Bishop Tuff at Sotcher Lake (5)

About 760,000 years ago, a supereruption occurred east of Devils Postpile creating the Long Valley caldera. During the eruption, a third of the 150 cubic miles of pumice and ash penetrated the stratosphere and blanketed the land between the Pacific Ocean and Nebraska; the rest spread out as ground-hugging ash flows in all directions including the Middle Fork canyon. Where thick and hot enough, the mass of pumice and ash welded itself into rock. There is also densely welded black obsidian-like tuff just uphill from Reds Meadow Hot Springs and a 570-foot tall knob one mile west of Rainbow Falls that shows two discrete pulses of the enormous ash-flow eruption. Near Sotcher Lake, a rare exposure of unconsolidated pink and white ash-flow tuff remains, having survived many glacial periods. Originally thicker than 800 feet near Devils Postpile, 99% of the ash flow has been scoured away by glaciers.

Pumice (6)

In late summer of 1350 AD, eruptions northeast of Devils Postpile sent explosive plumes 12 miles into the air, blanketing Mammoth Mountain and the Middle Fork canyon with two feet of pumice and ash. Since the eruption, wind, rain, and snowmelt have redistributed the pumiceous fallout, concentrating it along river terraces such as Pumice Flat. How can we know these events so precisely? Ring sequences from trees blown down by the eruptive blast and buried in the pumice were matched with those of living trees of the region.

Volcanic Rock Classification and Terminology

Rock Name
** = mentioned in brochure*

Erupted (glassy)	Obsidian*			
Erupted (small crystals)	Rhyolite	Dacite*	Andesite*	Basalt*
Cooled beneath the surface (large crystals)	Granite*	Granodiorite	Diorite	Gabbro

Rock Characteristics

Amount of the mineral silica	*70%*	←→	*50%*
Color	*Lighter*	←→	*Black*
Viscosity of Magma	*Thick*	←→	*Fluid*
Style of eruption	*Explosive*	←→	*"Quiet"*

Magma: Hot, molten rock beneath Earth's surface.
Lava: Magma that has erupted onto Earth's surface.
Tuff: Cemented volcanic ash and other small rock material.
Pumice: Low-density, silica-rich, volcanic rock formed from "frothy" lava.

Adapted from: R. Lillie. 2005. Parks and Plates. W.W. Norton and Co.

Devils Postpile National Monument

P.O. Box 3999
Mammoth Lakes, CA
93546-3999
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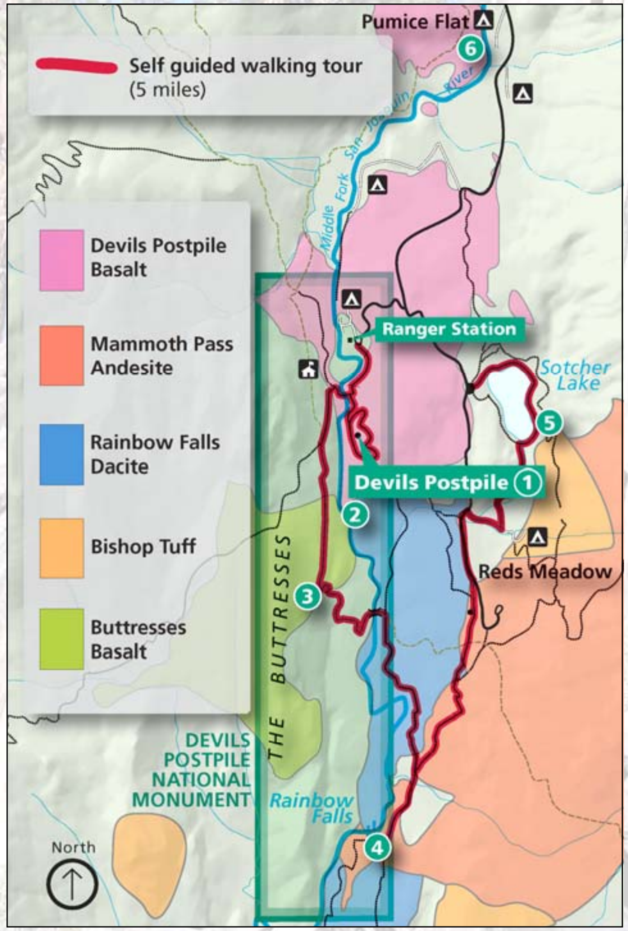

Simplified geologic map showing types of rocks and self-guided trail. Numbers refer to features described in the text. NPS map.

Go See It!

The Devils Postpile area is rich with geologic features and a history of those who have tried to understand them. You too can ponder and visit all of the features highlighted in this publication. A suggested walking tour using roads and established trails is on the above map.

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National Park Service
U.S. Department of the Interior

Devils Postpile National Monument

What happened here?

Celebrating 100 years of geologic research at Devils Postpile

Volcanology advanced greatly in the last half-century and dating techniques are far more precise than a generation ago. Field geologists still walk the land looking for clues and evidence of landscape evolution. Geologic maps published by the U.S. Geological Survey (USGS) are like progress reports documenting these improvements and human efforts. In the 1950s, the first geologic map of the Devils Postpile region mapped the region's mineral resources, granites, and ancient geologic history. Later, interest in geothermal resources and seismic unrest led to detailed mapping of the Long Valley caldera. Recently, interest in the seismic unrest and past eruptions near Mammoth Mountain and the numerous surrounding basaltic lavas such as Devils Postpile, will result in a new map to be published soon.

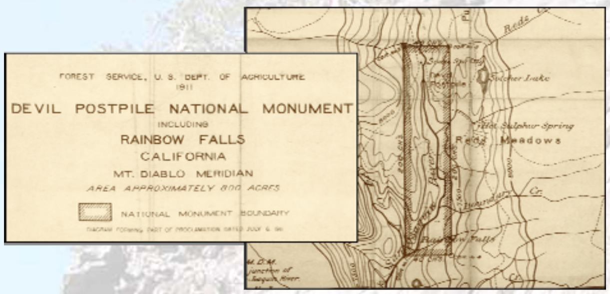
Over time, research provided more specific information resulting in more detailed geologic maps, and improved understanding of the region's geologic history. Geologic maps share this story with scientists and visitors.

History of Geologic Research

The Devils Postpile and surrounding landscape gained early recognition as an excellent example of the volcanic and glacial processes that shaped the Sierra Nevada. In the early 1900s, observers including University of California Professor Joseph N. LeConte and Forest Service engineer Walter Huber recognized the significance of Devils Postpile as a "wonderful natural curiosity" warranting future scientific study[1]. This language was included in the Presidential Proclamation that created the monument in 1911 for "scientific interest," and "public enjoyment." Since then, the geologic histories of Devils Postpile and the Sierra Nevada developed with increased depth and detail. With each revision, improvements in science lead to better knowledge and new questions that probe deeper into the story of the mountains and features we cherish.

Feature descriptions below are the culmination of a century of scientific study. Refer to the map on the other side for locations.

[1] J.N. LeConte to President Wm. H. Taft, March 29, 1911. Berkeley Water Resources Library, Walter Huber Papers.



Detail of 1911 map of Devils Postpile National Monument. U.S. Forest Service map.

Devils Postpile (1)

Thick, basaltic lava flowed down the Middle Fork canyon about 82,000 years ago from an unknown vent. Contact with the granite bedrock, air, and river caused the flow to rapidly cool, contract into solid lava. As a result, polygonal fractures grew inward for days or weeks, producing slender columns that gradually reached deeper into the flow's interior.

Today, most rock from this flow has been stripped away by glaciers that advanced down the canyon about 20,000 years ago, but a series of lava remnants survives along the canyon floor including the Devils Postpile. Other outcrops above the river suggest a minimum original thickness of nearly 350 feet.

Photo of the top of Devils Postpile. Note the glacial polish and striations. NPS photo.

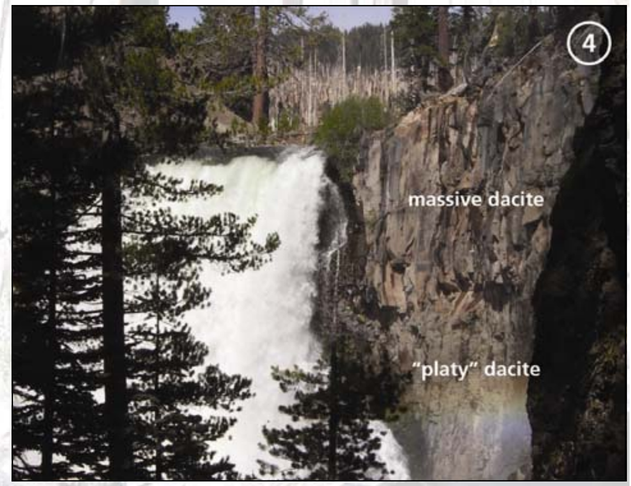
Contacts (2)

In volcanic landscapes, young lava flows often overlie older ones. The line of "contact" between them is an important clue in when constructing the history of the land. Because pumice blankets the landscape, it is younger than all the lavas and granites below. Similarly, the basalt of Devils Postpile lies over the andesite of Mammoth Pass, which in turn is above the dacite of Rainbow Falls. Such relationships allow volcanologists to put eruptions in chronological order even before calibrating the age and frequency using radioisotopic dating in the lab.

View of The Buttresses. Note the stair-step pattern of the basalt lava flows. These lava flows are much older than those of Devils Postpile. Photo by Jonathan Rees.

The Buttresses (3)

West of Devils Postpile is a stairstep of dark basaltic ledges, each formed by a separate flow, some with columns. Exposed columns north of King Creek rival those of Devils Postpile and are flush on granite: strikingly black-on-white. The Buttresses lavas are about 30 times older than those of Devils Postpile. Other remnants indicate that 1,500 vertical feet of the lava flows have been removed by erosion, mainly glaciers. A big surprise to geologists is that such old lava extends down to the present-day river level, indicating that the Middle Fork San Joaquin River has remained at its current elevation for more than two million years, despite numerous glaciations.



The cliffs beside Rainbow Falls show how the dacite flow cooled to form both massive and platy rock. NPS photo.

Rainbow Falls (4)

For 3.5 miles downstream from the Devils Postpile, the river flows across a thick dacite lava flow that erupted 98,000 years ago, about 16,000 years before the Postpile basalt. The dacite filled the former granite-walled river channel, forcing the river to wander eastward in a half-mile-long loop before rejoining its old channel by pitching over Rainbow Falls, where it cut a gorge through the dacite and then follows the dacite-granite contact downstream to Lower Falls. At 100-foot-high Rainbow Falls, gorge walls expose several cooling zones within the single thick dacite lava flow, variously columnar, massive, or platy.