



Lassen Peak, one of the world's largest plug dome volcanoes, erupts in May 1914. The ghost image shows the former profile of ancestral Brokeoff Volcano (also called Mount Tehama). Lassen Peak originally developed as a volcanic vent on Brokeoff Volcano's northern flank—see "Lassen and the Pacific Ring of Fire" below. This illustration is based on geologic mapping done by Howell Williams.

ILLUSTRATION NPS / L. KENNETH TOWNSEND

The Mountain Reawakens

Lassen Peak's May 1914 eruption launched three years of sporadic volcanic outbursts. In the largest eruption, May 22, 1915, the peak blew a huge, mushroom-shaped cloud of ash over 30,000 feet into the air. The volcano's reawakening profoundly altered the surrounding area. Congress made this area a national park in 1916 because of the eruption and active volcanic landscape. Lassen Volcanic National Park is a valuable natural laboratory of volcanic events and associated hydrothermal features. The park lies at the southern end of the Cascade Range, which is a chain of active volcanoes that stretches north to Mount Garibaldi in British Columbia.

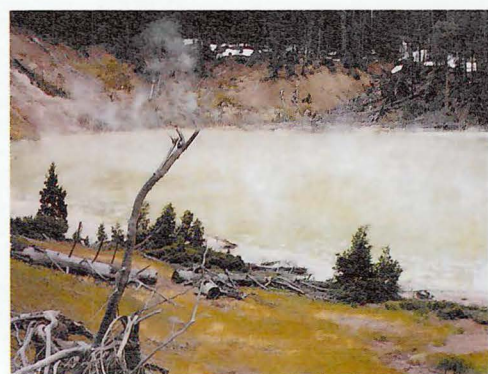
The western part of the park features great lava pinnacles, huge mountains created by lava flows, jagged craters, and steaming vents. The vents are rimmed by beautiful yellow sulfate crystals formed by hydrogen sulfide gases they emit. Cut by spectacular glaciated canyons, the area is dotted by lakes and threaded by clear rushing streams. At higher elevations snowfields can be found year-round. Spring and summer wildflowers adorn meadows. The eastern part of the park is a lava plateau over a mile above sea level, where you can find shield volcanoes and cinder cones. Forested with pine and fir, this area is studded with small lakes but boasts few streams. Warner Valley marks the southern

edge of the Lassen plateau and features hydrothermal areas—Boiling Springs Lake, Devils Kitchen, and Terminal Geyser. This forested, steep glacial valley also has gorgeous meadows.

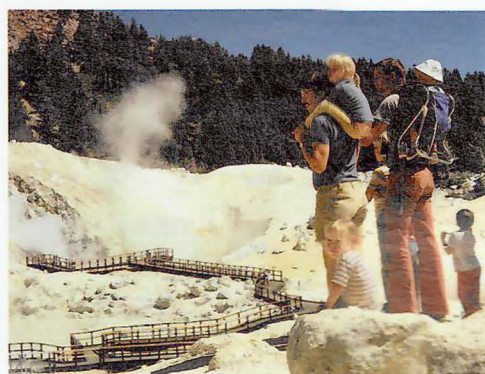
Lassen Volcanic National Park serves as a century-long example of how Mount St. Helens might recover from its eruptions in 1980. The Devastated Area shows the combined mud flow and avalanche destruction typical of Cascades volcanic eruptions. A different mechanism 350 years ago destroyed the Chaos Jumbles. A rock avalanche crashed down the Chaos Crags volcanic dome, to slam across the valley at 110-plus miles per hour with

such force that it ran 400 feet up Table Mountain before losing momentum and surging back down across Manzanita Creek.

Lassen hydrothermal areas—Sulphur Works, Bumpass Hell (the largest), Little Hot Springs Valley, Boiling Springs Lake, Devils Kitchen, and Terminal Geyser—offer bubbling mud pots, steaming fumaroles, and boiling water. These thermal features undergo constant change—some are getting hotter and more acidic and others less so. To shed light on regional volcanic hazards, U.S. Geological Survey scientists along with National Park Service staff investigate and monitor the geologic variations.



Boiling Springs Lake



Bumpass Hell



Painted Dunes



Cinder Cone



Atsugewi pounding basket



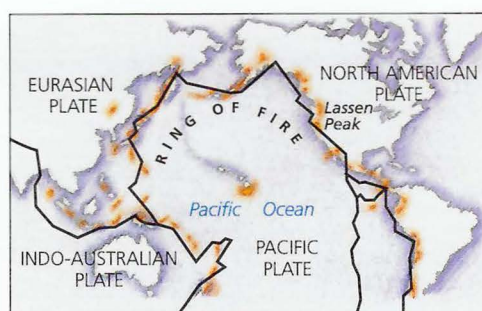
Pioneer program

Lassen and the Pacific Ring of Fire

Lassen Peak is one of many active, dormant, or extinct volcanoes found around the Pacific Ocean in a Ring of Fire (map at right). On this seismic zone, edges of plates that form Earth's crust grind against each other, and one plate subducts, sinks down.

Subduction creates molten rock, magma, at the plate margins. As the magma rises into the continental crust it becomes the feeding chambers of volcanoes.

Ancestral Brokeoff Volcano Some 400,000 to 600,000 years ago Broke-



Pacific Ring of Fire

off Volcano, a big composite volcano, built up through countless eruptions. Hydrothermal activity and weathering weakened and broke down the great volcano. Brokeoff Volcano's main

vent probably stood above what is now Sulphur Works. The remnants of its flanks are Brokeoff Mountain, Mount Diller, Pilot Pinacle, and Mount Conard. If you connect

these peaks in a circle you can envision how big Brokeoff Volcano was—over eight miles wide at its base and at least 11,000 feet high.

Lassen Peak Lassen Peak formed 27,000 years ago as a volcanic vent on the northern flank of Brokeoff Volcano. It is one of the world's largest plug dome volcanoes, rising 2,000 feet to an elevation of 10,457 feet.

How does the landscape recover from volcanic episodes? That question revived as Mount St. Helens erupted in 1980, but the answer has been in process here for nearly a century—since Lassen Peak quieted down.

Important post-eruption plant succession sites in the park illustrate how, slowly yet relentlessly, plant life returns. The Devastated Area and Chaos Jumbles were initially revegetated to conifer forests without significant preparation by herbaceous plants. New forests in disturbed areas are more diverse than

previous mature forests. Seeds carried from the higher elevations have brought species like hemlock and whitebark pine that are not usually found in this forest's normal succession.

The opportunity for trees to become established is great in earlier stages of species recovery and competition. At Chaos Jumbles competition will eventually crowd out four of eight coniferous species now found there.

The Devastated Area is now undergoing a successional process

of revegetation, with herbs, grasses, shrubs, and trees. Lodgepole pines are generally the first trees to give way in time to other pines and firs. By contrast the Cinder Cone and Fantastic Lava Beds areas were slower to recover from eruptions in those areas in the mid-1600s.

Diversity abounds here because plant life mixes species from the Sierra Nevada to the south, the Cascade Range, and the Great Basin to the east. The park hosts nearly 800 plant species, whereas nearby Mount Shasta has only 485.

In the park, 24 Sierran species occur at the northern limit of their range, and 14 Cascadian species are at their southern limit.

The forces that created the Devastated Area and Chaos Jumbles also created Hat and Manzanita lakes, fortuitous landscape recoveries for us today. Hat Lake has undergone succession too. As the basin fills with debris from higher elevations, the lake will disappear and become a meadow that will then eventually become a forest.

American Indians, Emigrants, and Historians

Atsugewi, Mountain Maidu, Yahi, and Yana Indian tribes have ancestral lands in this area. Because of deep snow, the high elevations, and seasonal deer migrations, they spent only warmer months here, for hunting, gathering, and spiritual activities.

They left few artifacts except stone points and knives. Ishi, last known Yahi Indian, appeared in Oroville, Calif., in 1911, having long avoided white settlers. He then lived at the University of California Museum in Berkeley, where he was an invaluable source of

first-hand information for ethnologists.

Trapper Jedediah Smith traversed this area in 1828 on his overland trek to the West Coast. Euro-Americans began to settle here in the early 1840s. With California's 1848 Gold Rush, emigrants streamed into California.

Peter Lassen developed the Lassen Trail (see map) using the tall St. Joseph's Peak (Lassen Peak) to orient emigrants. Both the peak and park now bear his name. More successful was Nobles Emigrant



Trail, that William Nobles developed in the 1850s. It took on regional transportation importance. Sections are still visible in the park (see map). People tried mining, power development projects, ranching, and logging in the area. Early federal protection as a park

saved it from heavy logging. Today this is one of the largest areas of old-growth forest in northern California.

B.F. Loomis documented Lassen Peak's eruption cycle and promoted the park's development. Loomis photographed the eruptions, explored geologically, and developed a large museum collection. The Loomis Museum, open summer and fall, is one of the park's information sites (see map on the other side).

Visiting Lassen Volcanic

Access and Information The park newspaper and website list area accommodations, services, seasonal activities, and wheelchair-accessible facilities. Get your free newspaper at park information sites (see map legend) or contact the park. Buy maps and publications at information sites or from the nonprofit Lassen Association. Fees are charged at park entrances.

Auto Tour The main road around three sides of Lassen Peak offers access to trails, lakes, and volcanic and geothermal features. The *Road Guide to Lassen Volcanic National Park* is sold at information sites. Speed limit is 35 mph or as posted. Do not stop on roadways; use overlooks to view wildlife or scenery. Off-road vehicle travel is prohibited.

Campgrounds The park offers eight campgrounds. All are above 5,650 feet in elevation; ask your doctor about health problems at high

altitudes. Reservations are available. They are required for group campsites. Contact the park or check the park website for more information. Camping at roadsides or in picnic areas and parking lots is prohibited except at the Southwest Walk-in Campground. • Do not disturb any natural features. • Bears are present; store food properly. Do not feed wild animals. • Build fires only in campground fire grates; do not leave any fire unattended.

Hiking The 150 miles of park trails include 17 miles of the Pacific Crest Trail. Self-guiding trails can introduce you to hiking. • Acclimate to high park elevations gradually. Wear sturdy shoes or boots. • **Avoid exposed areas during lightning storms.** • Never hike alone. • **Pets are not allowed on trails or boardwalks.** • Stay on trails; do not take shortcuts. • Bicycles, motor vehicles, and all wheeled conveyances are prohibited on trails. Ask a ranger about wheelchair

use on trails. • Rock climbing is discouraged because volcanic rock is unstable. Talk to a ranger before climbing. • To safely drink backcountry surface water use an absolute 1-micron filter and then **also boil it for at least five minutes or treat with iodine tablets.**

Backcountry Use Free backcountry permits are required for any overnight backcountry stay. They are issued for one trip at a time. Contact the park about closed areas. • Use self-contained stoves; **wood fires are prohibited.** • Pack out all trash. • **Be avalanche aware in winter.** **Always get weather and avalanche information before you enter park backcountry.** At times, backcountry travel may not be advised due to high or extreme avalanche conditions.

Stock Use Pack and saddle stock *may only stay overnight in the designated horse camps* provided at Summit, Juniper, and Butte lakes—



The park is in northern California 50 miles east of Red Bluff and Redding. Get copies of the free park newspaper at park information sites, on the park website, or by contacting the park.

Report emergencies to a ranger or call 911.

reservations required. Permits are required for day use of stock.

Fishing and Boating Anglers need a California fishing license and must know park regulations and limits. Only non-power watercraft may be used on park lakes. Power boats (including those with electric motors) are prohibited. Boating is prohibited on Reflection, Emerald, Helen, and Boiling Springs lakes. **U.S. Coast Guard-approved personal flotation devices are required for each occupant of a watercraft.** All boats must be removed nightly from Manzanita Lake and its lakeshore. Boat rentals are offered at Manzanita Lake Camper Store in summer.

Pets Pets must be leashed and are prohibited on trails and boardwalks, on lakeshores, in the backcountry, at evening talks, and in buildings. Service animals are welcome.

Thermal Warnings: Boiling, acidic water may be on or near surfaces in thermal areas. Crusts over thermal features can be brittle; if you **break through you're in boiling water.** Watch children closely. Stay on the boardwalks and established trails in thermal areas.

Weapons Use or display of weapons is prohibited. Weapons are not allowed in federal facilities. **For firearms regulations check the park website, ask at an information site, or call 530-595-4444.**

More Information Lassen Volcanic National Park P.O. Box 100, Mineral, CA 96063-0100 530-595-4444 or www.nps.gov/lavo

Lassen Volcanic is one of over 390 parks in the National Park System. To learn more about parks please visit www.nps.gov.

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