Times Standard

# Not My Fault: Mount St. Helens after 45 years: Where will our next eruption come from?

Lori Dengler for the Times-Standard
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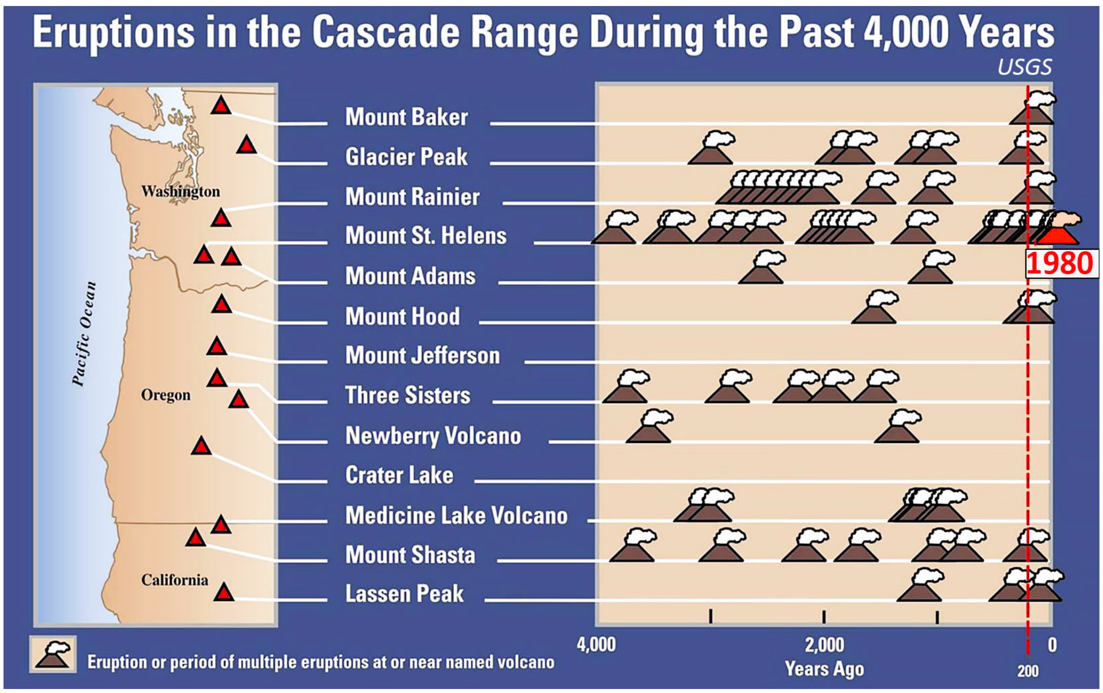


Eruptive history of major Cascade volcanoes in the past 4000 years. Red line marks 200 years ago; 1980 eruption of Mount St. Helens shown in red (USGS).

It's been 45 years since an eruption occurred on the U.S. mainland. The May 18, 1980 eruption of Mount St. Helens in southern Washington claimed 57 lives and blasted the terrain of old growth spruce over an area of 229 square miles. The blast and ensuing debris avalanche removed the upper 1,307 feet of volcano, changing the landscape forever. Ash from the main eruptive plume reached a height of 80,000 feet piercing the stratosphere and spewing 540 million tons of fine particulate into the air.

It was only my first third quarter of full-time teaching at what was then Humboldt State University. We followed the re-awakening of the volcano with eagerness as first a few, then hundreds of small earthquakes were detected beneath the mountain in mid-March. For vulcanologists the activity was exciting but no surprise. USGS scientists Crandell and Mullineaux had published a paper in 1978 fingering Mount St. Helens as the most likely Cascade volcano to next erupt and that such an eruption could occur within 20 years.

Forecasting volcanic eruptions was in its infancy in 1980. The association of earthquakes and eruptions had long been known. Pliny the Younger noted more than a decade of increasing earthquake activity before the Vesuvius cataclysm in 79 AD that destroyed Pompeii and Herculaneum. After the first small earthquakes were detected on the Ides of March 1980, the USGS deployed a temporary network of seismographs near the St. Helens' summit and around the mountain.

The USGS also began measuring sulfur dioxide emissions. As magma moves closer to the surface, the pressure decreases. In more fluid magmas like basalt, this allows gas to come out of solution. Silica-rich magmas are viscous, and gasses can't escape as easily. Tiltmeters were also deployed and targets established to measure distances with lasers. By early May even I could recognize the large bulge forming on the north flank just above Goat rocks. It was enlarging at a rate of 5 to 6 feet at day and by the time of the eruption an area 1.5 miles in diameter had bulged outward more than 400 feet.

Small steam eruptions triggered by over-heated groundwater began in late March. These eruptions increased in number and intensity along with nearly continuous seismic vibrations (tremor) detected on the seismic network. In mid-April, the Forest Service that owned much of the land to the east of the volcano created red and blue zones limiting access. On April $30^{th}$, Oregon governor Dixie Lee Ray issued an executive order further restricting access and establishing penalties.

USGS scientists made it clear their greatest concern was that the growing bulge was destabilizing the slopes. That is what happened at 8:32 AM on the morning of May $18^{th}$ when a M5.1 earthquake and a massive landslide occurred almost simultaneously. Measurements taken earlier that morning by David Johnston who was staffing the USGS observation point on the Coldwater Creek ridge about ten miles away from the summit showed no anomalies or deviation from the days before and no short-term warnings had been issued.
I had met Johnston at several scientific meetings. A charming, dedicated scientist who had a near escape from injury while studying Alaska's Augustine eruption in 1976 and was only a weekend replacement for the regular USGS staffer. The monitoring station was a trailer about ten miles from the summit with a great view and considered safe in the hazard maps of Crandell and Mullineaux. That 1978 assessment turned out to be quite accurate with but one deadly oversight – the lateral blast. David Johnston was one of the victims.

Numerous photographs and film footage document the slope failure and subsequent lateral blast. An animation stitched together from photographer Gary Rosenquist's images are still featured in introductory geology classes (https://youtu.be/bgRnVhbfIKQ?si=Q2svPgRjF8EZeuS0). The massive slide, the largest ever recorded on film, removed the cap on the bottle so to speak, and the gasses burst outwards at speeds of up to 155 mph. The onslaught displaced water in Spirit Lake creating a tsunami 820 feet high.

My husband Tom Lisle was part of a Forest Service research group deployed about six weeks later to study impacts on streams affected by blast and the massive addition of sediment. It would turn into a decades-long monitoring project, and I was lucky to tag along on a Forest Service sponsored research effort in late July 1980. This was long before I began working on tsunamis and it was my first on site visit to a massive geologic disaster. Photographs and video coverage didn't do the scale of devastation justice. The landscape had been stripped bare of all vegetation and old growth spruce and fir up to 10 feet in diameter lying like matchsticks pointing away from the blast. The sounds and smells that rendered the scene as totally alien.

Five additional but much smaller eruptions continued into October 1980 followed by 18 years of intermittent dome building events as a viscous plug to lava has slowly grown into the crater. It is now two-thirds of a mile across and 820 feet high. Seismic activity continues beneath the Mount St. Helens summit as the terrain continues to adjust to its post-eruption setting. Two hundred earthquakes in the magnitude 1 to 2.6 range have been recorded since the last dome building episode, the most recent ten days ago. This activity has become the new normal at Mount St. Helens and there is no indication that the volcano is likely to re-awaken soon.

What are the likely candidates for the next Cascade eruption? The Cascade volcanic arc includes at least 20 volcanic centers extending over 700 miles from Lassen in N California to Mount Meager in S British Columbia. Past eruptive history is one way to look for the next eruption locale. Based on sheer frequency of recent eruptions, Mount St. Helens is still near the top of that list. Seven eruptive episodes are documented in the past 4000 years, the penultimate lasted between 1800 and 1857 AD.

Lassen is the only other volcanic center to boast an eruption in written historic times. On May 30, 1914, a small steam eruption signaled a re-awakening after 27,000 years of dormancy. Over the next year activity increased with the largest explosion on May 22, 1915. Much smaller steam explosions continued in 1921. Since then, Lassen has returned to dormancy. Shasta, Hood, Ranier, Glacier Peak, and Baker have also produced modest eruptions in the past 200 years.

Volcanoes are unpredictable beasts and it's not a given that our next eruption will come from this most recently active group. There's a potential dark horse in the group. Last October, the USGS added new instruments to the Mount Adams monitoring network after detecting an increase in small quakes in 2024. In September six time quakes were recorded, the most in a single month since monitoring began in 1982.

Adams would not have been high on my list of highly volatile volcanic centers. I didn't know much about it until a few news stories popped up late last year. Adams lies a 34 miles due east of Mount St. Helens. Although not as tall as Ranier, it is larger in volume and the most massive composite cone in the Cascades. It last erupted over 1000 years ago and the current cone was built 40,000 to 10,000 years ago. Seismicity seems to have diminished since the new instruments were added so the jury is out on whether Adams' long slumber will be ending any time soon.

Our next Pacific Northwest eruption is much more likely to come from a different direction and an entirely different source. Media has been hyping "massive undersea volcano eruption" since December when a group of scientists led by William Chadwick of Oregon State presented a paper on Axial Seamount, an underwater volcano in our own backyard. It is located on the Juan de Fuca ridge about 280 miles west of the Oregon – Washington border.

My assessment of the threat hasn't changed since my column in January (Not My Fault 1/18/25). Axial Seamount produces relatively fluid basaltic lava that gas can easily escape from, very different from the explosive eruption of Mount St. Helens 45 years ago. It erupts frequently and the only way we will know when the eruption happens is from the monitoring team telling us. It won't be large enough to cause a tsunami and the only ones directly affected will be the microbial communities living in the hydrothermal vent ecosystems.

Note: I've drawn on numerous USGS publications archived at (https://www.usgs.gov/volcanoes/mount-st.-helens) and Wikipedia for much of the content in this column.

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