Volcanoes

Oregon's volcanoes reflect the state's location on the "Ring of Fire." This belt of volcanoes and earthquakes circles the Pacific Ocean, tracing the active boundaries of the Pacific and other neighboring crustal plates. Off the Pacific Northwest, a spreading ridge divides the Pacific Plate, moving to the northwest, from the Farallon Plate, moving to the southeast. The oceanic Farallon Plate meets the North American Plate in the Cascadia Subduction Zone, where it is overridden by the lighter continental material. The once immense Farallon Plate is now almost completely gone, subducted or recycled under the North American Plate. Three trailing remnants—the Gorda, Juan de Fuca, and Explorer Microplates—remain geologically important. At a depth of some 60 miles the subducted plate slab melts, sending plumes of molten rock, or magma, rising toward the surface, where some emerge as volcanoes. The Oregon Cascades are part of the archipelago of volcanoes that extends from Mount Lassen in Northern California into the Mount Garibaldi area in British Columbia.

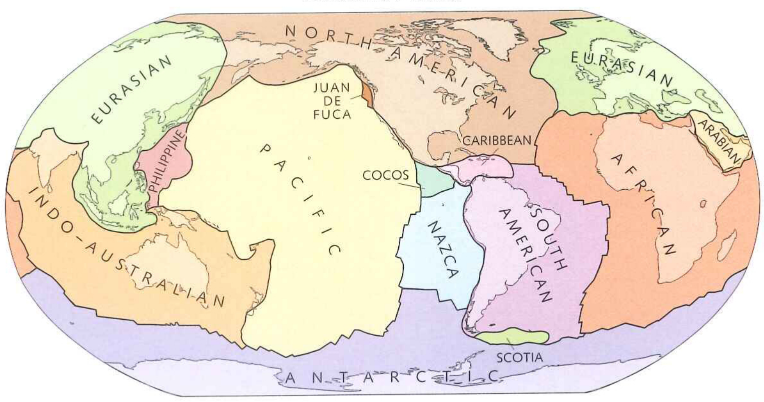
As the rate of plate collision has changed over time, the geometry of the plates being subducted beneath the Cascades has correspondingly altered. The result has been the steady movement of the volcanic crest eastward during the past 40 million years.

The active volcanic peaks are at present confined to the narrow belt known as the High Cascade Range and the adjacent western part of the High Lava Plains. The belt of active peaks was much broader during the Miocene epoch about 18 million years ago (see pages 146–147).

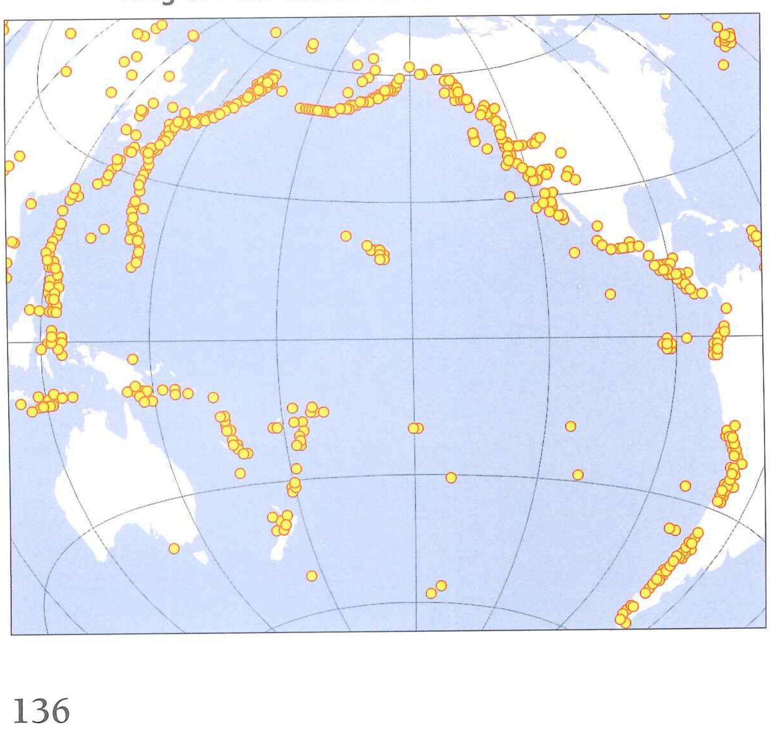
Typical volcanic forms include steep-sided stratovolcanoes like Mount Hood (see page 125); lower, more rounded domelike shield volcanoes like Newberry Crater; smaller swarms of volcanoes like those of the Boring Volcanic Field shown on page 123; cinder cones; and eroded remnants of all of these.

Cascade stratovolcanoes tend to erupt only very intermittently (as measured on a human time scale—on a geologic time scale they are extremely active). Unlike earthquakes, they almost always warn well in advance of an impending eruption, with elevated heat flow, microearthquakes and harmonic tremors, surface bulging and gas venting. The actual eruption can be a cataclysmic event of great force causing widespread destruction. The Mount St. Helens eruption in 1980 was a classic example, blasting 1,300 feet off the top of the mountain and leaving a crater floor nearly 3,500 feet below the former summit. Mount St. Helens is a small and young volcano, with its oldest deposits no more than 50,000 years old, and its now partially destroyed cone only about 2,200 years old. It is also the most active. Mount Mazama is about half a million years old and many times larger, with a peak estimated at 12,000 feet when it erupted repeatedly 6,600 years ago. The mountain then fell in on itself in a "collapse caldera" now occupied by Crater Lake. The high points remaining on the rim of its shattered cone are about 4,000 feet lower than the former summit, and the bottom of Crater Lake is another 4,000 feet below the rim. Newberry Crater, a low-profile shield volcano, formed a similar collapse caldera after eruptions about 7,000 years ago. The present appearance of all three features is strikingly similar. The digital oblique views on the facing page, showing landform details which are obscured in photographs by tree cover or haze, reveal many common characteristics. The smooth slopes of Mount St. Helens reflect its young age. Early stages of rebuilding are evident in the crater's central lava dome. Newberry Crater and Mount Mazama were also modified by subsequent lava flows and cinder cone development. Glacial valleys on the slopes of Mount Mazama testify to the size of the mountain that no longer exists. Cascade-type volcanoes typically experience episodes of growth punctuated by long periods of inactivity, so it is premature to consider any of the High Cascades volcanoes extinct.

Tectonic Plates



Ring of Fire: Volcanoes Around the Pacific



Subduction and Volcanism