary in the northwestern corner of British Columbia, near the border of Alaska. These are the youngest volcanoes in the province. It has been 150 years since one erupted.



Figure 3

The new island formed off the coast of Iceland was named Surtsey, after Surt, the lord of the land of fire giants in Norse mythology.

Volcanoes at Convergent Boundaries

Most of the volcanoes on land are located near convergent plate boundaries. Some of the most powerful volcanic eruptions occur where one plate is being subducted under another plate. The magma that is formed in a subduction zone is thick and sticky. Since the magma is too still to allow steam and volcanic gases to escape, tremendous pressure builds up. This type of volcano erupts explosively as the pressure is released. As the lava reaches the surface, the high-pressure steam escapes, carrying the lava and ash with it (Figure 4).

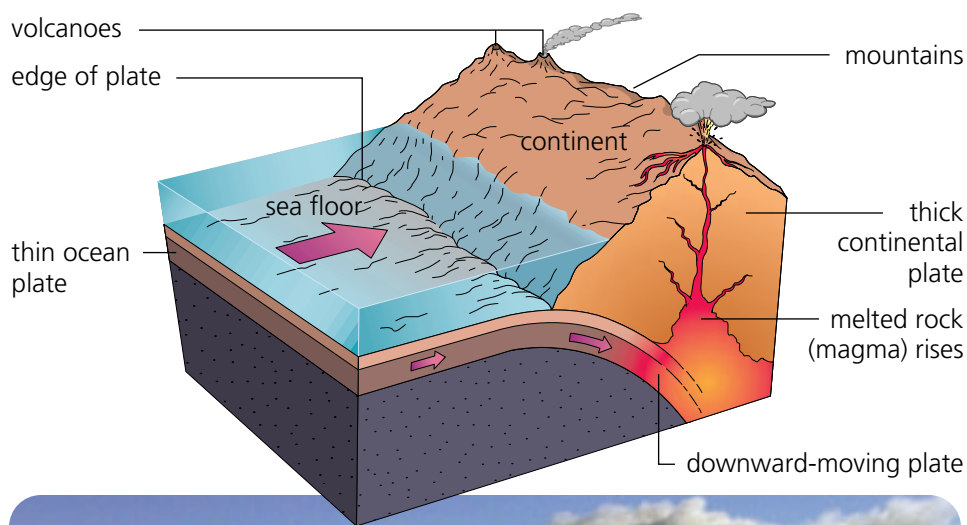


Figure 4

In 2004, Mount St. Helens, in the state of Washington, erupted. Mount St. Helens is near the convergent plate boundary where the Juan de Fuca Plate is being pulled under the North American Plate.

There has not been an explosive volcanic eruption in British Columbia since Mount Meager, near present-day Whistler, erupted over 2000 years ago. Mount Silverthorne, Mount Cayley, and Mount Garibaldi are other volcanoes on the convergent boundary where the Juan de Fuca plate is being subducted under the North American plate.



Volcanoes That Form at Hot Spots

Although most of Earth's volcanoes occur near plate boundaries, there are some exceptions. The Hawaiian Islands formed from volcanoes in the middle of the Pacific Ocean, over 3000 km from the nearest plate boundary. This puzzled scientists until J. Tuzo Wilson discovered evidence of hot spots. **Hot spots** are parts of the mantle where the temperature is much higher than normal.

At a hot spot, magma collects in enormous pools. The hot magma eventually melts a hole in the rock above it and pours out of the hole onto Earth's surface as lava (**Figure 5**). The lava that is produced at a hot spot tends to be runny and so fluid that the volcano does not erupt explosively. The lava simply pours out of the volcano like a river and hardens.

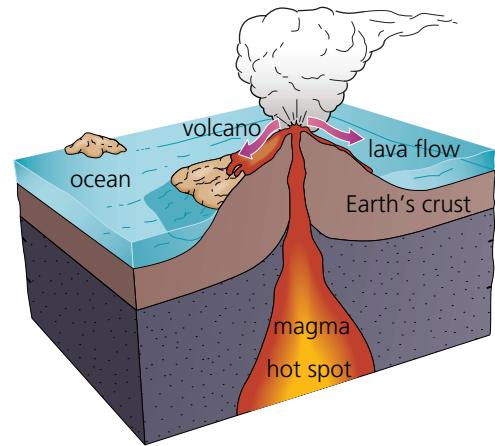


Figure 5

Volcanoes can form at a hot spot, where a huge pool of hot magma has risen through the mantle and melted a hole through the solid rock of Earth's crust.

If this type of volcano forms on the ocean floor, the lava hardens more quickly than it would on land. The hardened lava forms a cone-shaped mountain that may eventually rise above sea level as an island. This is how the Hawaiian Islands were formed (**Figure 6**).

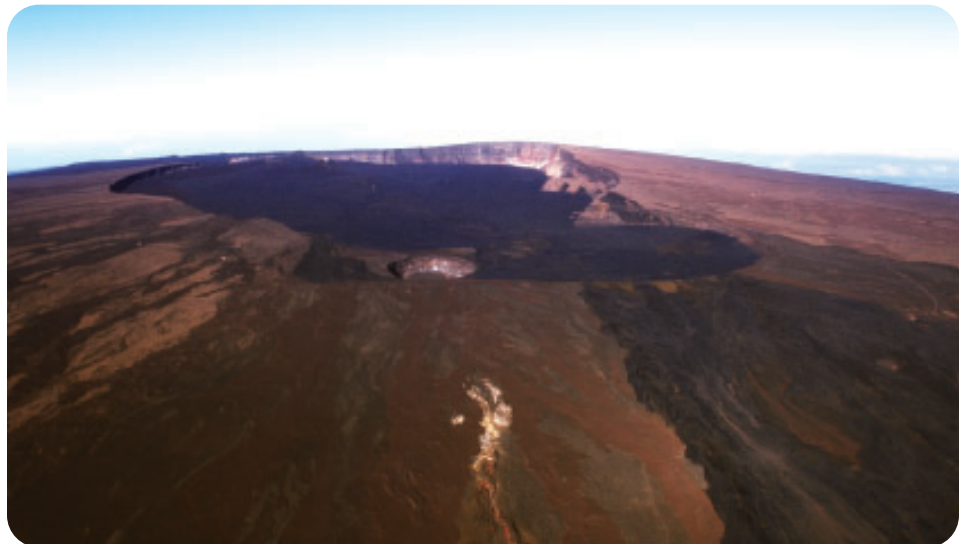


Figure 6

Mauna Loa, on the island of Hawaii, is a volcano that formed at a hot spot. From its base at the bottom of the Pacific Ocean to its summit, it rises 9750 m. This makes it taller than Mount Everest!

Recently, an underwater volcanic peak rising above the ocean floor was discovered close to the southern coast of the island of Hawaii. Scientists call it Loihi. It is over 3000 m above the floor of the ocean, but it is not expected to become an island officially for another 45 000 years.

British Columbia has a small hot spot area called the Anahim Volcanic Belt. This area stretches from the coast to Quesnel. **Figure 7** summarizes the locations where all three types of volcanoes are found in British Columbia.

LEARNING TIP

It is easier to remember information if you personalize it. How might a volcano affect your life?



Figure 7
Volcano locations in British Columbia.

TRY THIS: CLASSIFY VOLCANOES

Skills Focus: inferring, classifying

Go back to the map you labelled in Investigation 8.5. Beside each volcano you labelled, indicate whether it is occurring near a

- divergent boundary
- convergent boundary
- hot spot

Design your own symbols to use on your map.

The Effects of Volcanoes

Earthquakes can be very destructive, killing people and destroying property. People have been killed by clouds of hot ash and poisonous gases, and buried by volcanic mudslides. People have died of starvation because their crops, livestock, or other sources of food were destroyed. Whole villages and even cities have been destroyed by volcanoes. About 250 years ago, a lava flow in northern British Columbia destroyed two villages and killed about 2500 people (**Figure 8**). Scientists believe they were killed by carbon dioxide gas.

LEARNING TIP

Ask yourself, “How could community planners make use of this information on the effects of volcanoes?”



Figure 8

Lava beds at Anhluut’ukwsim Laxmihl Angwinga’asanskwhl Nisga’a: This is the first provincial park in British Columbia that has been established to combine the interpretation of geological features and Aboriginal culture.

Not all the effects of a volcano are felt right away or only close to the volcano. Ash from the 1980 eruption of Mount St. Helens fell on Vancouver. Large, explosive eruptions can send ash and gases high into the atmosphere. Volcanic clouds from the eruptions of Tambora (Indonesia) in 1815 and Mount Pinatubo (Philippines) in 1991 drifted around Earth, blocking the Sun and cooling temperatures for years.

Volcanoes have positive effects, as well. Volcanic ash improves soil and creates rich farmland. Volcanic rocks contain many useful minerals and gems. Some of the largest diamonds in the world are found in volcanic rocks. People have been using volcanic rocks for thousand of years. The Tahltan [TALL-tan] First Nation was mining obsidian several thousand years ago because the sharp edges and points of this volcanic rock could be made into useful tools (Figure 9). Some Aboriginal peoples used obsidian scalpels for surgery. This indigenous knowledge is important today—obsidian scalpels are still used for eye surgery.



Figure 9

Aboriginal people in many areas used the volcanic rock obsidian to make tools.

CHECK YOUR UNDERSTANDING

1. Copy and complete **Table 1** to summarize what you have learned about the three main types of volcanoes.

Table 1 Types of Volcanoes

Location	Characteristics	Examples

2. People were killed when Mount St. Helens erupted, but tourists can watch volcanic eruptions in Hawaii. Why are some volcanoes more explosive than others?
3. The ancient Roman city of Pompeii was destroyed by an earthquake in 63 C.E. Pompeii was rebuilt, only to be destroyed again in 79 C.E. when a nearby volcano, Vesuvius, erupted and buried the city in ash. Why are many volcanoes found in the same areas that earthquakes occur?
4. All the volcanoes in Canada are located in British Columbia and the Yukon Territory. Explain why.