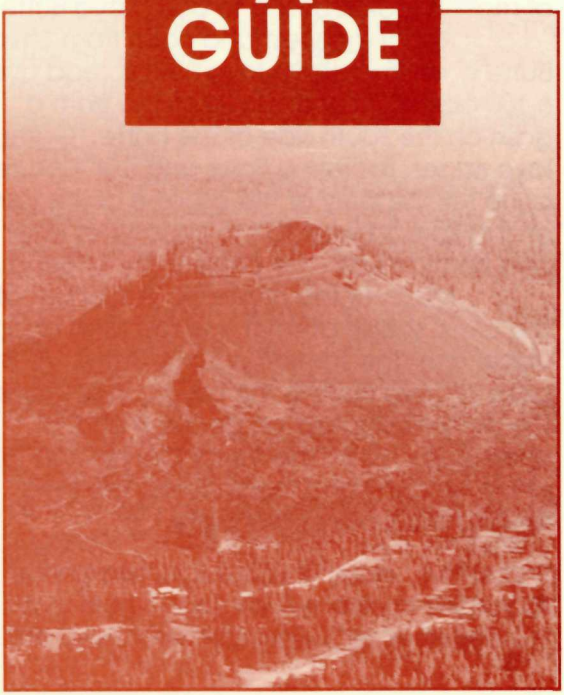
LAVA BUTTE GEOLOGICAL AREA

A GUIDE



DESCHUTES NATIONAL FOREST

United States Department of Agriculture

Forest Service Pacific Northwest Region

LAVA BUTTE

Lava Butte, a volcanic cinder cone that rises 500 feet above the adjacent forest-covered country, overlooks an area of spectacular volcanism.

To the south is Newberry Crater, a large shield-shaped volcano covered by more than 400 cinder cones like Lava Butte. To the west are the majestic Three Sisters and Mt. Bachelor volcanoes. Off to the east are the rims of the High Desert and to the north are the rugged pinnacles of Smith Rock.

But not all of the phenomenal features visible from the summit of Lava Butte are in the distance; some are virtually at the spectator's feet. Here is a volcanic crater, 150 feet deep, from which fountains of molten rock erupted to build Lava Butte.

Reaching west and north from Lava Butte is an impressive lava field spread over 6,100 acres. All of this lava spilled from a gash on the south side of the butte. Gutters, lava ridges, radiating flows and the ruptured cone tell the story of the escape of the lava and its spread west to the Deschutes River and north toward the present site of Bend.

Much of the dramatic volcanism of the area, scene of earth's unrest long ago, is visible from the summit of Lava Butte. At the base of Lava Butte is the Lava Lands Visitor Center with displays on geology and archaeology. From the Visitor Center, the Trail of the Molten Land leads across the lava flows to the base of the butte.

(Cover photo)
Aerial view of Lava Butte from south.

Lava Lands Visitor Center.

HISTORY

Prehistoric inhabitants probably witnessed Lava Butte's eruption and watched molten rock spill westward to the Deschutes River. Lava Butte was possibly the origin of some legends and it most assuredly affected their choice of hunting camps later.

North along the Deschutes River, Native Americans used a rock overhang as shelter and storage for their seasonal hunting forays into this game-rich area. From this vantage, known as Lava Island Rock Shelter, they would have had a perfect view of the lava from Lava Butte as it spilled into the channel of the river. Archaeologists in 1981 excavated Lava Island Rock Shelter and found evidence for occupation of the site as long ago as 7,000 years. Recent research suggests the site may be much younger, dating perhaps to 2,000 years. Artifacts from Lava Island Rock Shelter are on display at the Deschutes Historical Center in Bend.

Lava Island Rock Shelter.

In 1961, archaeologists from Washington State University excavated what appeared to be an ancient hunting camp east of Lava Butte. Prehistoric hunters occupied this site seasonally each year for thousands of years. There is evidence that the hunters set up a temporary camp each year on a lava ridge overlooking a major game trail. While waiting for deer, they fashioned arrowheads and spear points from obsidian (volcanic glass) and tossed the obsidian chips and broken points into a lava crevasse. In the bottom of the crevasse, under a deep deposit of soil, the archaeologists found many artifacts, some of which are now on display at the Sunriver Nature Center.

Nathaniel Wyeth and his trappers possibly were the first non-Indians to see Lava Butte when, late in 1834, they passed through the area in search of beaver. Wyeth and his party moved upstream along the Deschutes past Dillion, Benham, and Pringle Falls, but made no mention of Lava Butte. John C. Fremont, with Kit Carson and Warm Springs Indian Billy Chinook as guides, followed a similar route in 1843, as did the Williamson Survey party in 1855. Neither group noted Lava Butte, but their presumed routes must have taken them close to it.

During the mid 1850s emigrants from the east, searching for quicker routes to the Willamette Valley, tried to shorten the trip and avoid hostile Snake Indians by travelling through Central Oregon. Few were prepared for the harshness of the high desert, some perished and many became lost. Probably the most famous of the lost wagon trains was the Elliott Cutoff Party of 1853. They passed along the rocky apron of Lava Butte on their way south to cross the Cascades south of Diamond Peak.

Cattle ranchers and, later, sheep ranchers were the first to settle in the Bend area. In the 1870s those early settlers found Lava Butte much as it appears today, with animal trails spiraling the cone. En route to range on the upper Deschutes, pioneer stockmen found the lava from Lava Butte blocking the direct route south. Rather than move their herds off to the dry country to the east, they forded the river and used westside trails.

By the turn of the century, Bend was gaining population and Lava Butte became an attractive viewpoint. Parties frequently climbed the cone over a zigzag trail to view the spectacular Cascades to the west.

Road builders also recognized Lava Butte as a scenic vista and natural navigation marker and built roads skirting the lava at the east base of the butte. Modern U.S. Highway 97 eventually followed those early routes. Some of the lava apron was blasted to prepare the grade for the road. Lava Butte did not deter railroad builders, however. Great Northern constructed a grade over the lova field in 1928.

In the 1930s the U.S. Forest Service built a lookout at the butte's summit and a spiral road to access the structure. There is still a lookout on top of Lava Butte, though it is not the original one.

The Secretary of Agriculture officially designated the Lava Butte Geological Area in 1967, and the Lava Lands Visitor Center was dedicated on September 13, 1975. The area is manged by the Deschutes National Forest, U.S. Department of Agriculture.

AGE

How old is Lava Butte?

Oldtimers believed that the lavas cooled only yesterday. This is true, but it is the geologic yesterday, not man's 24-hour yesterday.

On the flows and slopes of Lava Butte several generations of trees have probably grown and died. Today there are trees which are several centuries old struggling to survive on the flow.

The first geologist to study Lava Butte was Israel C. Russell of the U.S. Geological Survey in 1903. He estimated that Lava Butte erupted as recently as 150 years ago. Dr. Howel Williams in his 1948 publication, *The Ancient Volcanoes of Oregon*, speculated that the eruptions occurred less than 1,000 years ago. More recent estimates by geologists have ranged from 2,000 to 4,000 years ago. However, in 1977 carbon 14 dating established the butte's age at 6,200 years.

Trees struggle to survive.

GEOLOGIC STORY

Geologists agree that volcanic activity in the upper Deschutes country of Oregon was as spectacular as any in the Pacific Northwest.

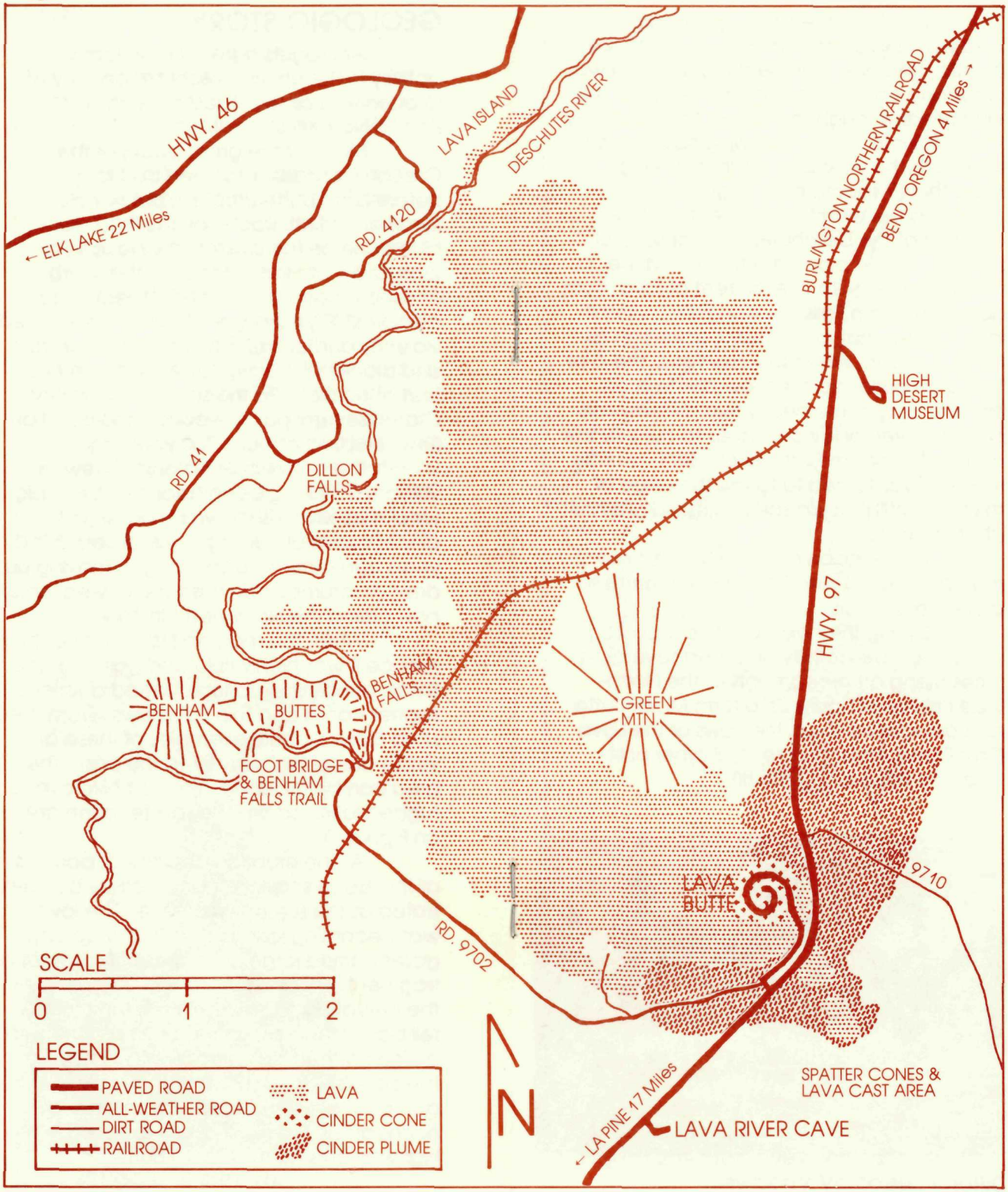
Many of the great peaks of the Oregon Cascdes had been built long before Lava Butte erupted, but not all. Symmetrical Mt. Bachelor, the 9,060-foot-high cone on the western skyline, and a long chain of cinder cones to the south ceased eruptions about 8,000 years ago. About 6,800 years ago Mt. Mazama erupted violently and collapsed to form Crater Lake and blanket the Lava Butte area with two feet of pumice. To the south in Newberry Crater, several pumice cones and obsidian flows erupted about 6,700 years ago.

The Northwestern flank of Newberry volcano has long been a zone of geologic weakness which is shown by dozens of cinder cones of varying ages. About 6,200 years ago magma again began moving up deep fractures within this zone of weakness, now called the Northwest Rift Zone.

When the magma first reached the surface it was highly fluid and gas-charged. Small, bubbling eruptions formed a series of spatter cones and thin fluid flows. From the Lava Butte summit, examples of these are visible across Highway 97 to the east. The area can be reached in a short hike over a rugged lava terrain (see spatter cone area on Figure 1).

As the eruption continued, portions of the fissure sealed off and activity concentrated at the site of Lava Butte. The lava was becoming less fluid, so that escaping gases carried large quantities of foamy lava fragments (cinders) into the air. Blown by the prevailing southwest winds the cinders fell back to the ground to build a cone with a high northeast rim and over two thirds of the cone's volume north of the crater. Also a deposit of finer cinders was spread to the northeast by the wind and is exposed in the highway cuts north of Lava Butte.

Figure 1 — Lava Butte Geological Area



With time the highly gas-charged lava was depleted and lava began to rise up into the cone, but the thin south side was not strong enough to contain the lava. The lava broke through the side of the cone and formed numerous overlapping flows which spread to the west and north, covering more than 9 square miles (Figure 1).

To the west the flows entered the channel of the Deschutes River at several places. At one place the flows filled the river's channel with over 50 feet of lava, from above Benham Falls to Dillon Falls. A small lake formed that probaboly backed up as far as Sunriver. When the lake filled, the river found an outlet across a low divide in an ancient lava dome nearly two million years old. The river today continues to cut into this dome at Benham Falls. Below Benham Falls the river was forced to follow the edge of the flow untill it could spill into its old channel at Dillon Falls.

The duration of the eruption is estimated to have been from a few months to a couple of years.

During the next couple of hundred years, eruptive activity occurred several times along other segments of the Northwest Rift Zone (Figure 2) to form Mokst Butte and associated flows, the flows of the Lava Cast Forest Area, and several other post-Mazama flows along the rift.

Dillon Falls.

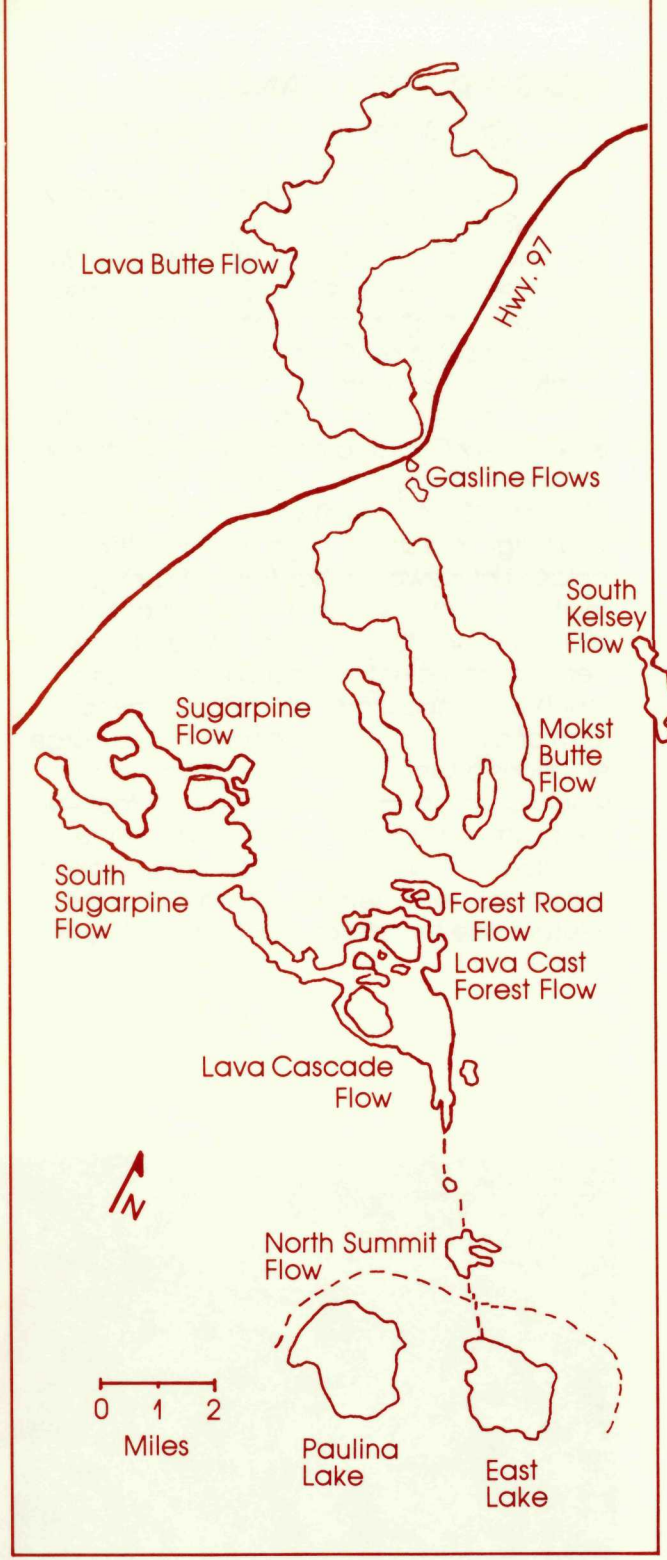


Figure 2 — Northwest Rift Zone of Newberry Volcano.

NEWBERRY VOLCANO

Lava Butte is one of thousands of small volcanoes that make up a much larger and longer-lived volcano. Newberry Volcano is an enormous shield-shaped volcano, with a basal diameter of some 20 to 25 miles covering 400 to 500 square miles. It has been built up mainly of fluid basalt flows and silicic ashflows over a period of nearly a million years.

At the summit of Newberry Volcano is Newberry Crater, a caldera, 4 to 5 miles in diameter. Unlike the caldera of Mt. Mazama (Crater Lake) which formed 6,800 years ago in a single large eruption, the caldera of Newberry has formed during multiple eruptions over a period of at least 500,000 years. During the building of Newberry, large violent eruptions ejected as much as 20 cubic miles of material in the form of ashflows. During each of these large eruptions a section of the summit area would drop down several thousand feet into the cavity emptied of molten rock by the eruption. The final result of these eruptions is today's caldera, hemmed in on all but the western side by cliffs as much as 1,500 feet high.

Newberry Crater from Paulina Peak.

Paulina Peak, accessible by auto during the summer, offers an exceptional view of Newberry Crater, the south flank of Newberry Volcano, and the Cascades.

Between major eruptions and since the final caldera-forming eruption, the caldera has filled with 1,500 feet of volcanic, lake, and erosional deposits. Over much of the history of the caldera, there has probably been one large lake within the caldera. As the caldera filled with deposits, two basins formed which are occupied today by East and Paulina Lakes. The outlet of Paulina Lake is to the west, through Paulina Creek, where the water tumbles into a canyon at picturesque Paulina Creek Falls. East Lake has no surface outlet.

About 6,700 years ago, eruptions built the Central Pumice Cone and several obsidian flows. Finally, about 1,300 years ago, the Big Obsidian flow was formed, the most recent volcanic landform in central Oregon.

Paulina Creek Falls.

Prehistoric native people visited Newberry Crater regularly for thousands of years to collect obsidian for making tools. They would work large pieces of obsidian into crude "bifaces" to check the quality of the piece and to reduce the bulk and weight for easier transport down the mountain. At more permanent campsites away from the mountain, the bifaces would be worked into tools such as points, blades, and scrapers.

Peter Skeen Ogden and his trappers were the first white men to visit Newberry Crater in 1826.

POINTS OF INTEREST

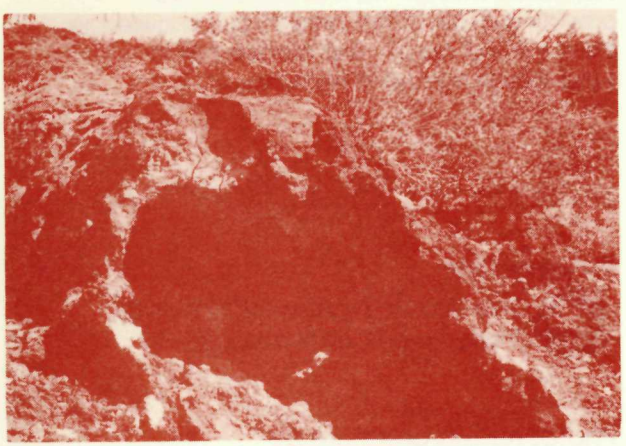
Besides Lava Butte and Newberry Crater, there are a number of interesting volcanic features nearby. Four miles to the west is Benham Falls Day Use Area where a trail from the parking lot leads to viewpoints overlooking Benham Falls.

One mile to the south on Hwy. 97 is Lava River Cave. This mile-long lava tube fed a much older lava flow from the Northwest Rift Zone. Stairs and a trail make this a relatively easy cave to explore. Lanterns are available for rent. For a more primitive cave experience, ask for directions to Boyd, Skeleton and Wind caves southeast of Bend.

Three and a half miles south on Hwy. 97 and then ten miles east on F.S. Rd. 9720 is the Lava Cast Forest. Here eruptions of lava about 6,000 years ago spilled into a stand of timber. Because of the fluid character of these flows, the lava flowed around the trees and was chilled by the moisture within the trees. The heat of the lava eventually burnt the wood out, leaving tree molds. A self-guided nature trail leads to many excellent examples of these tree molds.

Benham Falls.

Lava River Cave.



Tree mold at Lava Cast Forest.

FOR ADDITIONAL INFORMATION

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58201 South Hwy. 97
(11 miles south of Bend)
Bend, Oregon 97707
(503) 593-2421

Forest Geologist
Deschutes National Forest
1645 Hwy. 20 East
Bend, Oregon 97701
(503) 388-5618

Deschutes Historical Center
129 NW Idaho Ave.
Bend, Oregon 97701
(503) 389-1813

DEDICATION

The "Lava Butte Geological Area" brochure is dedicated to Phil Brogan. Mr. Brogan was extremely interested in the historical geology of the Central Oregon region. Through incessant forays and constant searches into surrounding areas, Phil Brogan made significant geological and paleontological contributions. By way of his prolific writings, he was instrumental in providing much of the present-day knowledge in these subject areas. The branch trail to the overlook is named in his honor.

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