

# VOLCANOES

An opening in the earth's crust through which magma erupts.

# Magma

- ▣ As magma forms, it flows upward through cracks in the rock above it.
- ▣ Magma rises until it becomes trapped under layers of rock or until it reaches the surface.
- ▣ If it reaches the surface, it erupts through a volcano.
- ▣ Magma that erupts through a volcano is called lava.

- ▣ Magmas that are high in silica are **thick**, light-colored and slow-moving (FELSIC).
  - Granite
- ▣ Magmas that are low in silica, high in iron are **thinner**, darker and fast-moving (MAFIC).
  - Basalt

## (WRITE IN NOTES)

- ▣ Viscosity - the ability of a liquid to resist flowing
  - Corn Syrup: High viscosity
  - Baby Oil: Low viscosity

# Kinds of Eruptions

## ▣ 1. Rift eruptions:

- Occur at long, narrow fractures in the crust
- Occur at divergent boundaries
- May be on the ocean floor or on land
- Non-explosive eruptions; mafic lava
- EX. Spreading centers such as the Mid-Atlantic Ridge



- ▣ 2. Subduction Boundary Eruptions:
  - Occur at convergent boundaries
  - Occurs in subduction zones
  - Explosive eruptions; felsic lava
  - Lava, steam and ash are ejected violently
  - Most of the world's active volcanoes occur at subduction boundaries
  - Ex. Japan, Philippines, Cascades, Andes



Like earthquakes, volcanoes tend to occur at plate boundaries!!

- ▣ The exceptions are:
- ▣ **3. Hot Spots:**
  - Occurs at areas of volcanic activity in the middle of a lithospheric plate
  - Eruption can be explosive or non-explosive
  - cause is unclear!
  - Ex. Hawaiian Islands, Yellowstone Nat'l Park

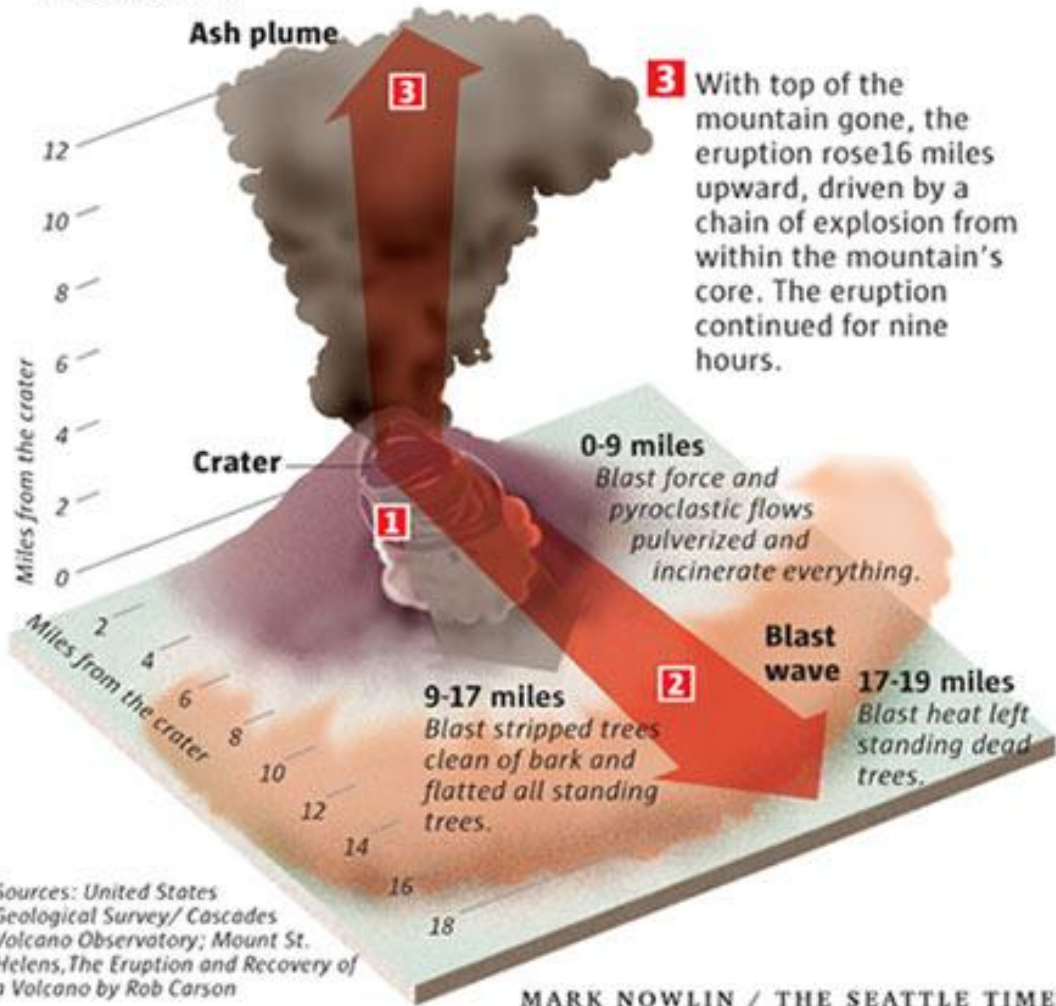




# May 18th, 1980

At 8:32 a.m. an earthquake signaled the beginning of Mount St. Helens' eruption.

- 1** Magma rising inside the mountain over a period of weeks created a bulge on the northside. At 8:32 a.m., a 5.1 magnitude earthquake broke the bulge loose, causing the northside to dissovle into a massive avalanche.
- 2** The avalanche released built up pressure from magmatic gases, resulting in a northern lateral explosion. The blast created a 17-18 mile fan-shaped path of destruction.



Sources: United States Geological Survey/ Cascades Volcano Observatory; Mount St. Helens, The Eruption and Recovery of a Volcano by Rob Carson

MARK NOWLIN / THE SEATTLE TIMES

## Mount St. Helens

- <http://dsc.discovery.com/videos/understanding-volcanoes-mt-saint-helens.html>

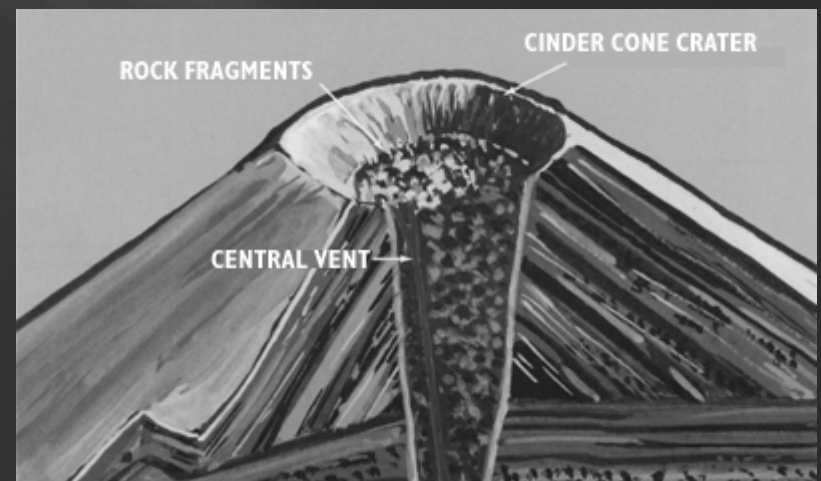
# Types of Volcanoes

## ▣ 1. Cinder cone:

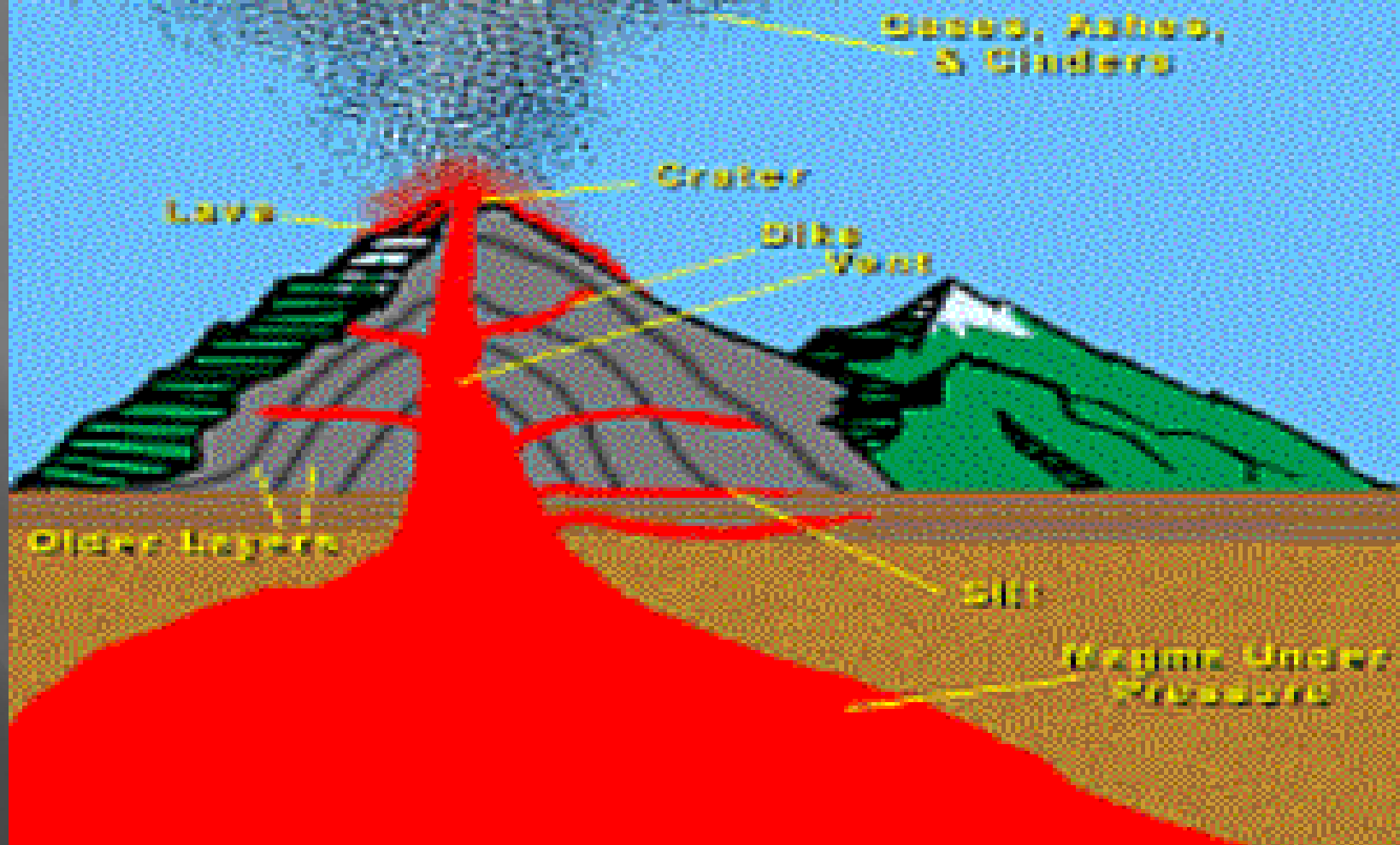
- Explosive; felsic lava
- Convergent boundaries; subduction zones
- Cinders and rock particles are blown into the air
- Small mountain; steep sides
- Ex. Paricutin, Mexico



1943 eruption



# Volcano Diagram

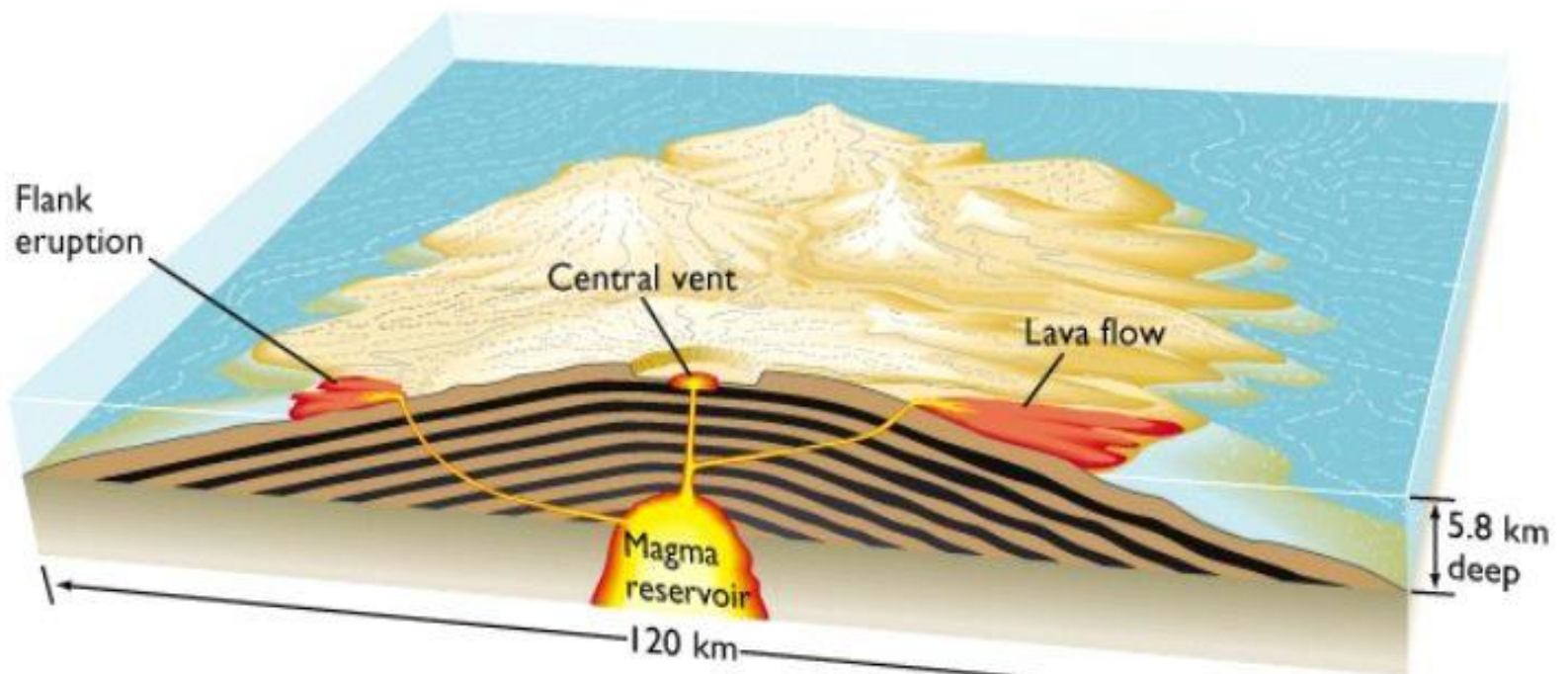




## ▣ 2. Shield volcano:

- Non-explosive; mafic lava
- Divergent boundaries; rift eruption or hot spot
- Lava quietly flows from the vent
- The mountain covers a large area; gently sloped sides
- Dome-shaped mountain
- Ex. Mauna Loa, HI; Iceland

# Shield Volcano



**Fig. 5.10**

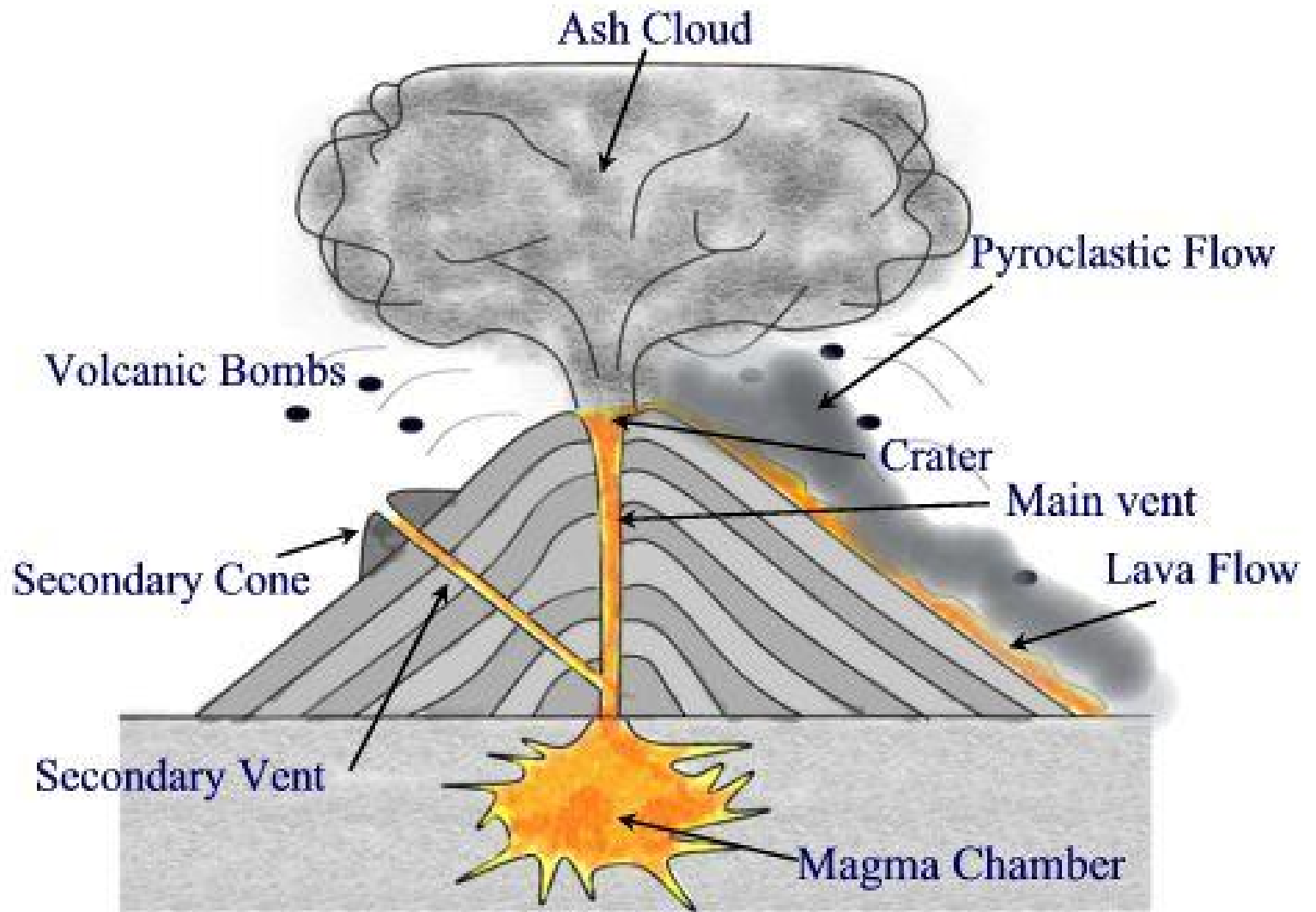


Mauna Loa, HI



### ▣ 3. Composite Cone (Stratovolcano):

- Mostly felsic or intermediate lava
- Explosive and non-explosive
- Convergent boundaries
- A violent eruption sends up volcanic bombs, cinders and ash.
- A quiet volcanic flow follows the explosion. Alternating layers continue forming the mountain.
- Large mountain; steep sides; cone-shaped
- Ex. Mt. Fuji, Japan; Mt. Vesuvius, Italy; Mt. St. Helens, WA



**Main Features of a Volcano**



# Other dangers of volcanoes

## ▣ Lahar Mud Flows

- Mixture of water, rock fragments and sediment that flow down the slopes of a volcano
- Looks like a mass of wet concrete
- Eruptions may trigger one or more lahars by quickly melting snow/ice or ejecting water from a crater lake
- Can easily grow to more than 10 times their initial size
- Typically associated with stratovolcanoes (explosive)

# Other dangers of volcanoes

- ▣ Atmospheric Ash
- ▣ Volcanic ash is made up of tiny, dust-like fragments of jagged rock, minerals and volcanic glass.
- ▣ Unlike the soft ash created by burning wood, volcanic ash is hard, abrasive, and does not dissolve in water
- ▣ After a violent eruption, the ash in the air can be thick enough to block sunlight. If inhaled, ash can cause breathing problems or suffocation. Severe eruptions that have sent ash into the atmosphere blocked some sunlight and lowered temperatures worldwide for years.

# Other dangers of volcanoes

- ▣ Pyrcoclastic flows
- ▣ current of superheated volcanic ash, lava, and gas that flows from a volcano.
- ▣ Moves very quickly
- ▣ Caused when an eruption column collapses or when a dome collapses
- ▣ **MOST DEADLY PART!**

