Mount St. Helens

A Mountain Reborn

The cataclysmic eruption of Mount St. Helens on the morning of May 18, 1980, instantly transformed the glacier-capped volcano and its surrounding forests and lakes into an unrecognizable landscape. Moments before the volcano erupted, an earthquake accompanied the collapse of 3.7 billion cubic yards of land on the north flank of the mountain—one of the largest landslides in recorded history! The lateral blast that instantaneously followed the landslide flattened everything in its path—as far as 17 miles away from the volcano. Pyroclastic flows covered the land to the north of the volcano with a mixture of hot gases and debris while the vertical eruption column sent ash and gas high into the atmosphere.

In addition to altering the volcano's physical landscape, the eruption catastrophically disrupted its productive mountain ecosystem. In the years and decades that followed, however, streams carved new paths through the volcanic deposits, the volcano grew bulky lava domes, and within the steep crater walls, a new glacier was born. Today, plants and animals have repopulated the lakes and lands around the volcano and life is once again flourishing.

Read more below for examples of how the landscape of Mount St. Helens has been continuously transformed since the eruption of 1980.

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The main climbing routes to the summit of Mount St. Helens are not visible on this map.

The Worm Flows winter route starts at the Marble Mountain Sno-Park trailhead and the Monitor Ridge summer route starts at the Climbers Bivouac trailhead, both of which are behind the mountain in this view. The June Lake trailhead is also obscured.

1 Lava Domes

Between 1980 and 1986, a series of smaller eruptions formed a lava dome in the crater of Mount St. Helens. These eruptions added an estimated 100 to 120 million cubic yards of lava to the crater. An eruption from 2004 to 2008 formed a series of dacite spines that added an additional lava dome with 120 million cubic yards of material—enough to fill almost 37,000 Olympic swimming pools!

2 Crater Glacier

Movement in the crater snowfield in the mid-1990s signaled the arrival of Crater Glacier (also known as Tulutson Glacier). Since then, a combination of shade from a north-facing aspect and high crater walls, avalanches of snow, ice, and rock from the crater rim, and an insulating rock cover have fueled the glacier's continuous growth. In 2004, erupting lava began squeezing the glacier against the crater walls accelerating its downslope flow. Four years later the east and west arms of the glaciers merged, completely encircling the lava domes.

3 Spirit Lake

The debris avalanche from the 1980 eruption displaced Spirit Lake, pushing its waters 800 feet up the opposite slopes and completely filling the former lake basin with volcanic sediment. Amazingly, the elevation of the current lakebed is now higher than the lake's previous surface. Although the lake is not as deep as before, the shoreline is 200 ft higher than it once was and the surface area is nearly double its previous size. In the decades since the eruption, life has returned to the lake. Phytoplankton, the base of the aquatic food chain, reemerged, followed by frogs and salamanders. Rainbow trout, likely reintroduced by humans, now thrive in the lake's waters. A persistent mat of floating logs, remnant of the former surrounding forest, now covers 15–20 percent of the lake, providing additional habitat for insects and other life.

4 Pumice Plain

Pyroclastic flows from the initial and subsequent 1980 eruptions of Mount St. Helens blanketed the surface of the debris avalanche directly north of the mountain and left behind a barren zone known as the 'Pumice Plain'. Incredibly, within two years, native lupine plants bloomed on this sterile landscape. In turn, lupine added essential nutrients to the soil while also providing anchor points for other plants to take hold. In the decades since the eruption, many other native plants and animals, including pocket gophers and elk, have gradually returned to the Pumice Plain. It has become an invaluable living laboratory for scientists seeking to study how landscapes recover and develop after a seemingly catastrophic geologic event.

5 North Fork Toutle River

The debris avalanche completely buried the upper North Fork Toutle River near the mountain. Hours after the eruption, a volcanic mudflow known as a lahar entered the lower reach of the river, as ice and snow meltwater, groundwater, and sediment flowed from the deposit. The lahar traveled down the Toutle and Cowlitz River system to the Columbia River, choking downstream channels with sediment and debris. Today, the river winds a new course by eroding and transporting debris avalanche sediment down river. Including the lahar, over 400 million tons of sediment have been removed from the Toutle River basin since 1980, yet only about 15 percent of the debris-avalanche deposit has been eroded. Although many structures have been built to contain sediment and manage flooding, the North Fork Toutle River continues to erode and transport sediment downstream, promising that the effects of the 1980 eruption will continue to be felt into the foreseeable future.

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References:

Crisafulli, C. M.; Swanson, F. J.; Dale, V. H., 2005, Overview of ecological responses to the eruption of Mount St. Helens: 1980–2005. In Dale, V. H.; Swanson, F. J.; Crisafulli, C. M., editors, Ecological responses to the 1980 eruption of Mount St. Helens: Springer Science+Business Media, Inc., p. 287–299. [https://link.springer.com/chapter/10.1007/0-387-28150-9_20]

Driedger, C. L.; Major, J. J.; Pallister, J. S.; Clynne, M. A.; Moran, S. C.; Westby, E. G.; Ewert, J. W., 2020, Ten ways Mount St. Helens changed our world—The enduring legacy of the 1980 eruption: U.S. Geological Survey Fact Sheet 2020-3031, 6 p. [https://doi.org/10.3133/fs20203031]

Major, J. J.; Zheng, Shan; Mosbrucker, A. R.; Spicer, K. R.; Christianson, Tami; Thorne, C. R., 2019, Multidecadal geomorphic evolution of a profoundly disturbed gravel bed river system—A complex, nonlinear response and its impact on sediment delivery: Journal of Geophysical Research: Earth Surface, v. 124, no. 5, p. 1281–1309. [https://doi.org/10.1029/2018JF004843]

Mazza, Rhonda, 2010, Mount St. Helens 30 years later: A landscape reconfigured: PNW Science Update, no. 19, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 11 p. [https://www.fs.fed.us/pnw/pubs/science-update-19.pdf]

Oregon Public Broadcasting, 2008, Mount St. Helens remains a mystery to ecologists [video]: Oregon Public Broadcasting. [accessed Mar. 22, 2022 at https://www.youtube.com/watch?v=5UABeDXf_iE]

Pallister, J. S.; Clynne, M. A.; Wright, H. M.; Van Eaton, A. R.; Vallance, J. W.; Sherrod, D. R.; Kokelaar, B. P., 2017, Field-trip guide to Mount St. Helens, Washington—An overview of the eruptive history and petrology, tephra deposits, 1980 pyroclastic density current deposits, and the crater: U.S. Geological Survey Scientific Investigations Report 2017-5022-D, 65 p. [https://doi.org/10.3133/sir20175022D]

Uhrich, M. A.; Spicer, K. R.; Mosbrucker, A. R.; Saunders, D. R.; Christianson, T. S., 2021, A 40-year story of river sediment at Mount St. Helens: U.S. Geological Survey Fact Sheet 2021-3004, 6 p. [https://doi.org/10.3133/fs20213004]

Map: Daniel E. Coe,
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Most of the land shown on this map is managed by the U.S. Forest Service (USFS) and is part of Mount St. Helens National Volcanic Monument in Gifford Pinchot National Forest. Due to the sensitive nature of this area, access to many parts of the monument is restricted, and may require a USFS-issued permit. Please consult the USFS for all the rules and regulations before visiting Mount St. Helens. https://www.fs.usda.gov/recarea/giffordpinchot/recarea/?recid=34143

to Mount St. Helens Forest Learning Center (10 miles) and Mount St. Helens Visitor Center (45 miles)