

DID CRATER LAKE, OREGON, ORIGINATE BY A VOLCANIC SUBSIDENCE OR AN EX- PLOSIVE ERUPTION?

J. S. DILLER

United States Geological Survey, Washington, D.C.

The great volcanic eruption of 1912 at Katmai, Alaska,¹ has again called the attention of geologists to Crater Lake, Oregon, with the suggestion of a similar explosive origin of the great depression containing that lake, which depression had previously been ascribed by the present writer² to subsidence.

Crater Lake is in a deep abrupt basin about 5 miles in diameter and 4,000 feet deep in the plateau-shaped summit of the Cascade Range.

Crater Lake is completely encircled by a very bold rim which rises to approximately 2,000 feet around the lake, which is about 2,000 feet deep. The rim has a very steep slope inside toward the lake but a gentle slope outside to the summit-plateau on which Mount Mazama was built up by many successively overlapping lava flows and sheets of ejected volcanic fragments, all erupted from practically the same volcanic orifice.

Nearly all this rim, however, was built up by eruptions of andesite before the eruptions of dacite began.

Much dacite-pumice formed a partial top-rim of Crater Lake, but the succeeding dacite flow from the summit of Mount Mazama finally broke from the surface of the lava tunnel at Rugged Crest and overflowed down the inside of the rim into the head of Cleetwood Cove of Crater Lake as Mount Mazama sank away into engulfment, leaving the outer slope of the rim with its fresh flow of dacite and the glaciated rim with its glacial striae and moraines, as shown on the map, Figure 13, *Geological History of Crater Lake National*

¹ Robert Fiske Griggs, *The Valley of Ten Thousand Smokes*. The National Geographical Society, 1922.

² "Geology of Crater Lake National Park 1902," *U.S. Geol. Survey Professional Paper No. 3*. Also *Geological History of Crater Lake National Park*. Dept. of Interior, 1912.

Park, 1912, entirely uncovered by any material that could have been blown out from Mount Mazama to make the great depression for Crater Lake if Mount Mazama was *blown away à la Katmai* and *not engulfed*.

The most striking evidence of the engulfment of Mount Mazama is afforded by the inflowing stream of dacite, Fig. 1, from the notch produced by the cave-in at Rugged Crest down the inner

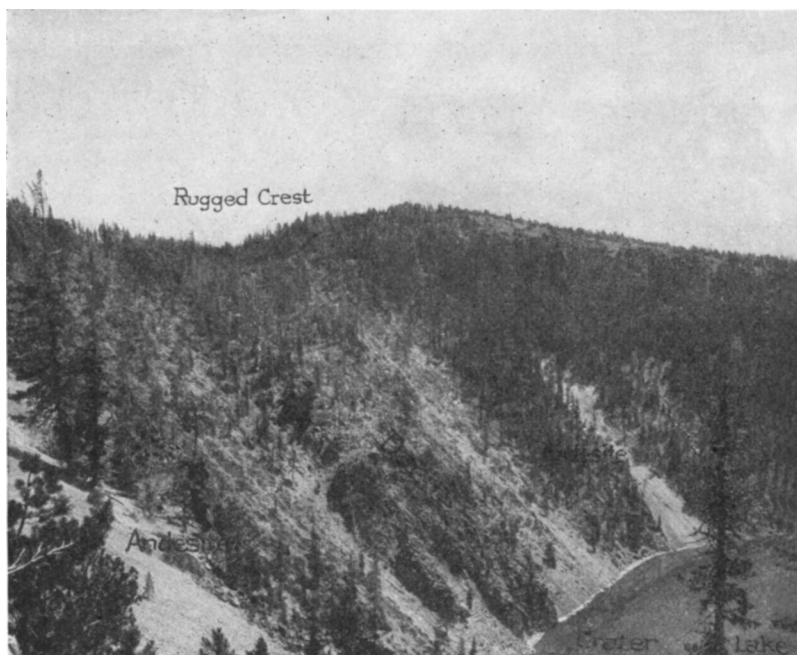


FIG. 1.—The inflow of dacite at Cleetwood Cove of Crater Lake

slope of the rim to Cleetwood Cove of Crater Lake. The view shows the whole length of the inflow from the notch of Rugged Crest to the shore of the lake, and it appears that Mount Mazama sank away about the time the final flow of dacite occurred, for the dacite beneath the crust at Rugged Crest was still soft enough to flow and to cause the crust to break and cave in. The broad flow of dacite from Rugged Crest northeast down the outer slope of Mount Mazama is shown in Figure 1, also the short flow inward to the lake.