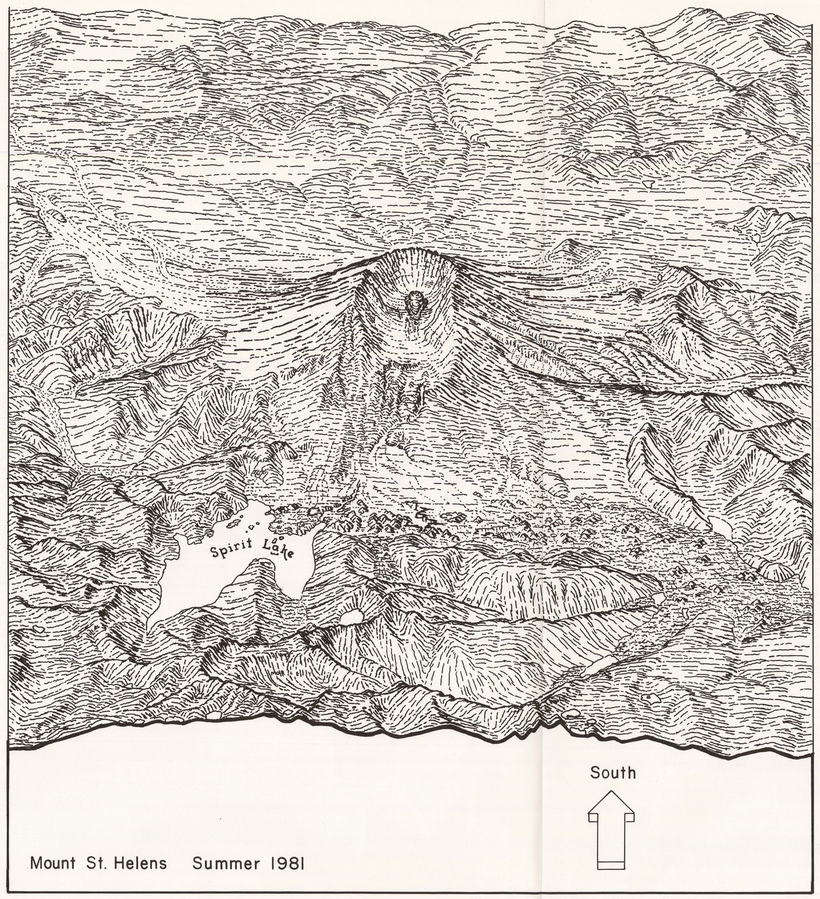
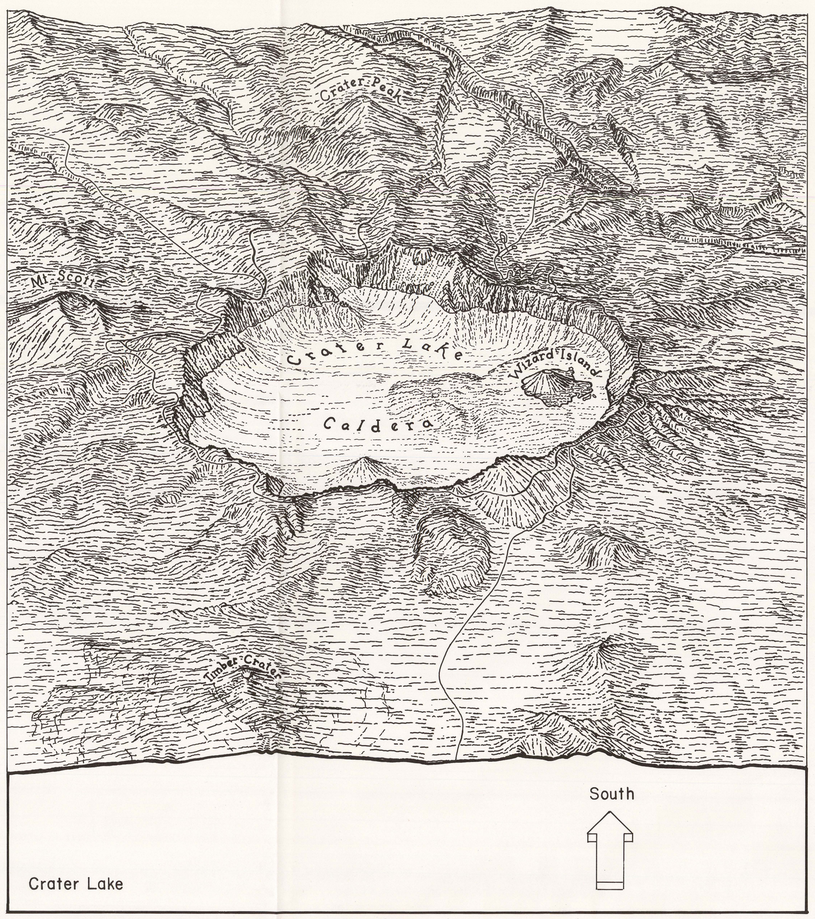
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

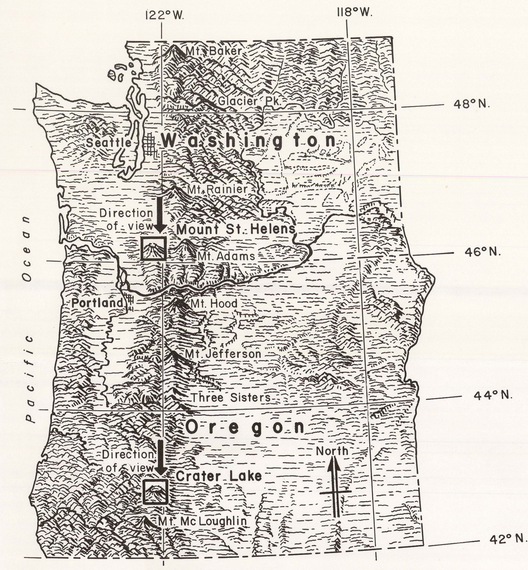
MISCELLANEOUS FIELD STUDIES
MAP MF-1403



Mount St. Helens Summer 1981

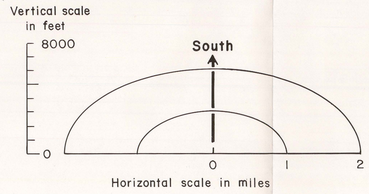


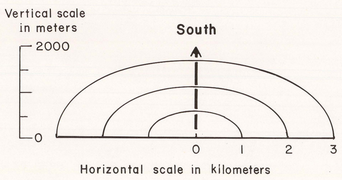
Crater Lake



LOCATION MAP

0 200 Miles
0 200 Kilometers
Scale





SCALE

THESE PHYSIOGRAPHIC DIAGRAMS provide a visual comparison of two Cascade Range volcanoes which have had their tops destroyed in different ways -- Mount St. Helens in 1980, Mount Mazama (whose site is now occupied by Crater Lake) about 6,800 years ago. Both volcanoes are viewed from the north from 30 degrees above the horizon, with no vertical exaggeration. The ground area portrayed in each diagram is equal; the south edge of the Mount St. Helens drawing is lower than that of the Crater Lake drawing because elevations drop away toward the south, whereas elevations are more constant at the north and south edges of the Crater Lake diagram.

The 1980 eruptions of Mount St. Helens began in March and reached a spectacular climax on May 18, when an earthquake triggered a huge landslide (one of the largest ever recorded anywhere) on the north side of the mountain. An estimated 2.5 cubic kilometers of rock flowed into Spirit Lake and down the canyon of the North Fork of the Toutle River. Immediately following the start of the landslide, a violent, north-directed blast destroyed trees over a fan-shaped area of more than 600 square kilometers. Following the landslide and blast, a vertical eruption threw ash to heights greater than 20 kilometers, and winds carried it hundreds of kilometers to the east. At the same time a series of pyroclastic flows (avalanches of ejected rock fragments mixed with hot gases) swept out of the vent, across the new amphitheater crater, and down the north slopes to the vicinity of Spirit Lake. Another 0.5 cubic kilometer of the original mountain was lost in these events subsequent to the landslide, and about 0.2 cubic kilometer of dacitic magma was erupted. Repeated growth of small dacitic domes has occurred in the new crater above the primary vent, since the main eruption.

Crater Lake half fills the large, basin-shaped volcanic depression (caldera) of former Mount Mazama, which was a complex of overlapping stratovolcanoes much larger than Mount St. Helens. During the climactic eruption of Mount Mazama about 6,800 years ago, about 50 cubic kilometers of dominantly rhyodacitic magma was ejected from a chamber beneath the volcano. Some of this material was erupted as a column of gas and molten rock that rose to great heights; deposits of pumice and ash from this eruption are still preserved over an area reaching some 1,000 kilometers to the northeast. Immediately following this phase of the eruption, pyroclastic flows rushed down valleys radially around the mountain and deposited pumice and ash as far as 56 kilometers from the present caldera rim. During this latter activity, as magma was removed from the chamber beneath and ejected at the surface, Mount Mazama collapsed, forming a caldera. Subsequent eruptions produced lava flows and scoria cones of cinderlike fragments on the caldera floor. Over the centuries the caldera was flooded by rainwater and snowmelt to form the cobalt-colored lake, having a current maximum depth of 589 meters, that obscures all post-caldera volcanic features except the scoria cone and lava flows composing Wizard Island.

A FEW STATISTICAL COMPARISONS:

	Approx. diameter of cone base	Original height	Max. rim height now	Crater-caldera diameter, E-W	Volume lost
Mt. St. Helens	15 km	2950 m	2550 m	2 km	3.2 km^3
Mt. Mazama	45 km	3700? m	2484 m	9.5 km	About 50 km^3

Spectacular and devastating as was the 1980 eruption of Mount St. Helens, it can be seen from these figures, and from the diagrams, that it was a minor event compared to the catacylsmic destruction of Mount Mazama.

TEXT REFERENCES:

Mount St. Helens --
Data on reverse of sheet: Mount St. Helens and Vicinity, Washington-Oregon, 45121-H8-TM-100, March 1981, U.S. Geological Survey, Topographic series, scale 1:100,000.

Lipman, P. W., and Mullineaux, D. R., (eds.) 1981 [1982], The 1980 eruptions of Mount St. Helens, Washington: U.S. Geological Survey Professional Paper 1250.

Mount Mazama --
Williams, Howel, Crater Lake, on reverse of sheet: Crater Lake National Park and Vicinity, Oregon, 1956, U.S. Geological Survey 26x25 Minutes, scale 1:62,500.

Bacon, C. R., 1981, Eruptive history of Mount Mazama: Abstracts, 1981 International Association of Volcanology and Chemistry of the Earth's Interior Symposium -- Arc Volcanism, p. 22-23.

SOURCE MAPS FOR PHYSIOGRAPHIC DIAGRAMS:

Mount St. Helens -- Mount St. Helens and Vicinity, Washington-Oregon, 45121-H8-TM-100, March 1981, U.S. Geological Survey, Topographic series, scale 1:100,000; four U.S. Geological Survey 1:62,500-scale quadrangles: Cougar, Wash., 1953; Elk Rock, Wash., 1953; Mount St. Helens, Wash., 1958; Spirit Lake, Wash., 1957.

Crater Lake -- Crater Lake National Park and Vicinity, Oregon, 1956, U.S. Geological Survey, 26x25 minutes, Topographic series, scale 1:62,500, modified with lake bathymetry from U.S. Coast and Geodetic Survey map of the lake floor, on reverse of the map sheet.

These physiographic diagrams are based on the above topographic maps, vertical and oblique aerial photographs, and field observations made in September 1980 and August 1981. The data were compiled with the use of an isometrograph.

Comparative physiographic diagrams of Mount St. Helens, Washington, and Crater Lake, Oregon

by
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