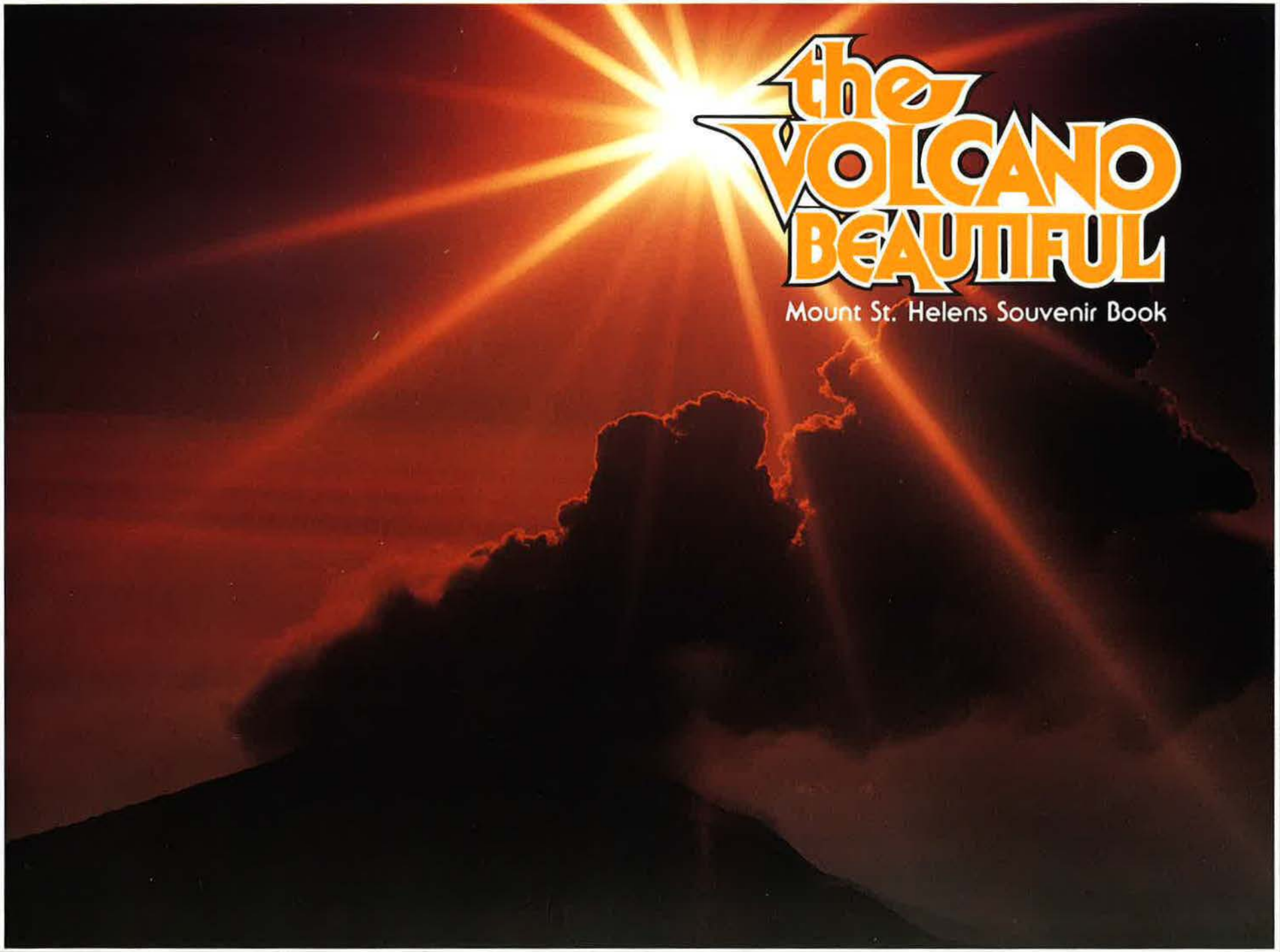
the VOLCANO BEAUTIFUL
Mount St. Helens Souvenir Book

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Cover: A star burst of light from the setting sun above the plume of the August 7, 1980 eruption.

Page 3:
Mount St. Helens is in southwestern Washington State, 45 miles northeast of Portland, Oregon. It was a beautiful, symmetrical and serene peak.

Page 5: Looking northwest. Initial eruption on March 27, 1980 ejected ash onto the mountain's white, snow-covered slopes. The first ash was composed of finely ground rock fragments and crystals from the old cone. The snow covered lava flows in the foreground were formed during an eruption about 450 years ago. At this same time the cone shaped summit dome was formed.

Page 6: Steam and ash are ejected through a cloud that obscures the crater and emphasizes the symmetry of the cone that existed in March. Spirit Lake (seen in foreground, covered with snow and ice), was created about 4,000 years ago by mudflows and ash from Mount St. Helens that dammed the North Toutle River. The May 18 eruption, in the direction of Mt. Rainier left similar deposits. The same kind of eruption that created Spirit Lake was later to devastate it, and then to rebuild it.

Page 7: Eruptions between March 27 and May 18 contained varying amounts of steam and ash. The heavier ash tends to fall out of the eruptive cloud as condensed steam rises to form a white cloud. A dark shadow of ash mantles the once pristine, snow-covered slopes downwind.

Page 8: May 18, 1980, 8:31 a.m. P.S.T., the largest explosion in the United States took place. Pyroclastic flows of hot ash suspended on super-heated gases race down the slopes instantly destroying everything in their path for miles.

Page 9: The shape of the mountain was completely changed by the May 18 eruption. About 1,300 feet of the top was blown away from the 9,677 foot volcano.

Page 10: The initial blast knocked down trees up to 16 miles from the summit in a fan-shaped swath north from the eruption. The initial blast was created in part by the huge landslide and in part by the lateral forces of expanding gases when the "pressure cooker" exploded, destroying 150 sq. miles of timber in less than 4 minutes, while 100 foot trees were sand blasted to needle points in some areas. This upwind location, near the southwest margin of the blast area on the ridge received very little ash. Other areas were buried in several feet of ash.

Page 11: Tons of mud, hot ash and gases poured over the land. Craters were then formed by steam from the trapped water and created "rootless" vents (fumeroles) in pyroclastic flow deposits near Spirit Lake at the base of Mt. St. Helens, where Harry Truman's lodge stood. These fumeroles were created by hot flows of gas and ash from the north side of the crater. Heat from these deposits warmed water below producing steam that erupted with tremendous force, carrying ash high into the air. This type of vent lasted several weeks.

Page 12: Steam rises from a 1 x 2 mile, 3000 foot deep crater at sunset creating a thing of beauty unto itself, at full moon.

Page 13: Lava dome. The first liquid rock to reach the surface non-explosively was the lava which formed this dome. This was not the free-flowing red basalt seen in Hawaii, but a viscous dacite which rose slowly in the vent and cooled at the surface to a crusty white rock. The ridges surrounding the dome are pumice deposits from the three previous explosive eruptions. Note airplane in crater.

Page 14: The "new look" of a shorter, by 1,300 ft., black Mount St. Helens contrasts with the dormant 14,440 ft. Mt. Rainier to the north.

Page 15: Mt. Adams, to the east, appears to watch the billows of steam rise out of the August, 1980 crater, at sunset.

Back Cover: After the 5th eruption August 7, 1980 the area around the original lava dome filled in with ash, and a new smaller crater was formed. Then a new lava dome began to grow, both the dome and crater glow after dark with the molten lava.

THE 1980 ERUPTION OF MOUNT ST. HELENS: A SUMMARY

by Marvin H. Beeson, Ph.D.

Man and the Mountain

Mount St. Helens is in southwestern Washington State, 45 miles northeast of Portland, Oregon. It was a beautiful, symmetrical and serene peak. The mountain dramatically changed in the public mind when, with a small eruption on March 27, 1980, the world saw proof that it was an active volcano. Millions of people followed its progress from this small initial eruption to the violent and climactic explosion of May 18, 1980. This was the first eruption of ash from Mount St. Helens in 123 years, the first eruption of a volcano in the contiguous United States since Mt. Lassen erupted in 1914-15 and the first such eruption to be thoroughly covered by the media and brought live into millions of homes through television—the most exciting natural phenomenon of the century.

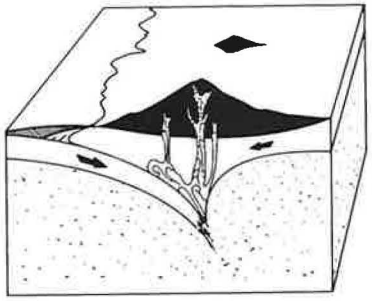
There were many participants in this event, as well as spectators. One such was the colorful and crusty 83 year old Harry Truman, owner of the Mount St. Helens Lodge at Spirit Lake. Harry had lived there at the base of the mountain's north slope for over half a century and loved and trusted his mountain. Although he was concerned and excited about the eruptions and earthquakes, he refused to leave his lodge. Harry would point his finger at the mountain and say, "There is no way that mountain is going to get me here at Spirit Lake." Harry Truman is now among the 65 people listed as dead or missing in the catastrophic May 18th eruption. Thousands more who lived near the volcano were affected by mudflows and floods and millions were affected by ash that drifted across the entire continent.

Science and Mount St. Helens

Mount St. Helens is one of many volcanoes in the Cascade Range of Washington, Oregon and California that includes Mt. Baker, Mt. Rainier, Mt. Hood, Mt. Jefferson, Mt. Shasta and Lassen Peak. The Cascade Range is a segment of the "ring of fire" that circles the Pacific Ocean with volcanoes and frequent earthquakes. Geologists have recently concluded that this belt results from rigid plates of the outer shell of the earth colliding along this zone. The oce-

Page 3: Mount St. Helens in evening light—1979

anic plate is thinner and denser than the continental plate and dives beneath the continental margin where it is heated and partly melted to produce liquid rock called magma, the source for all volcanoes (see figure top next column). The energy source within the earth that moves the plates and heats the rock is decay of naturally occurring radioactive isotopes of potassium, uranium and thorium. The magma is produced in a zone just below the 60 mile thick plates and rises to the surface due to its lower density. Eruption at the surface from a single vent produces a volcano, such as Mount St. Helens.



The mid-Atlantic Ridge, including Iceland, the Azores and Surtsey, is made of volcanic rock erupted where plates move apart, creating new oceanic crust. The Hawaiian Islands are produced where a plate moves slowly over a magma-generating "hot spot" in the mantle that lies beneath the earth's crust. Volcanoes formed in these different structural settings are different in their shape, explosiveness and rock types.

Common volcanic rocks include basalt, andesite, dacite and rhyolite. Basalt, as in Hawaiian volcanoes, flows most easily and tends to erupt least explosively whereas rhyolite flows slowly and may erupt violently. Volcanoes such as Mount St. Helens, formed in belts where earth plates converge, have the potential to be most explosive.

Mount St. Helens has been the most active volcano in the contiguous United States in the past 4,500 years, coming to life approximately every 100 years. It has a long history of explosive activity going back 38,000 years. Most of the visible cone of this mountain was formed in the last 2,500 years. The classical cone shape was formed as successive eruptions distributed lava and ash around the single vent, or conduit.

A Chronology of the 1980 Eruptions

I. Pre-eruptive Stage: March 20-March 26
A magnitude 4.1 earthquake on March 20 signaled the awakening of Mount St. Helens as magma began pushing its way toward the surface. At first only a few small quakes per day were recorded until March 25 and 26 when about 130 quakes per day of magnitude greater than 3.0 shook the mountain.

II. Non-magmatic Eruptive Stage: March 27-May 17
This stage was characterized by eruptions of steam and ash. The intruding magma was acting as a heat source that changed ground-water of the mountain to steam that rose explosively to the surface grinding rocks within the conduit to a fine ash that was expelled in the eruptions. No new solid magmatic material was erupted, however some magmatic gases, such as sulfur dioxide, escaped from the vent. The first eruption took place on March 27 creating a small crater. Subsequent eruptions enlarged the crater until it was bigger than four football fields and over 800 feet deep. Ice and rock constantly caved off into the crater to be ground up and ejected in the next eruption. The maximum height of the steam and ash plumes was about 10,000 feet above the crater during this stage. A bulge that finally expanded northward to a total of about 500 feet formed on the north side of the cone above Spirit Lake. In early May its rate of growth was measured at five feet a day. The frequency of earthquakes decreased slowly until May 18.

III. Explosive Magmatic Eruptive Stage: May 18-Aug. 7
Since May 18, four major eruptions have occurred in which new solid magmatic material was produced. First was the catastrophic eruption of May 18 in which ash was carried to an altitude of 63,000 feet. Smaller eruptions occurred on May 25, June 12 and July 22. The May 18th eruption was initiated by a magnitude 5.1 earthquake that caused the entire bulging north flank of the cone to slide. This released pressure on superheated water in the cone and on the underlying magma gave rise to a gigantic eruption. First the super-heated water of the volcano flashed into steam, carrying with it huge amounts of rock and ash from the old cone. This was followed by the escape of gases from within the magma which blew the liquid rock into fine pieces. Nearly one cubic mile was blown off the top of the mountain during this one eruption. The huge new crater now measured about one mile wide by two miles long and over 3,000 feet deep. The 9,677 foot mountain was 1,300 feet shorter. Following the June 12th eruption a lava dome began to form at the top of the conduit in the crater. Magma rising from below hardened into rock when it reached the surface and cooled, and the dome increased in size as additional magma rose underneath it. During late June and early July there was little notable earthquake activity. Finally, pent up gases beneath the lava dome exploded on July 22 with three eruptions in rapid succession, leaving a hole where the dome had been. After the August 7th eruption, a new dome began to form.

The Future

No one knows what the volcano will do next, or when, or if it will do anything more at all. Volcanology is at best an inexact science so all geologists can do is say what may happen and help everyone to be prepared.

So we watch...and wait...and wonder...awed by the opportunity to observe and study the Earth in its natural process of change. Mount St. Helens—our window to one way our world evolves.

PHOTO CREDITS:

Al Hayward
Cover and pages 3, 5, 6, 8, 9, 10, 11, 12, 13, 14, back cover.

Ron Cronin
Page 7

Carl M. Jones
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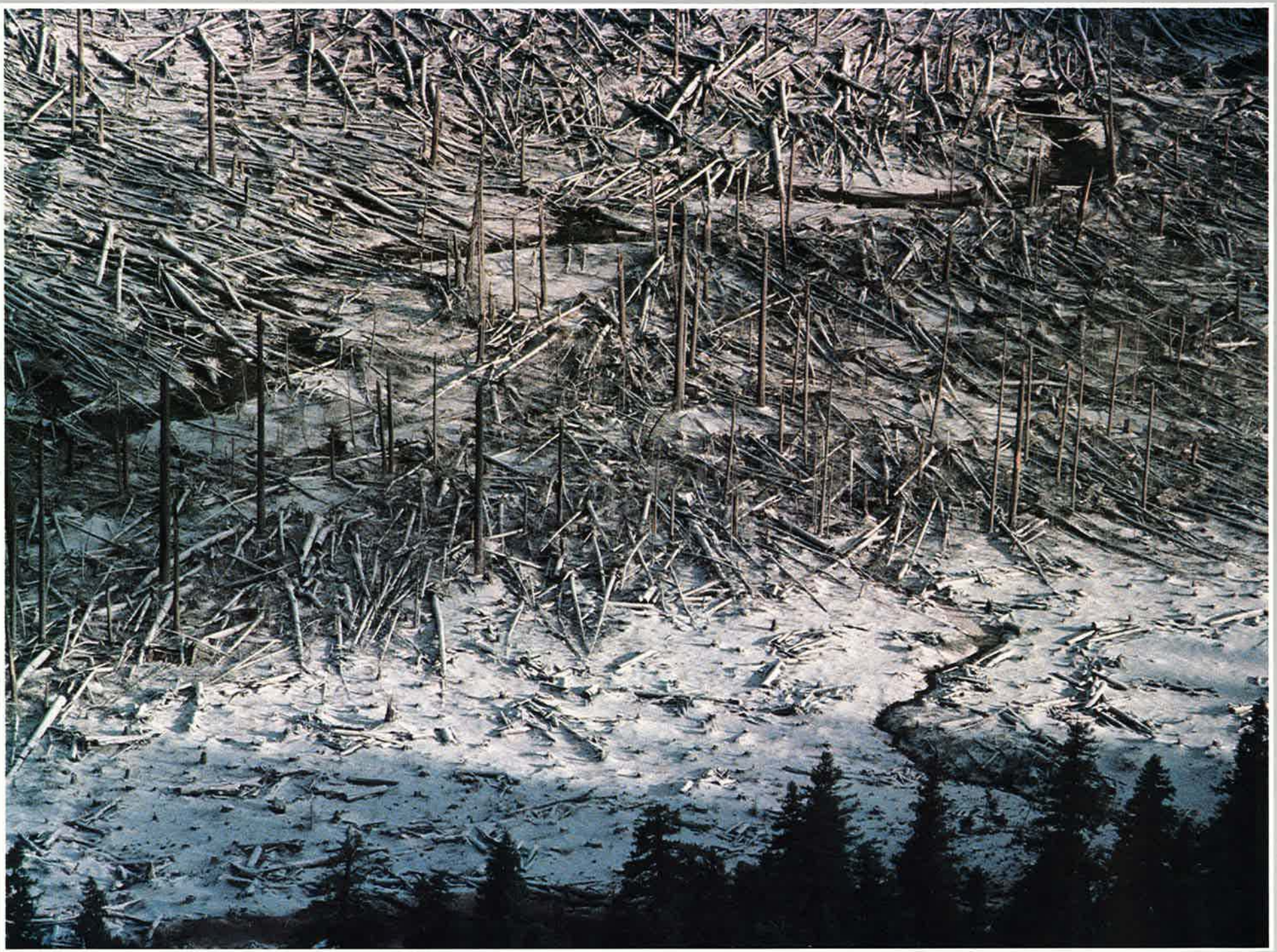
Page 5: Dark ash covered spot marks first eruption late March

Page 6: Dome-shaped cloud obscures crater during March eruption

Page 7: Purple plume of ash and steam drift southward—late March

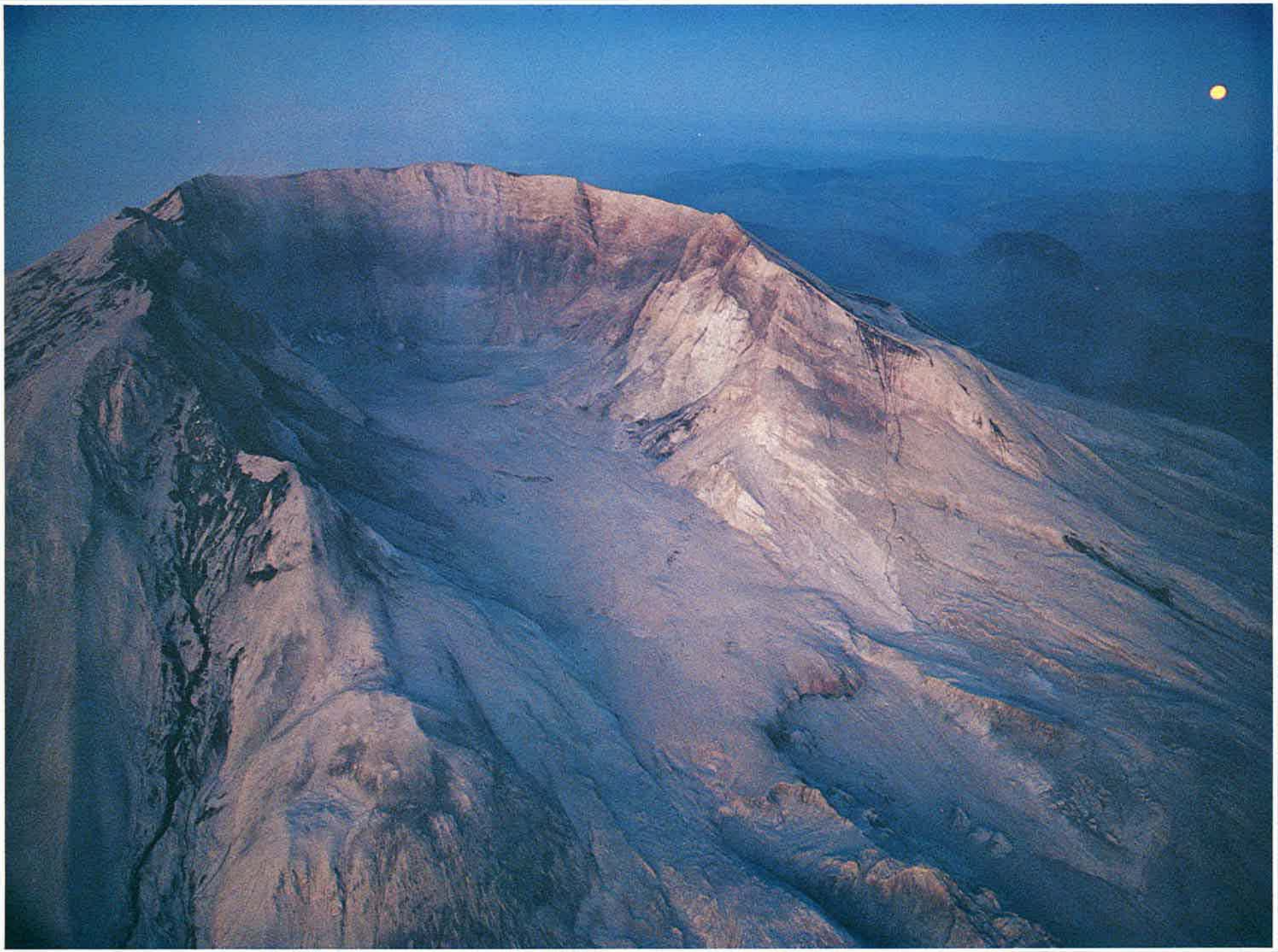
Page 8: Climactic eruption of May 18, 1980 viewed from the south

Page 9: Mt. Saint Helens crater at sunset



Page 10: Devastated forest. 16 miles northwest of Mt. St. Helens volcano summit

Page 11: Mt. Saint Helens "moonscape"—craters caused by trapped hot gases



Page 12: Steam rises from the new crater at sunset

Page 13: St. Helens lava dome—July 1980

Page 14: Ash-covered snow on Mount St. Helens contrasted with snow-covered Mt. Rainier

Page 15: Crater at sunset Aug. 12, 1980 after 5th major eruption

Back Cover: Crater within crater with new glowing lava dome. Aug., 1980