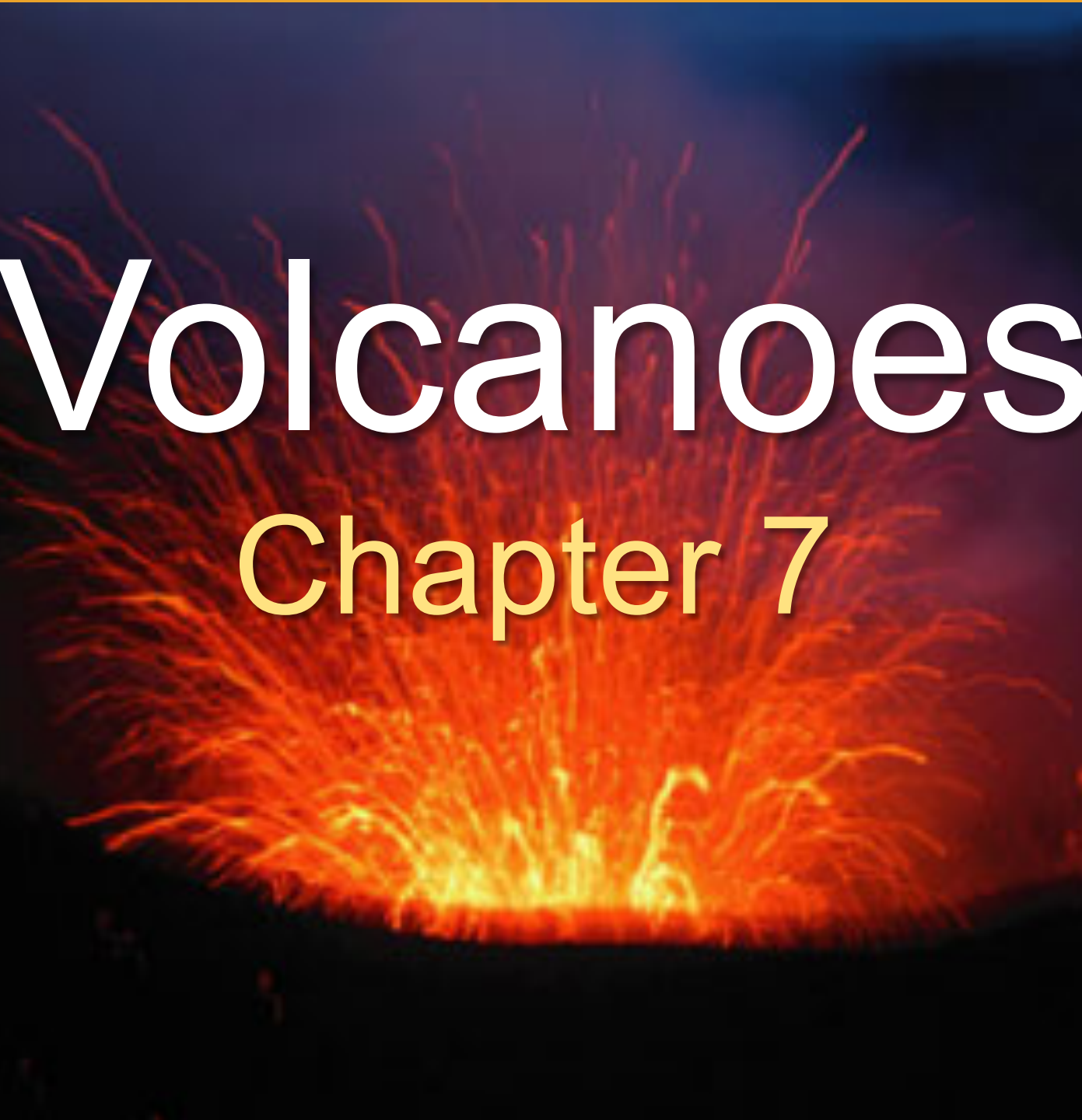


A photograph of a volcanic eruption at night, showing a bright orange and yellow lava flow at the base of the volcano, with numerous thin, dark, and glowing red lava fountains spraying upwards into a dark blue sky. The entire image is framed by a thick orange border on the left and right sides, which features a pattern of faint, overlapping white circles.

Volcanoes

Chapter 7

The Big Idea

Volcanoes are locations where magma reaches Earth's surface. They affect human and wildlife habitats.

- **Lesson 1: Volcanoes and Plate Boundaries**

- Most volcanic activity occurs along plate boundaries where plates move relative to one another.

- **Lesson 2: Volcanic Eruptions**

- Earthquakes cause seismic waves that provide valuable data.

- **Lesson 3: Hazards of Volcanic Eruptions**

- Volcanic eruptions can change human and wildlife habitats.

Lesson 1: Volcanoes & Plate Boundaries

Most volcanic activity occurs along plate boundaries where plates move relative to one another.

What you'll learn:

- **Explain what causes volcanic activity.**
- **Relate the location of volcanoes to plate boundaries.**

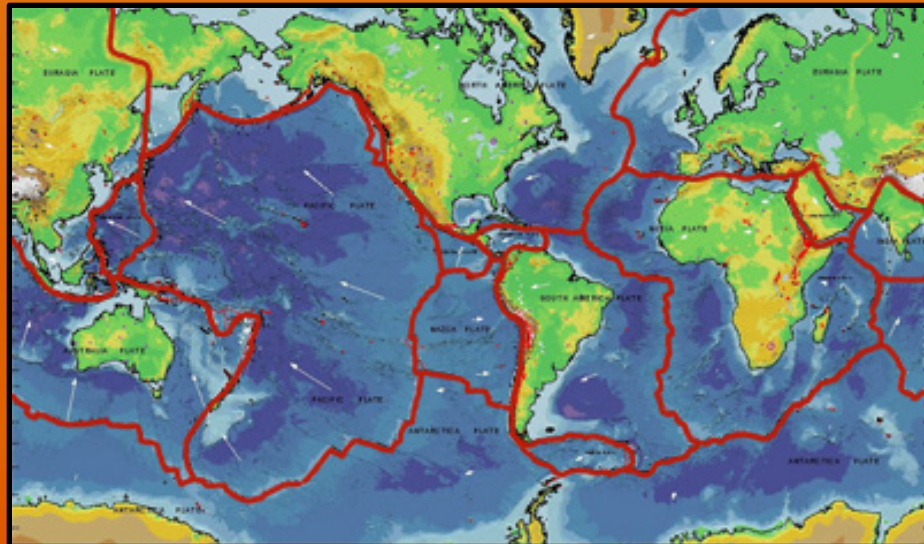
So What?!

Understanding how volcanoes form and where they occur helps scientists predict volcanic eruptions.

Review Vocabulary

Lithospheric plate

A section of Earth's crust and rigid upper mantle that moves slowly on the asthenosphere.



New Vocabulary

A volcano is a land or an underwater feature that forms when magma reaches the surface of Earth. The opening through which magma escapes from a volcano onto Earth's surface is called a vent. During a fissure eruption, magma escapes through cracks in Earth's surface. Most volcanoes occur along plate boundaries, but some form from localized areas of heat called hot spots that occur inside Earth.

Academic Vocabulary

source Point of origin

*** We found the source of the leak to be the hole in the pipe.**

What Is A Volcano?



What Is A Volcano?

Distinguish magma from lava.

Magma

Magma is molten material that forms igneous rock. It is INSIDE of the Earth!

Lava

Lava is magma that has reached Earth's surface.

How Do Volcanoes Form?

Sequence the events that occur as a volcano forms.

Heat deep inside Earth causes rock to melt, forming magma

Magma rises because it is less dense than surrounding rock.

Magma reaches Earth's surface and flows out through a vent, becoming lava.

A cone-shaped landform develops from the lava that pours onto Earth's surface.

How Do Volcanoes Form?

Organize information about fissure eruptions by completing the table.

Fissure Eruptions

**When they
occur**

**When magma escapes from
cracks in Earth's crust**

**Where they
occur**

At divergent plate boundaries

**What they
form**

**In oceans: mid-ocean ridges and
new seafloor**

**On continents: rifts and new crust
at Earth's surface**

Summarize it!

**Summarize the three main
ideas of the above
sections.**

Where Do Volcanoes Occur?

Identify three places at which volcanoes often form.

1. At divergent plate boundaries
2. At convergent plate boundaries
3. At hot spots

Where Do Volcanoes Occur?

Compare & Contrast how volcanoes form at divergent and convergent plate boundaries.

At Divergent Boundary	At Convergent Boundary
❖ When plates move apart, a huge crack forms between them. ❖ Magma rises through the crack and reaches the surface. ❖ The magma cools and hardens to form new crust.	❖ When two plates are pushed together, one plate sinks beneath the other. ❖ Magma forms as the plate sinks. ❖ The magma rises to the surface forming volcanoes.

Where Do Volcanoes Occur?

Classify the types of plates involved in the formation of each group of landforms.

Volcanic Landforms at Converging Plates

**Island
Arcs**

include

**Volcanic
Arcs**

that form where

**Two oceanic
plates are
pushed
together**

that form where

**An oceanic plate
sinks beneath a
continental plate.**

Summarize it!

**Summarize the main idea
of the above sections.**

Lesson 2: Volcanic Eruptions & Features

The composition of magma controls volcanic eruptions and determines the different types of lava flow and volcanic features

What you'll learn:

- **Relate the composition of magma to characteristics of volcanic eruptions.**
- **Compare and contrast different types of volcanoes.**
- **Analyze California's volcanic activity.**
- **Differentiate between volcanic features.**

So What?!

Understanding the composition of magma helps scientists better predict how volcanoes erupt.

Review Vocabulary

Landform

A cinder cone is a type of landform that results from volcanic activity.



New Vocabulary

Shield Volcano

Huge, gently sloping volcanic landform that is composed mainly of basaltic lava.

Cinder Cone Volcano

Steep-sided, cone-shaped landform that is composed mainly of solid fragments.

Tephra

Solid fragments, including rocks and boulders, that erupt from a volcano.

Composite Volcano

Mountainlike volcanoes that form from alternating layers of tephra and lava.

Academic Vocabulary

emerge To rise from; to come into view

* The lava emerged from the vent of the volcano, escaping onto Earth's surface.



What Controls Volcanic Eruptions?

Identify three factors that affect how a volcano erupts.

1. Composition of magma
2. Amount of dissolved gases in magma
3. Temperature of magma

What Controls Volcanic Eruptions?

Label the arrow to show how the amount of silica in magma affects its viscosity.

LOW VISCOSITY

HIGH VISCOSITY



LESS Silica

MORE Silica

Types of Magma & Lava

Compare & contrast basaltic magma & lava and granitic magma & lava.

	Basaltic	Granitic
Silica Content	low	high
Viscosity	low	high
Type of Eruption	Quiet, non-explosive	explosive

Types of Magma & Lava

Contrast pahoehoe lava and aa lava.

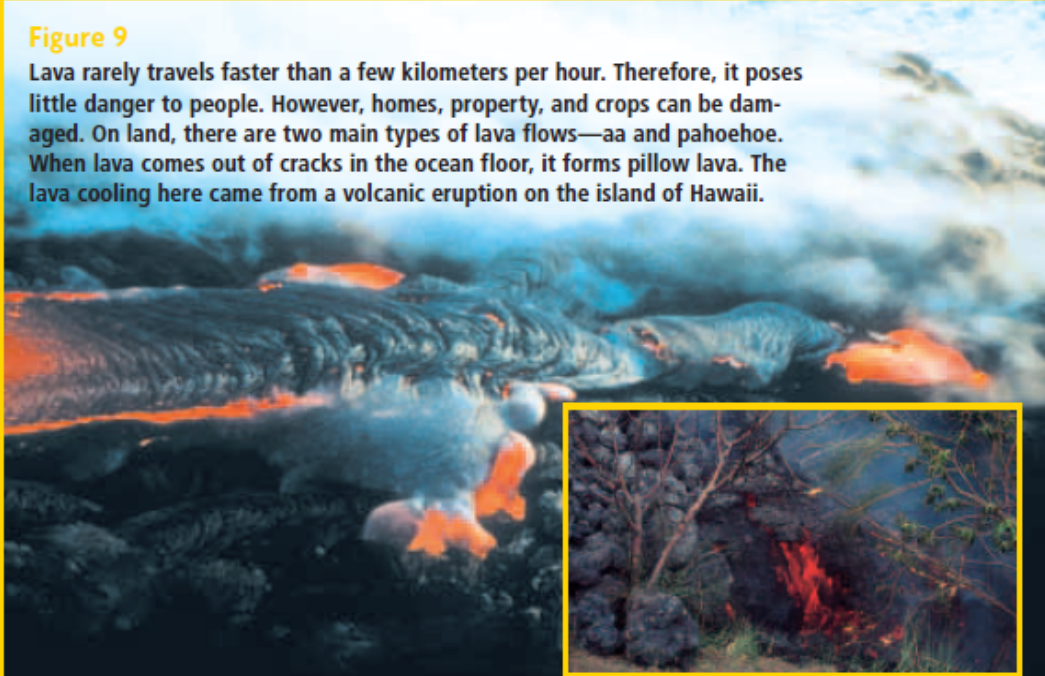
Pahoehoe lava: Flows down side of volcano; develops a smooth skin and ropelike structure as it cools.

Aa lava: Flows at a lower temperature, is stiffer, and moves more slowly than pahoehoe.

Visualizing Lava

Figure 9

Lava rarely travels faster than a few kilometers per hour. Therefore, it poses little danger to people. However, homes, property, and crops can be damaged. On land, there are two main types of lava flows—aa and pahoehoe. When lava comes out of cracks in the ocean floor, it forms pillow lava. The lava cooling here came from a volcanic eruption on the island of Hawaii.



Aa lava flows, like this one on Mount Etna in Italy, carry sharp, angular chunks of rock. Aa flows move more slowly than hotter pahoehoe flows.



Pahoehoe lava flows, like this one near Kilauea's Mauna Ulu Crater in Hawaii, are hotter and more fluid than aa flows. They develop a smooth skin and form ropelike patterns as they push forward and then cool.



Pillow lava occurs where lava oozes out of fissure eruptions in the ocean floor. It forms bubble-shaped lumps as it cools. Pillow lava is the most common type of lava on Earth.

Contributed by National Geographic

Summarize it!

**Summarize the main ideas
of the above sections.**

Volcano Types

```
graph TD; A([Volcano Types]) --> B([Shield]); A --> C([Cinder Cone]); A --> D([Composite]); B --> B1[Appearance: Huge, gently sloping]; B --> B2[Composition: Mainly basaltic lava]; B --> B3[Formation: Layers of gently flowing lava pile up]; C --> C1[Appearance: Steep-sided, cone-shaped]; C --> C2[Composition: Mostly solid fragmts = tephra]; C --> C3[Formation: Explosive eruptions create tephra piles near vent]; D --> D1[Appearance: Tall, steeper than shield]; D --> D2[Composition: Lava and tephra]; D --> D3[Formation: Alt. quiet & explosive eruptions = layers of lava & tephra];
```

Shield

Appearance:

Huge, gently sloping

Composition:

Mainly basaltic lava

Formation:

Layers of gently flowing lava pile up

Cinder Cone

Appearance:

Steep-sided, cone-shaped

Composition:

Mostly solid fragmts = tephra

Formation:

Explosive eruptions create tephra piles near vent

Composite

Appearance:

Tall, steeper than shield

Composition:

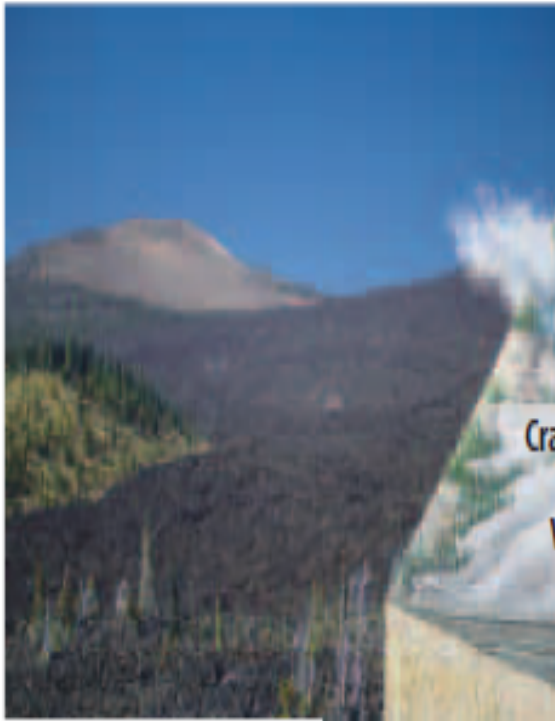
Lava and tephra

Formation:

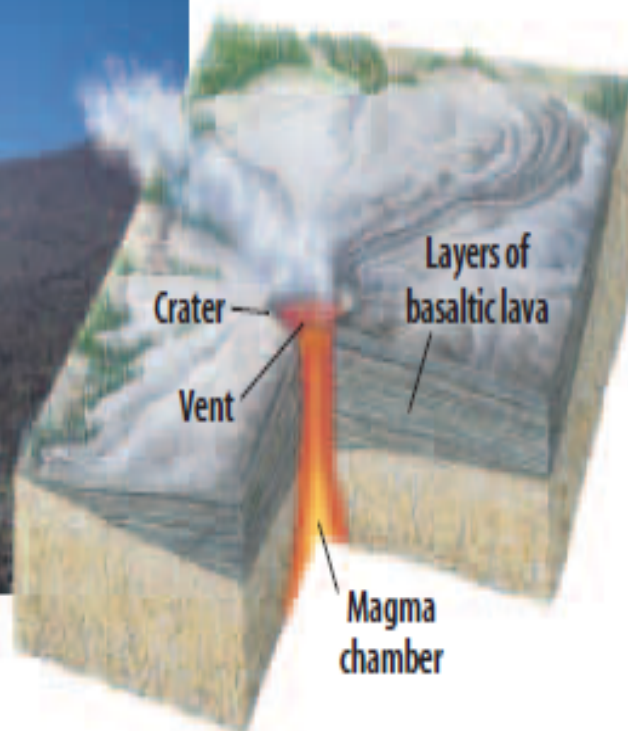
Alt. quiet & explosive eruptions = layers of lava & tephra

Types of Volcanoes

Model three types of volcanoes by drawing a cross-section of each in the boxes provided.



Belknap volcano, Oregon

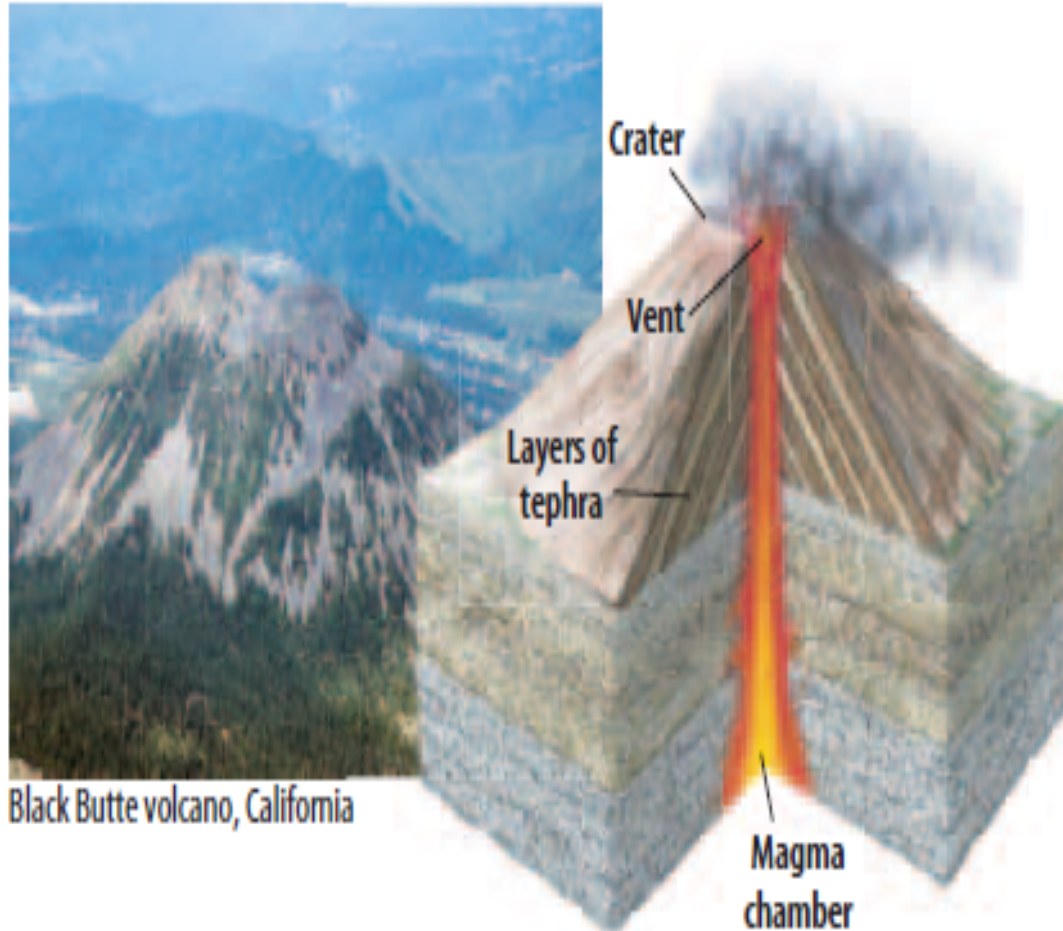


Shield Volcano

Show a broad volcano with broad, flat layers and gently sloping sides.

Types of Volcanoes

Model three types of volcanoes by drawing a cross-section of each in the boxes provided.



Cinder Cone Volcano

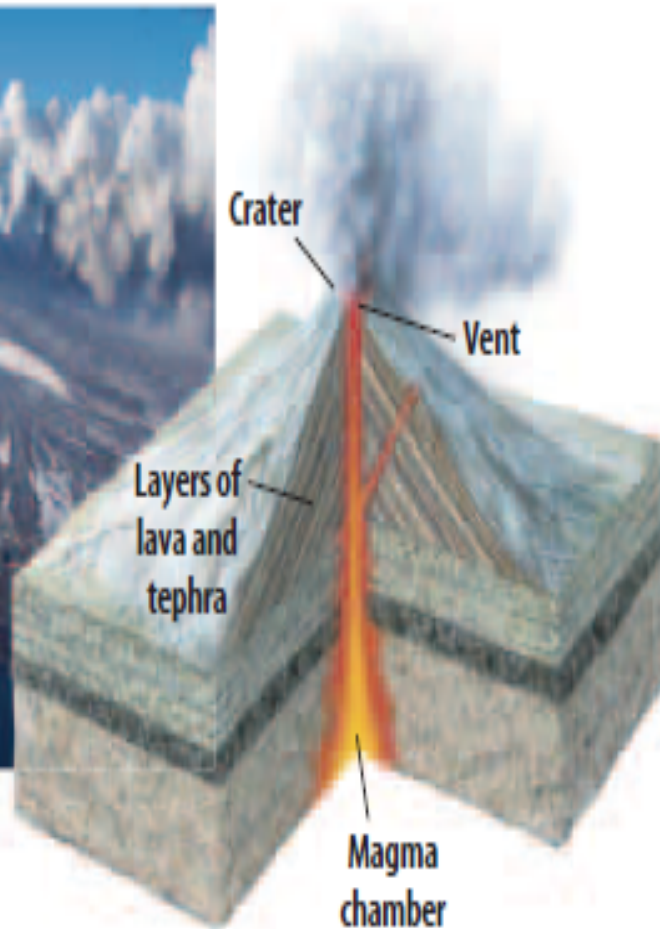
Show a steep-sided, cone-shaped volcano

Types of Volcanoes

Model three types of volcanoes by drawing a cross-section of each in the boxes provided.



Augustine volcano, Alaska



Composite Volcano

Show a steep-sided mountain with alternating layers of lava and tephra

Summarize it!

**Summarize the main idea
of the above sections.**

**(Three types of
volcanoes...)**

Volcanoes in California

Complete the following paragraph.

The Juan de Fuca **plate subducts
beneath the North American **plate.**
This forms a volcanic arc **. Part of**
this extends into Northern California **.****

Volcanic Features

Identify features of intrusive volcanoes (see pages 308-309).

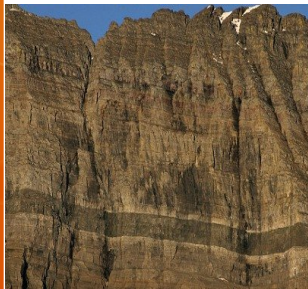
Intrusive Volcanic Features



Batholiths form when magma slowly cools and solidifies before reaching the surface.



Dikes are created when magma squeezes into cracks in rocks below the surface. The magma cuts across rock layers and hardens.



Magma that is parallel to rock layers and hardens is called a **sill**.



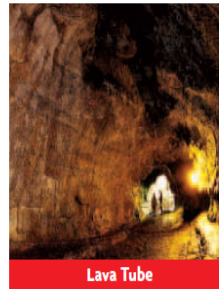
Volcanic Neck

When a volcano stops erupting, magma hardens inside the vent. Erosion wears away the volcano's cone, leaving behind the igneous core as a **volcanic neck**.



Lava Dome

After slowly erupting from the vent, granitic lava piles up instead of flowing freely. Pressure builds up within the **lava dome**, and gas, lava, and solid materials can be violently ejected into the air.



Lava Tube

A hollow tube forms when lava flows through a channel, cools, and hardens on the surface. **Lava tubes** often form underground and branch to the sea.

Wizard Island in Crater Lake, Oregon, USA



Lesson 3: Hazards of Volcanic Eruptions

Volcanic eruptions can change human and wildlife habitats.

What you'll learn:

- **Describe effects of volcanic eruptions on human and wildlife habitats.**
- **Discover geologic events that scientists observe and measure to help predict volcanic eruptions.**

So What?!

As scientists become better able to predict and monitor volcanic eruptions, more lives and property are saved.

Review Vocabulary

Seismic Wave

A wave that travels through Earth generated by an earthquake.

[Discover more about the Earth's interior](#)

SEISMIC WAVES

Which type of wave travels the farthest?

- ☐ P Wave
- ☐ S Wave

Which type of wave is bent (refracted)?

- ☐ P Wave
- ☐ S Wave
- ☐ Both

Now superimpose the seismographic data on the diagram of the Earth all at the same time by clicking the right arrow below.



New Vocabulary

Volcanic Ash

Very fine-grained tephra

***During a volcanic eruption, large clouds of volcanic ash may be ejected over wide areas.**

Lahar

Rapidly flowing mixture of volcanic debris and water

***Large lahars often begin as landslides.**

Pyroclastic Flow

Fast-moving body of hot gases and solids released from explosive volcanic eruptions

***Pyroclastic flows can destroy everything in their path.**

Academic Vocabulary

release To set free from confinement

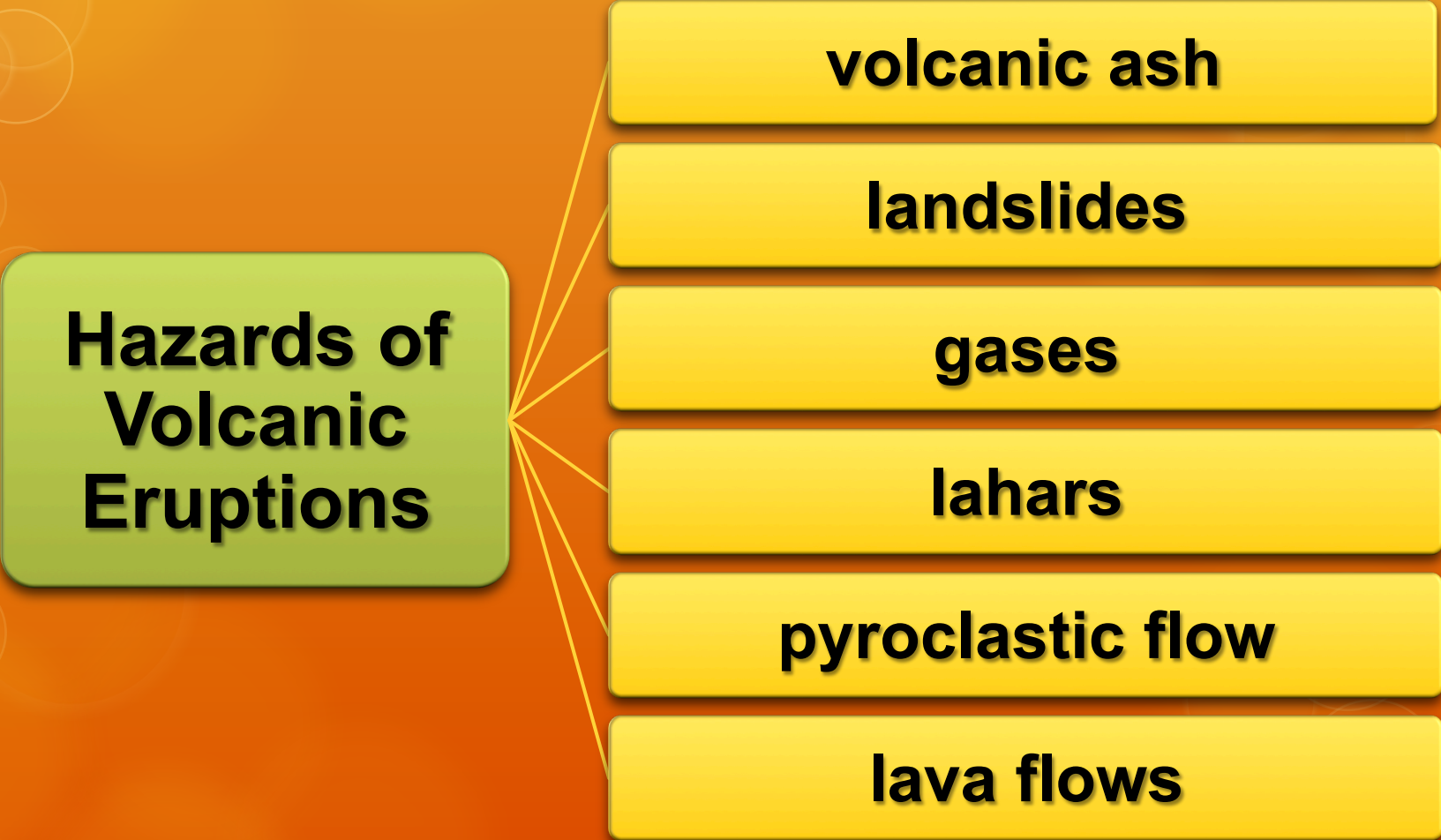
*** Volcanoes release hazardous gases into the atmosphere.**



Effects on Habitats

Organize information by listing six hazards of volcanic eruptions.

Hazards of Volcanic Eruptions



```
graph LR; A[Hazards of Volcanic Eruptions] --- B[volcanic ash]; A --- C[landslides]; A --- D[gases]; A --- E[lahars]; A --- F[pyroclastic flow]; A --- G[lava flows];
```

volcanic ash

landslides

gases

lahars

pyroclastic flow

lava flows

Effects on Habitats

Identify and Describe information about the harm that volcanic eruptions pose to habitats.

Volcanic Hazard	Potential Damage to Human or Natural Habitats
Volcanic Ash	Causes structural damage; buries plants, animals, and their food sources.
Landslides & Lahars	Bury habitats
Gases	Mix with water to form acid precipitation
Pyroclastic Flows	Burn or bury habitats; release gas that contaminates air
Lava Flows	Burn or bury habitats; release smoke that damages air quality



Lahar



Volcanic Ash

Summarize it!

**Summarize the main idea
of the above sections.**

Predicting Volcanic Eruptions

Analyze why each sign listed can be used to predict possible volcanic activity.

Small Earthquakes

Small earthquakes can occur as magma is forced up through brittle rock.

Gas Emissions

Different amounts of gases indicate how far beneath the surface magma is located.

Ground Movement

As magma is forced upward, the ground may rise or bulge slightly.

Temperature

As magma moves toward the surface, the temperature of the ground around the volcano may increase.

Monitoring Volcanic Activity

Identify three ways scientists monitor volcanic activity from space.

Monitoring Volcanic Activity from Space

```
graph TD; A[Monitoring Volcanic Activity from Space] --> B[Satellite Imaging]; A --> C[Radar Imaging]; A --> D[GPS];
```

**Satellite
Imaging**

**Radar
Imaging**

GPS

Summarize it!

**Summarize two main ideas
of the above sections in
two bullet points.**



Mt. Vesuvius





Mt. Vesuvius







