

MT. HOOD

Summary

Mount Hood volcano, Oregon's highest peak, forms a prominent backdrop to the state's largest city, Portland, and contributes valuable water, scenic, and recreational resources that help sustain the agricultural and tourist segments of the economies of surrounding cities and counties. The volcano has erupted episodically for about 500,000 years and hosted two major eruptive periods during the past 1,500 years. During both recent eruptive periods, growing lava domes high on the southwest flank collapsed repeatedly to form pyroclastic flows and lahars that were distributed primarily to the south and west along the Sandy River and its tributaries. The last eruptive period began in AD 1781 and affected the White River as well as Sandy River valleys. The Lewis and Clark Expedition explored the mouth of the Sandy River in 1805 and 1806 and described a river much different from today's Sandy. At that time the river was choked with sediment generated by erosion of the deposits from the eruption, which had stopped about a decade before their visit. In the mid-1800's, local residents reported minor explosive activity, but since that time the volcano has been quiet.

Eruption History

Mount Hood, which has been active for at least 500,000 years, occupies a long-lived focus of volcanic activity that has produced ancestral Hood-like volcanoes for the past 1.5 million years. Much of the Mount Hood edifice is formed of lava flows, but eruptive activity during the past 30,000 years has been dominated by growth and collapse of near-summit lava domes to produce broad fans of pyroclastic flow deposits. Similar deposits were probably formed in Mount Hood's past but were largely eroded, especially during ice ages, and are poorly represented in the geologic record. The last two periods of eruptive activity occurred about 1,500 years ago and in the late 18th century. In addition to Mount Hood, other volcanoes scattered through the nearby area have erupted during the past 500,000 years. In contrast to the long-lived activity at Hood, each of these regional volcanoes was active for a relatively short period of time. The youngest such volcano is the 7-km-long Parkdale lava flow whose vent lies about 12 km north-northeast of the summit of Mount Hood.

Geology & History

Mount Hood is Oregon's highest peak and an active volcano of the Cascade Range. It is located about 80 km (50 mi) east of the Portland metropolitan area. Volcanism occurs at Mount Hood and other Cascades arc volcanoes because of the subduction of the Juan de Fuca Plate off the western coast of North America.

Mount Hood is a long-lived volcanic center that has erupted recurrently during the past 500,000 years, and geologic evidence records eruptions from a similar volcano at about the same site back to more than one million years ago. In fact, geologic studies of the Mount Hood region have identified products of numerous local volcanoes that post-date the great floods of basalt lava (the Columbia River Basalts) that flowed down ancestral valleys of the Columbia River between about 16 and 15 million years ago. Local volcanoes have ranged from long-lived andesitic to dacitic volcanoes similar to Mount Hood to relatively short-lived outpourings of basalt and basaltic andesite that built shield volcanoes and cinder cones.

Present-day Mount Hood has grown episodically, with decades to centuries of frequent eruptions separated by quiet periods lasting from centuries to more than 10,000 years. In the recent past, the volcano has produced two significant eruptive periods, one about 1,500 years ago and the other during the late 18th century. Mount Hood eruptions produce andesite and dacite lavas of a much narrower range of composition than does its neighbor

Future Eruptions of Mt. Hood

When Mount Hood erupts again, it will severely affect areas on its flanks as well as locations far downstream in the major river valleys that head on the volcano. Volcanoes like Mount Hood are very episodic in their eruptive behavior, and have periods with frequent eruptions over decades to centuries, separated by dormant periods lasting centuries to thousands of years. The volcano ended a long (~10,000 yr) dormant period about 1,500 years ago and has had two eruptive periods of lava-dome growth in the past 1,500 years. A significant eruption of Mount Hood, such as an eruption of lava domes that collapse to form pyroclastic

flows and lahars, would displace several thousand residents and cause billion-dollar-scale damage to infrastructure and buildings.

to the northwest, Mount St. Helens. The primary eruptive style has alternated between production of lava flows that have traveled as far as 12 km (7 mi) and lava domes that have piled up over vents on the steep upper slopes of the volcano; both types of eruptions were accompanied by modest production of tephra fallout. On the steep upper slopes of Mount Hood, growing lava domes have repeatedly collapsed to form hot, fast-moving pyroclastic flows. The extreme heat from such flows can swiftly melt significant quantities of snow and ice to produce lahars that surge down river valleys, typically far beyond the flanks of the volcano. Over the past 30,000 years, growth and collapse of lava domes and generation of lahars have dominated Mount Hood's eruptive activity.

Throughout Mount Hood's history, swift landslides, called debris avalanches, of various sizes have occurred. The largest ones removed the summit and sizable parts of the volcano's flanks and formed lahars that flowed to the Columbia River. Large debris avalanches occur infrequently and are usually triggered by eruptive activity. Smaller ones, not associated with eruptive activity, occur more frequently. Typically these are triggered by failure of rocks that have been altered and weakened by acidic volcanic fluids or by weathering.

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In addition to a large and growing nearby residential population, Mount Hood is a major recreation destination for skiing, climbing, hiking, camping, and other types of tourism. There are also significant elements of transportation and electrical power infrastructure in the area, all of which would be affected by future activity and cause major economic losses in the region.



MT. HOOD

Quick Facts

Location: Oregon, Clackamas/Hood River Counties

Latitude: 45.374 °N

Longitude: 121.695 °W

Elevation: 11,240 (f) 3,426 (m)

Volcano Type: Stratovolcano

Alert Level: Normal

Information Source:
www.volcanoes.usgs.gov/volcanoes/mount_hood
(12/04/12)

Lahars

Volcanic mudflows can be triggered by an eruption, can develop during a landslide, or can occur during periods of heavy precipitation and high runoff. These lahars sweep rapidly down valleys picking up additional debris while eroding the channels in which they travel. As the flows run out, they deposit the mass of material that was gathered along the way.

Lava-dome eruptions are characterized by frequent rockfalls and collapses of the growing dome. Collapses typically generate pyroclastic flows of a variety of sizes, all of which can swiftly melt snow and ice. Pyroclastic flows are confined to the volcano's flanks, but melt water can mix with rock debris to form lahars, the largest of which can flow far downstream.

Intense rainfall and sudden release of water from glaciers also cause small versions of lahars called debris flows. A rainstorm on Christmas day, 1980, triggered a landslide at the steep head of Polallie Creek on the east flank. The landslide transformed into a debris flow that scoured sediment from the creek's channel banks and entered the East Fork Hood River, carrying a volume 20 times greater than the initial landslide. The debris flow temporarily dammed the East Fork. About 12 minutes later, the dam was breached and a flood surged down the East Fork, destroying about 10 km (6 mi) of Oregon Highway 35—a total of \$13 million in damage in 1980 dollars). One person was killed. Similar events have swept down most of the valleys on Mount Hood during the past century, but flows on White River, Newton Creek, Eliot Branch, and Ladd Creek have done the most damage to roads and bridges.

Debris Avalanches

Rapidly moving landslides, called debris avalanches, occurred numerous times in the past when the steep upper parts of Mount Hood collapsed under the force of gravity. Small ones tend to be restricted to the upper flanks of the volcano, and large ones typically contain sufficient water to rapidly transform into far-traveling lahars.

About 1,500 years ago, a debris avalanche originating on the upper southwest flank of Mount Hood produced a lahar that flowed down the Zigzag and Sandy River valleys. It swept over the entire valley floor in the Zigzag-Wemme-Wildwood area and inundated a broad area near Troutdale, where the Sandy flows into the Columbia River—a total distance of about 90 km (55 mi). The debris avalanche created the breached summit crater that has since caused most eruptive products to flow into the Sandy River basin while the Hood River basin remains sheltered.

More than 100,000 years ago, a much larger debris avalanche and related lahar flowed down the Hood River, crossed the Columbia River, and flowed several kilometers up the White Salmon River on the Washington side. Its deposits must have dammed the Columbia River at least temporarily.

Seismic Monitoring of Mt. Hood

Mount Hood is one of the most seismically active volcanoes in the Washington and Oregon Cascades, and the most seismically active volcano in Oregon. In an average month 1-2 earthquakes are located by the Pacific Northwest Seismic Network (PNSN) within 3 miles of the summit. Most Hood earthquakes don't actually occur directly beneath the volcano's summit, but instead in one of several clusters located 2-5 km west, southwest, and southeast of the summit. The largest earthquake recorded in the vicinity of Mount Hood was a M 4.5 in 2002 that was widely felt and followed 4 hours later by a M 3.8 aftershock. M > 3.0 events also occurred in 1989, 1990, 1996, and 2010. Earthquakes in these clusters tend to occur in swarms (defined as three or more located earthquakes in a single day) or "mainshock- aftershock" sequences.

Glaciers

Glaciers and perennial snowfields on Mount Hood cover about 13.5 km² (5 mi²) and contain more than 300 million cubic meters (nearly 400 million yd³) of ice and snow. The largest glaciers, Eliot and Coe on the north flank, are about 2.5-3 km (1.5 to 1.8 mi) long. Summer meltwater from the glaciers and seasonal snowpack provides irrigation water for the highly productive Hood River Valley fruit orchards and maintains flow in important fish habitats.

During the last ice age, glaciers radiated outward up to 15 km (9.3 mi) in all of the major Hood drainages and filled valleys with hundreds of meters of ice. Glaciers were even more extensive during several older ice ages. Many lava flows were erupted during times of extensive glacier cover, which strongly influenced their distribution. During the Polallie eruptive period, pyroclastic flows from collapsing lava domes mantled glaciers with debris, which was transported by the glacier and dumped in moraines that formed at the glacier snout.

Whether during times of relatively restricted glacier cover as now or during ice ages, glaciers and snow provided a ready source of water to mobilize long-traveled lahars by pyroclastic flows swiftly producing large volumes of meltwater.

The most notable such swarm occurred 06/29-08/18, 2002, when 200+ earthquakes were located by the PNSN following the June 29, 2002, M 4.5 mainshock. Scientists believe that earthquakes in the clusters south of the summit occur on tectonic faults and aren't directly related to volcanic processes occurring beneath Mount Hood. The largest earthquake recorded beneath the summit was a M 3.5 in 1989 that was felt, with a M > 3.0 event also occurring in 1982. In contrast to the southerly clusters, earthquakes directly beneath the summit rarely occur in swarms.

Mount Hood seismicity is monitored by the PNSN and CVO via a regional network that includes 5 seismic stations within 12 miles of the volcano.

