

= Mount Rainier =

Mount Rainier ( pronounced : / re??n??r / ) , Mount Tacoma , or Mount Tahoma is the highest mountain of the Cascade Range of the Pacific Northwest , and the highest mountain in the U.S. state of Washington . It is a large active stratovolcano located 54 miles ( 87 km ) south @-@ southeast of Seattle . It is the most topographically prominent mountain in the contiguous United States and the Cascade Volcanic Arc , with a summit elevation of 14 @,@ 411 ft ( 4 @,@ 392 m ) .

Mt . Rainier is considered one of the most dangerous volcanoes in the world , and it is on the Decade Volcano list . Because of its large amount of glacial ice , Mt . Rainier could potentially produce massive lahars that could threaten the entire Puyallup River valley , and poses a grave threat to sections of Seattle , a city with nearly a million people living in it .

= = Name = =

Mount Rainier was first known by the Native Americans as Talol , or Tacoma or Tahoma . One hypothesis of the word origin is [ t?q?ú?b?? ] ( " mother of waters " ) , in the Lushootseed language spoken by the Puyallup people . Another hypothesis is that " Tacoma " means " larger than Mount Baker " in Lushootseed : " Ta " , larger , plus " Koma ( Kulshan ) " , Mount Baker . Other names originally used include Tahoma , Tacobeh , and Pooskaus .

The current name was given by George Vancouver , who named it in honor of his friend , Rear Admiral Peter Rainier . The map of the Lewis and Clark expedition of 1804 @-@ 1806 refers to it as " Mt . Regniere " .

Although " Rainier " had been considered the official name of the mountain , Theodore Winthrop , in his posthumously published 1862 travel book *The Canoe and the Saddle* , referred to the mountain as " Tacoma " and for a time , both names were used interchangeably , although " Mt . Tacoma " was preferred in the city of Tacoma .

In 1890 , the United States Board on Geographic Names declared that the mountain would be known as " Rainier " . Following this in 1897 , the Pacific Forest Reserve became the Mount Rainier Forest Reserve , and the national park was established three years later . Despite this , there was still a movement to change the mountain 's name to " Tacoma " and Congress was still considering a resolution to change the name as late as 1924 .

In the lead up to Super Bowl XLVIII , the Washington State Senate passed a resolution on Friday , January 31 , 2014 , temporarily renaming the mountain Mount Seattle Seahawks until the midnight after the Super Bowl , Monday , February 3 , 2014 , in response to the renaming of 53 mountains in Colorado after the 53 members of the Denver Broncos by Governor of Colorado John Hickenlooper .

After the renaming of Mount McKinley in 2015 , debate over the name resumed .

= = Geographical setting = =

Mount Rainier is the highest mountain in Washington and the Cascade Range . This peak is located just east of Eatonville and just southeast of Seattle and Tacoma . Mount Rainier is ranked third of the 128 ultra @-@ prominent mountain peaks of the United States . Mount Rainier has a topographic prominence of 13 @,@ 210 ft ( 4 @,@ 026 m ) , which is greater than that of K2 , the world 's second @-@ tallest mountain , at 13 @,@ 189 ft ( 4 @,@ 020 m ) . On clear days it dominates the southeastern horizon in most of the Seattle @-@ Tacoma metropolitan area to such an extent that locals sometimes refer to it simply as " the Mountain . " On days of exceptional clarity , it can also be seen from as far away as Corvallis , Oregon ( at Marys Peak ) and Victoria , British Columbia .

With 26 major glaciers and 36 sq mi ( 93 km<sup>2</sup> ) of permanent snowfields and glaciers , Mount Rainier is the most heavily glaciated peak in the lower 48 states . The summit is topped by two volcanic craters , each more than 1 @,@ 000 ft ( 300 m ) in diameter , with the larger east crater overlapping the west crater . Geothermal heat from the volcano keeps areas of both crater rims free

of snow and ice , and has formed the world 's largest volcanic glacier cave network within the ice @-@ filled craters , with nearly 2 mi ( 3 @. @ 2 km ) of passages . A small crater lake about 130 by 30 ft ( 39 @. @ 6 by 9 @. @ 1 m ) in size and 16 ft ( 5 m ) deep , the highest in North America with a surface elevation of 14 @, @ 203 ft ( 4 @, @ 329 m ) , occupies the lowest portion of the west crater below more than 100 ft ( 30 m ) of ice and is accessible only via the caves .

The Carbon , Puyallup , Mowich , Nisqually , and Cowlitz Rivers begin at eponymous glaciers of Mount Rainier . The sources of the White River are Winthrop , Emmons , and Fryingpan Glaciers . The White , Carbon , and Mowich join the Puyallup River , which discharges into Commencement Bay at Tacoma ; the Nisqually empties into Puget Sound east of Lacey ; and the Cowlitz joins the Columbia River between Kelso and Longview .

= = = Subsidiary peaks = = =

The broad top of Mount Rainier contains three named summits . The highest is called the Columbia Crest . The second highest summit is Point Success , 14 @, @ 158 ft ( 4 @, @ 315 m ) , at the southern edge of the summit plateau , atop the ridge known as Success Cleaver . It has a topographic prominence of about 138 ft ( 42 m ) , so it is not considered a separate peak . The lowest of the three summits is Liberty Cap , 14 @, @ 112 ft ( 4 @, @ 301 m ) , at the northwestern edge , which overlooks Liberty Ridge , the Sunset Amphitheater , and the dramatic Willis Wall . Liberty Cap has a prominence of 492 ft ( 150 m ) , and so would qualify as a separate peak under most strictly prominence @-@ based rules . A prominence cutoff of 400 ft ( 122 m ) is commonly used in Washington state .

High on the eastern flank of Mount Rainier is a peak known as Little Tahoma Peak , 11 @, @ 138 ft ( 3 @, @ 395 m ) , an eroded remnant of the earlier , much higher , Mount Rainier . It has a prominence of 858 ft ( 262 m ) , and it is almost never climbed in direct conjunction with Columbia Crest , so it is usually considered a separate peak . If considered separately from Mt . Rainier , Little Tahoma Peak would be the third highest mountain peak in Washington .

= = Geology = =

Mount Rainier is a stratovolcano in the Cascade Volcanic Arc that consists of lava flows , debris flows , and pyroclastic ejecta and flows . Its early volcanic deposits are estimated at more than 840 @, @ 000 years old and are part of the Lily Formation ( about 2 @. @ 9 million to 840 @, @ 000 years ago ) . The early deposits formed a " proto @-@ Rainier " or an ancestral cone prior to the present @-@ day cone . The present cone is more than 500 @, @ 000 years old .

The volcano is highly eroded , with glaciers on its slopes , and appears to be made mostly of andesite . Rainier likely once stood even higher than today at about 16 @, @ 000 ft ( 4 @, @ 900 m ) before a major debris avalanche and the resulting Osceola Mudflow approximately 5 @, @ 000 years ago . In the past , Rainier has had large debris avalanches , and has also produced enormous lahars ( volcanic mudflows ) due to the large amount of glacial ice present . Its lahars have reached all the way to Puget Sound , a distance of more than 30 mi ( 48 km ) . Around 5 @, @ 000 years ago , a large chunk of the volcano slid away and that debris avalanche helped to produce the massive Osceola Mudflow , which went all the way to the site of present @-@ day Tacoma and south Seattle . This massive avalanche of rock and ice removed the top 1 @, @ 600 ft ( 500 m ) of Rainier , bringing its height down to around 14 @, @ 100 ft ( 4 @, @ 300 m ) . About 530 to 550 years ago , the Electron Mudflow occurred , although this was not as large @-@ scale as the Osceola Mudflow .

After the major collapse approximately 5 @, @ 000 years ago , subsequent eruptions of lava and tephra built up the modern summit cone until about as recently as 1 @, @ 000 years ago . As many as 11 Holocene tephra layers have been found .

= = = Modern activity and the current threat = = =

The most recent recorded volcanic eruption was between 1820 and 1854 , but many eyewitnesses reported eruptive activity in 1858 , 1870 , 1879 , 1882 and 1894 as well .

Although Mount Rainier is an active volcano , as of 2016 seismic monitors within Mount Rainier National Park and on top of the mountain appear to show that it is indeed very much alive , but very soundly asleep . However , an eruption could be deadly for all living in areas within the immediate vicinity of the volcano and an eruption would also cause trouble from Vancouver , Canada to San Francisco because of the massive amounts of ash blasting out of the volcano into the atmosphere .

Mount Rainier is located in an area that itself is part of the eastern rim of the Pacific Ring of Fire . This includes mountains and calderas like Mount Shasta and Lassen Peak in California , Crater Lake , Three Sisters , and Mount Hood in Oregon , Mount Saint Helens , Mount Adams , Glacier Peak , and Mount Baker in Washington , and Mount Cayley , Garibaldi , Silverthorne , and Mount Meager in British Columbia . All of the above are dormant , but alive , and scientists on both sides of the border gather research of the past eruptions of each in order to predict how mountains in this arc will behave and what they are capable of in the future , including Mount Rainier . Of these , only two have erupted in the past hundred years : Lassen in 1915 and St. Helens in 1980 & 2004 . However , past eruptions in this volcanic arc have multiple examples of sub @-@ plinian eruptions or higher : Crater Lake 's last eruption as Mount Mazama was large enough to cause its cone to implode , and Mt . Rainier 's closest neighbor , Mount St. Helen 's had a huge chunk of the side of the mountain blow up in a phreatic explosion caused by a mix of gas and water ; where St. Helens was once perfectly symmetrical there is now , thirty five years later , a huge crater at the top of one face . Statistics place the likelihood of a major eruption in this range at 2 @-@ 3 per century .

Mount Rainier is currently listed as a Decade Volcano , or one of the 16 volcanoes with the greatest likelihood of causing great loss of life and property if eruptive activity resumes . If Mt . Rainier were to erupt as powerfully as Mount St. Helens did in its May 18 , 1980 eruption , the effect would be cumulatively greater , because of the far more massive amounts of glacial ice locked on the volcano compared to Mount St. Helens , the vastly more heavily populated areas surrounding Rainier , and the simple fact that Mt Rainier is a much bigger volcano , almost twice the size of St. Helens . Lahars from Rainier pose the most risk to life and property , as many communities lie atop older lahar deposits . According to the United States Geological Survey ( USGS ) , about 150 @,@ 000 people live on top of old lahar deposits of Rainier . Not only is there much ice atop the volcano , the volcano is also slowly being weakened by hydrothermal activity . According to Geoff Clayton , a geologist with a Washington State Geology firm , RH2 Engineering , a repeat of the Osceola mudflow would destroy Enumclaw , Orting , Kent , Auburn , Puyallup , Sumner and all of Renton . Such a mudflow might also reach down the Duwamish estuary and destroy parts of downtown Seattle , and cause tsunamis in Puget Sound and Lake Washington . Rainier is also capable of producing pyroclastic flows and expelling lava .

According to K. Scott , a scientist with the USGS :

" A home built in any of the probabilistically defined inundation areas on the new maps is more likely to be damaged or destroyed by a lahar than by fire ... For example , a home built in an area that would be inundated every 100 years , on the average , is 27 times more likely to be damaged or destroyed by a flow than by fire . People know the danger of fire , so they buy fire insurance and they have smoke alarms , but most people are not aware of the risks of lahars , and few have applicable flood insurance . "

The volcanic risk is somewhat mitigated by lahar warning sirens and escape route signs in Pierce County . The more populous King County is also in the lahar area , but currently has no zoning restrictions due to volcanic hazard . More recently ( since 2001 ) funding from the federal government for lahar protection in the area has dried up , leading local authorities in at @-@ risk cities like Orting to fear a disaster similar to the Armero tragedy .

= = = Seismic background = = =

Typically , up to five earthquakes are recorded monthly near the summit . Swarms of five to ten shallow earthquakes over two or three days take place from time to time , predominantly in the

region of 13 @, @ 000 feet ( 4 km ) below the summit . These earthquakes are thought to be caused by the circulation of hot fluids beneath Mount Rainier . Presumably , hot springs and steam vents within Mount Rainier National Park are generated by such fluids . Seismic swarms ( not initiated with a mainshock ) are common features at volcanoes , and are rarely associated with eruptive activity . Rainier has had several such swarms ; there were days @-@ long swarms in 2002 , 2004 , and 2007 , two of which ( 2002 and 2004 ) included M 3 @. @ 2 earthquakes . A 2009 swarm produced the largest number of events of any swarm at Rainier since seismic monitoring began over two decades earlier . Yet another swarm was observed in 2011 .

= = = Glaciers = = =

Glaciers are among the most conspicuous and dynamic geologic features on Mount Rainier . They erode the volcanic cone and are important sources of streamflow for several rivers , including some that provide water for hydroelectric power and irrigation . Together with perennial snow patches , the 26 major glaciers cover about 36 square miles ( 93 km<sup>2</sup> ) of the mountain 's surface and have a volume of about 1 cubic mile ( 4 @. @ 2 km<sup>3</sup> ) .

Glaciers flow under the influence of gravity by the combined action of sliding over the rock on which they lie and by deformation , the gradual displacement between and within individual ice crystals . Maximum speeds occur near the surface and along the centerline of the glacier . During May 1970 , Nisqually Glacier was measured moving as fast as 29 inches ( 74 cm ) per day . Flow rates are generally greater in summer than in winter , probably due to the presence of large quantities of meltwater at the glacier base .

The size of glaciers on Mount Rainier has fluctuated significantly in the past . For example , during the last ice age , from about 25 @, @ 000 to about 15 @, @ 000 years ago , glaciers covered most of the area now within the boundaries of Mount Rainier National Park and extended to the perimeter of the present Puget Sound Basin .

Between the 14th century and 1850 , many of the glaciers on Mount Rainier advanced to their farthest extent downvalley since the last ice age . Many advances of this sort occurred worldwide during this time period known to geologists as the Little Ice Age . During the Little Ice Age , the Nisqually Glacier advanced to a position 650 to 800 ft ( 200 to 240 m ) downvalley from the site of the Glacier Bridge , Tahoma and South Tahoma Glaciers merged at the base of Glacier Island , and the terminus of Emmons Glacier reached within 1 @. @ 2 mi ( 1 @. @ 9 km ) of the White River Campground .

Retreat of the Little Ice Age glaciers was slow until about 1920 when retreat became more rapid . Between the height of the Little Ice Age and 1950 , Mount Rainier 's glaciers lost about one @-@ quarter of their length . Beginning in 1950 and continuing through the early 1980s , however , many of the major glaciers advanced in response to relatively cooler temperatures of the mid @-@ century . The Carbon , Cowlitz , Emmons , and Nisqually Glaciers advanced during the late 1970s and early 1980s as a result of high snowfalls during the 1960s and 1970s . Since the early @-@ 1980s , however , many glaciers have been thinning and retreating and some advances have slowed .

The glaciers on Mount Rainier can generate mudflows , through glacial outburst floods not associated with any eruption . The South Tahoma Glacier generated 30 floods in the 1980s and early 1990s , and again in August , 2015 .

= = Human history = =

At the time of European contact , the river valleys and other areas near the mountain were inhabited by many Pacific Northwest tribes who hunted and gathered berries in its forests and mountain meadows . These included the Nisqually , Cowlitz , Yakama , Puyallup , and Muckleshoot .

Captain George Vancouver reached Puget Sound in early May 1792 and became the first European to see the mountain .

In 1833 , Dr. William Fraser Tolmie explored the area looking for medicinal plants . Hazard Stevens and P. B. Van Trump received a hero 's welcome in the streets of Olympia after their successful summit climb in 1870 . The first female ascent was made in 1890 by Fay Fuller , accompanied by Van Trump and three other teammates .

John Muir climbed Mount Rainier in 1888 , and although he enjoyed the view , he conceded that it was best appreciated from below . Muir was one of many who advocated protecting the mountain . In 1893 , the area was set aside as part of the Pacific Forest Reserve in order to protect its physical and economic resources , primarily timber and watersheds .

Citing the need to also protect scenery and provide for public enjoyment , railroads and local businesses urged the creation of a national park in hopes of increased tourism . On March 2 , 1899 , President William McKinley established Mount Rainier National Park as America 's fifth national park . Congress dedicated the new park " for the benefit and enjoyment of the people " and " ... for the preservation from injury or spoliation of all timber , mineral deposits , natural curiosities , or wonders within said park , and their retention in their natural condition . "

In 1998 , the United States Geological Survey began putting together the Mount Rainier Volcano Lahar Warning System to assist in the emergency evacuation of the Puyallup River valley in the event of a catastrophic debris flow . It is now run by the Pierce County Department of Emergency Management . Tacoma , at the mouth of the Puyallup , is only 37 mi ( 60 km ) west of Rainier , and moderately sized towns such as Puyallup and Orting are only 27 and 20 mi ( 43 and 32 km ) away , respectively .

Mt . Rainier appears on four distinct United States postage stamp issues . In 1934 , it was the 3 ¢ issue in a series of National Park stamps , and was also shown on a souvenir sheet issued for a philatelic convention . The following year , in 1935 , both of these were reprinted by Postmaster General James A. Farley as special issues given to officials and friends . Because of complaints by the public , " Farley 's Follies " were reproduced in large numbers . The second stamp issue is easy to tell from the original because it is imperforate . Both stamps and souvenir sheets are widely available .

The Washington state quarter , which was released on April 11 , 2007 , features Mount Rainier and a salmon .

= = Climbing and recreation = =

Mountain climbing on Mount Rainier is difficult , involving traversing the largest glaciers in the U.S. south of Alaska . Most climbers require two to three days to reach the summit . Climbing teams demand experience in glacier travel , self rescue , and wilderness travel . About 8 ,000 to 13 ,000 people attempt the climb each year , about 90 % via routes from Camp Muir on the southeast flank . Most of the rest ascend Emmons Glacier via Camp Schurman on the northeast . About half of the attempts are successful , with weather and conditioning being the most common reasons for failure . All climbers who plan to climb above high camps , Camp Muir and Camp Schurman , are required by law to purchase a Mount Rainier Climbing Pass and register for their climb . Additionally , solo climbers must fill out a solo climbing request form and receive written permission from the Superintendent before attempting to climb .

The worst mountaineering accident on Mount Rainier occurred in 1981 , when eleven people lost their lives in an ice fall on the Ingraham Glacier . This was the largest number of fatalities on Mount Rainier in a single incident since 32 people were killed in a 1946 plane crash on the South Tahoma Glacier .

More recently , the mountain received media attention in 2012 , as one of the park rangers lost his life when several climbers were caught in a storm while trying to ascend the mountain . While trying to help load the climbers into a rescue helicopter , the ranger lost his footing , and slid 3 ,700 feet ( 1 ,100 m ) to his death .

In one of the worst disasters on the mountain in over thirty years , six climbers ? two guides , and four clients ? last heard from on May 28 , 2014 , were presumed dead on May 31 , 2014 , when low flying search helicopters pinged the signals from the avalanche beacons worn by the climbers

. Officials concluded that there was no possible chance for survival after the climbers fell 3 @, @ 300 feet ( 1 @, @ 000 m ) while attempting or returning from the summit via the Liberty Ridge climbing route . Searchers found tents and clothes along with rock and ice strewn across a debris field on the Carbon Glacier at 9 @, @ 500 ft ( 2 @, @ 900 m ) , possible evidence for a slide or avalanche in the vicinity where the team went missing , though the exact cause of the accident is unknown . The bodies of three of the guest climbers were spotted on August 7 , 2014 , during a training flight and subsequently recovered on August 19 , 2014 . The bodies of the fourth guest climber and two guides have not been located .

About two mountaineering deaths each year occur because of rock and ice fall , avalanche , falls , and hypothermia associated with severe weather ( 58 reported since and including the 1981 accident through 2010 per American Alpine Club Accidents in North American Mountaineering and the NPS ) .

Hiking , backcountry skiing , photography , and camping are popular in the park . Hiking trails , including the Wonderland Trail ? a 93 @-@ mile or 150 @-@ kilometre circumnavigation of the peak ? provide access to the backcountry . Mount Rainier is also popular for winter sports , including snowshoeing and cross @-@ country skiing .

= = Climate = =

The summit of Mount Rainier has an alpine climate .