

= Three Sisters (Oregon) =

The Three Sisters are a complex volcano of three volcanic peaks of the Cascade Volcanic Arc and the Cascade Range in the U.S. state of Oregon . Each exceeding 10 000 feet (3 000 m) in elevation , they are the third , fourth , and fifth highest peaks in the state of Oregon , and are located in the Three Sisters Wilderness , about 10 miles (16 km) south of the nearest town of Sisters . Diverse species of flora and fauna inhabit the area on and around the mountains , which is subject to frequent snowfall , occasional rain , and extreme temperature differences between seasons . The mountains , particularly South Sister , are popular for climbing and scrambling .

Although they are often grouped together and seen as one unit , the three mountains evolved under differing geologic situations , and the petrologic composition of each mountain can vary significantly . Whereas North Sister is extinct and Middle Sister is dormant , South Sister last erupted about 2 000 years ago and still could erupt , threatening life within the region . After satellite imagery detected tectonic uplifting near South Sister in 2000 , the United States Geological Survey made plans to improve monitoring in the immediate area .

= = Geography and geology = =

The Three Sisters are located on the boundaries of Lane and Deschutes counties and the Willamette and Deschutes national forests in the U.S. state of Oregon , about 10 miles (16 km) south of the nearest town of Sisters . The three peaks , the third , fourth , and fifth highest peaks in Oregon , have 15 named glaciers among them , nearly half of the 35 named glaciers in Oregon . The Sisters were named Faith , Hope , and Charity by early settlers , but " these names have not prevailed " , and instead they are named North Sister , Middle Sister , and South Sister .

A complex volcano that extends for 20 miles (32 km) , the Three Sisters are located at latitude 44 ° N and longitude 121 ° W. Part of the Cascade Volcanic Arc and the Cascade Range , the volcanoes formed during separate time periods from several varieties of magma , and the amount of rhyolite found in the lava of the younger two mountains is unusual relative to nearby volcanoes . Like other Cascade volcanoes , the Three Sisters were fed by magma chambers produced by the subduction of the Juan de Fuca Plate under the western edge of the North American Plate . They were also affected by the changing atmosphere of the Pleistocene epoch , a geologic period during which an Ice Age occurred where glaciers ate away at mountains as they retreated . Specifically , Three Sisters join several other volcanoes in the eastern segment of the Cascade Range known as the High Cascades , which trends from north to south .

The Three Sisters form the centerpiece of a region of closely grouped volcanic peaks , an exception to the typical 40 to 60 mile (64 to 97 km) spacing between volcanoes elsewhere in the Cascades . These nearby peaks include Belknap Crater , Mount Washington , Black Butte , and Three Fingered Jack to the north , and Broken Top and Mount Bachelor to the south . The region was active in the Pleistocene epoch , with eruptions between 700 000 and 170 000 years ago from an explosively active complex known as the Tumalo volcanic center . Basaltic lava flows from North Sister overlay the newest Tumalo pyroclastic deposits , placing the age of North Sister , the eldest , at less than 170 000 years .

= = Wilderness and climate = =

The Three Sisters Wilderness covers an area of 281 190 acres (1 137 km²) , making it the second largest wilderness area in Oregon . Created by the U.S. Congress in 1964 , it borders the Mount Washington Wilderness to the north and shares a southern edge with the Waldo Lake Wilderness . The Three Sisters Wilderness includes 260 miles (420 km) of trails , in addition to many forests , lakes , waterfalls , and streams , such as the source of Whychus Creek . More specifically , the Three Sisters and Broken Top account for about a third of the Three Sisters Wilderness ? an area known as the Alpine Crest Region . Rising from about 5 200 feet (1 600 m) to 10 358 feet (3 157 m) in elevation , it features the wilderness area's

most @-@ frequented glaciers , lakes , and meadows .

Weather in the area varies because of separation created by the mountain barrier . The west is wetter and the east is drier , and precipitation increases with elevation . The moisture , falling mostly as winter snow , originates from warm air pockets over the Pacific Ocean and cools as it ascends the mountains . In the western section , precipitation ranges from 80 to 125 inches (200 to 320 cm) annually , varying from 40 to 80 inches (100 to 200 cm) in the east . Temperature extremes reach 80 to 90 ° F (27 to 32 ° C) in summers and ? 20 to ? 30 ° F (? 29 to ? 34 ° C) during the winters .

In the wilderness , part of the National Wilderness Preservation System , motor vehicles and means of transport are prohibited . These include bicycles , wagons , motorboats , and helicopters . From Memorial Day to October 31 , permits are required for entry to the wilderness .

= = = Flora and fauna = = =

While Douglas fir and ponderosa pine trees predominate in the western and eastern parts of the Cascades , respectively , flora in the Three Sisters Wilderness also consists of lodgepole pine , Pacific silver fir , subalpine fir , western hemlock , western white pine , Englemann spruce , and western redcedar . White fir , once a common species in the area , has declined due to recent blights of mountain pine beetle . At higher altitudes , alpine meadows are common , and they feature the following flowers : lupine , red Indian paintbrush , heather , arnica , larkspur , sunflowers , columbines , and many other genera . Also common at high altitudes are mountain hemlock and whitebark pine trees .

The local fauna of the Three Sisters includes fish such as brook and rainbow trout , birds such as blue and ruffed grouse , and larger species like the Columbian black @-@ tailed deer , mule deer , Roosevelt elk , and American black bear . In addition to predator bobcats , cougars , and coyotes , raccoons , martens , weasels , and American minks live throughout the Three Sisters area .

= = Peaks = =

= = = North Sister = = =

North Sister , also known as " Faith , " is the oldest and most eroded of the three , with towering rock pinnacles and glaciers . A stratovolcano atop an ancient shield volcano named Little Brother , North Sister is 5 miles (8 @.@ 0 km) wide . Consisting primarily of basaltic andesite , it is more mafic (rich in magnesium and iron) than the other two volcanoes . Its deposits are rich in palagonite and red and black cinders , and grow progressively more iron @-@ rich with decreasing age . North Sister 's lava flows demonstrate similar composition throughout its eruptive history , which lasted for a long period of time . Estimates place the volcano 's last eruption at more than 100 @,@ 000 years ago , so the volcano is considered extinct . The North Sister possesses more dikes than any similar Cascade peak , and many dikes were pushed aside by the intrusion of a 980 @-@ foot (300 m) -wide plug dome that now forms the mountain 's summits of Prouty Peak and the South Horn . The remainder of the peak is chiefly loose debris held in place by the dike system .

North Sister has not erupted since the late Pleistocene . Extensive erosion exposed the volcanic edifice , including magma pathways such as dikes and sills . At one point , the volcano stood more than 11 @,@ 000 feet (3 @,@ 400 m) in elevation , but this erosion claimed a quarter to a third of its original volume .

= = = Middle Sister = = =

Middle Sister also known as " Hope , " is a stratovolcano consisting primarily of basalt , but it also has erupted andesite , dacite , and rhyodacite . The smallest and most poorly @-@ studied of the trio , it is also the middle in age , its most recent flows dating to 14 @,@ 000 years ago , making them slightly older than South Sister 's . These flows , thick and rich in dacite , extended from the

northern and southern sides . They stand in contrast to older , andesitic lava remains which reach as far as 4 @. @ 35 miles (7 @. @ 00 km) from the volcano 's base .

The mountain has a cone shape that lost its eastern side to glaciation , but its western portion remains near @-@ intact . The Hayden and Diller glaciers continue to cut into the east face , while the Renfrew Glacier sits on the northwestern slope . The large but retreating Collier Glacier descends along the north side of Middle Sister , cutting into North Sister 's west side . Erosion from Pleistocene and Holocene glaciation exposed a plug near the center of Middle Sister .

= = = South Sister = = =

South Sister , also known as " Charity , " is the youngest and tallest volcano of the trio . Its eruptive products range from basaltic andesite to rhyolite and rhyodacite . It is a stratovolcano overlying an older shield structure , no more than 50 @, @ 000 years old , which last erupted about 2 @, @ 000 years ago . The first such episode , termed the Rock Mesa eruptive cycle , first spread tephra from flank vents from the south and southwest flanks , followed by a thick rhyolite lava flow . The second cycle , the Devils Hill eruptive cycle , was similar in result , but was caused by the intrusion of a dike of new silicic magma that erupted from about 20 vents on the southeast side and from a smaller line on the north side .

Unlike its sister peaks , South Sister has an uneroded summit crater about 1 ? 4 mile (0 @. @ 40 km) in diameter that holds a small crater lake known as Teardrop Pool , the highest lake in Oregon . The slopes of South Sister have a number of small glaciers , including the Lewis , Clark , Lost Creek and Prouty glaciers near the crater rim .

= = Climbing and recreation = =

The Three Sisters are a popular climbing destination for hikers and mountaineers . The United States Forest Service requires permits for use from Memorial Day until the beginning of September , and dogs must be kept on leashes on the Green Lakes , Moraine Lakes , South Sister , Soda Creek , Todd Lake , and Crater Ditch trails from July 15 through September 15 . Horses are prohibited , and ice axes are required during the winter climbing season for safety reasons .

Due to extensive erosion , which causes rockfall , North Sister is the most dangerous climb of the three volcanic peaks . However , one of its peaks , Little Brother , can be scrambled . The first recorded ascent of North Sister was made by six people , including Oregon politicians George Lemuel Woods and James McBride , in 1857 , according to a story published in Overland Monthly in 1870 . Today , the common trail lasts 11 miles (18 km) round @-@ trip , gaining 3 @, @ 165 feet (965 m) in elevation and lasting about 6 ? 7 hours for the average climber . After passing through forest , lava flows , and meadows , from the summit scramblers can see various cinder cones as well as North Sister and nearby volcanoes .

Middle Sister can also be scrambled , for a round @-@ trip of 16 @. @ 4 miles (26 @. @ 4 km) and an elevation gain of 4 @, @ 757 feet (1 @, @ 450 m) . The trip lasts about 12 hours , beginning with a route through dense forest and ending on Middle Sister 's southern summit . In addition to views of North Sister , the summit offers sights of South Sister , Hayden Glacier , and other Cascade Volcanoes including Mount Hood .

The standard climbing route up the south ridge of South Sister runs for 12 @. @ 6 miles (20 @. @ 3 km) round @-@ trip , and rises from 5 @, @ 446 feet (1 @, @ 660 m) at the trailhead to 10 @, @ 358 feet (3 @, @ 157 m) at its summit . Traveling over cinder cones , domes , and lava flows , the hike does not become demanding until the last mile as it ascends to the summit . In his book Into the Wild , Jon Krakauer notes that his first climb of South Sister with his father inspired him to pursue mountaineering . Popular starting points are the Green Lakes and Devils Lake trailheads . Although this path does not require any technical skills or much in the way of mountaineering knowledge , many environmental dangers remain the same , and rescue operations are common during the climbing season .

= = Recent history and potential hazards = =

Neither North nor Middle Sister is likely to resume volcanic activity , while South Sister could become active . If South Sister were to erupt , it would pose a threat to nearby life . The proximal danger zone extends from 1 @. @ 24 to 6 miles (2 @. @ 00 to 9 @. @ 66 km) from the volcano 's summits . Tephra would accumulate to 1 to 2 inches (25 to 51 mm) in the city of Bend , and lahars (volcanically induced mudflows) and pyroclastic flows would run down the flanks of the mountain , threatening any life in their paths .

South Sister was found to be potentially active when in 2000 , satellite imagery showed a deforming tectonic uplift 3 miles (4 @. @ 8 km) west of the mountain . The ground began to bulge in late 1997 , when magma started to pool about 4 miles (6 @. @ 4 km) underground . Scientists were concerned that the volcano was awakening . A map at the Lava Lands Visitor Center of the Newberry National Volcanic Monument south of Bend shows the extent of the uplift , which reaches a maximum of 11 inches (28 cm) . In 2004 an earthquake swarm occurred with an epicenter in the area of uplift , and the hundreds of small earthquakes subsided after several days . By 2007 the uplift had slowed somewhat , though the area was still considered potentially active . In February 2013 , scientists determined that the uplift had slowed to a rate of about 0 @. @ 3 inches (7 @. @ 6 mm) per year , compared to up to 2 inches (51 mm) per year in the early 2000s . Because of the uplift at South Sister , the United States Geological Survey planned to increase monitoring of the Three Sisters and their vicinity by installing a global positioning system (GPS) receiver , sampling airborne and ground @-@ based gases , and adding seismometers .