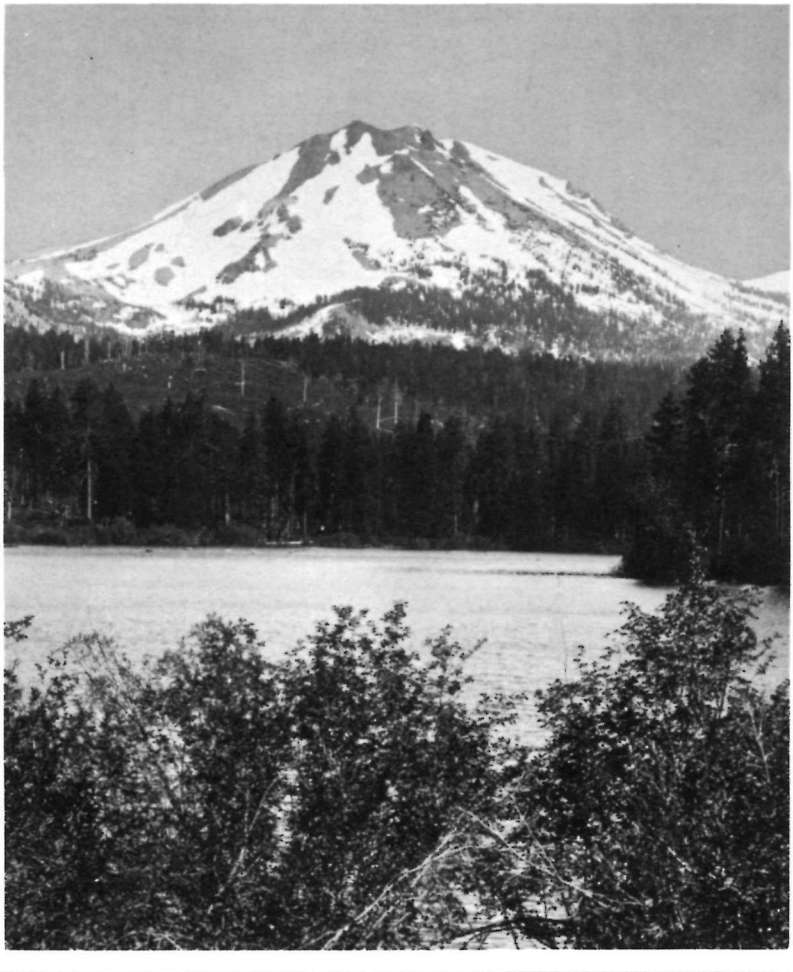
LASSEN VOLCANIC
NATIONAL PARK

✦ CALIFORNIA ✦



UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

Lassen Volcanic

[CALIFORNIA]

National Park

United States Department of the Interior

Harold L. Ickes, Secretary

NATIONAL PARK SERVICE

Arno B. Cammerer, Director

UNITED STATES

GOVERNMENT PRINTING OFFICE

WASHINGTON : 1936

Rules and Regulations

THE PARK regulations are designed for the protection of the natural beauties as well as for the comfort and convenience of visitors. The complete regulations may be seen at the office of the superintendent of the park and at all ranger stations. The following synopsis is for the general guidance of visitors, who are requested to assist in the administration of the park by observing the rules.

Automobiles

Many sharp unexpected curves exist on the Lassen Peak Loop Highway, and fast driving is dangerous. Park speed limit is 35 miles per hour. Drive slowly, keeping always well to the right, and enjoy the scenery. Fee for automobile permit is $1.

Specimens and souvenirs

In order that future visitors may enjoy the park unimpaired and unmolested, it is strictly prohibited to break any formation; to take any minerals, lava, pumice, sulphur, or other rock specimens; to injure or molest or disturb any animal, bird, tree, flower, or shrub in the park. Driving nails in trees or cutting the bark of trees in camp grounds is likewise prohibited and the regulation strictly enforced. Deadwood may be gathered for camp fires.

Trash

Scraps of paper, lunch refuse, orange peelings, kodak cartons, chewing-gum wrappers, and similar trash scattered along the roads and trails and camp grounds and parking areas are most objectionable and unsightly. Consider the park as yours. Help us keep it clean and attractive, and assist by carrying trash with you until it can be burned, buried, or placed in receptacles.

Camping

Camp only in designated areas. Keep your camp clean. As far as possible, burn garbage in camp fire, and empty cans and residue into garbage cans provided for that purpose.

Trails

Cutting corners and taking short cuts on trails is a dangerous practice, and causes considerable damage to the trails. This practice is prohibited and the regulation strictly enforced.

Fishing

State license required. Limit: 10 pounds and 1 fish or 10 fish.

Fires

Light carefully and in designated places. Extinguish *completely* before leaving camp, even for temporary absence.

Hot Spring areas

Dangerous. Do not take chances. Keep on trails or step where others have stepped before. Injuries have resulted from carelessness in these areas.

Park rangers

The rangers are on duty to help and advise you as well as enforce the regulations. When in doubt, ask a ranger.

Contents

What To Do and See

ONE-DAY TRIP

ONLY a small portion of Lassen Park can be seen in one day, but those who cannot stay longer will find the following suggestions helpful:

Obtain the schedule of conducted trips and hikes from the ranger at the checking station.

Drive over the entire Lassen Park Loop Highway (30 miles) from one checking station to the other, stopping enroute at:

The Sulphur Works
The Soda Spring
Lake Emerald
The Devastated Area
Chaos Jumbles and Dwarf Forest
The Mae Loomis Memorial Museum

If time permits, climb Lassen Peak (allow at least 3 hours for the round trip) or hike into Bumpas Hell (2 hours is the average time required).

Lunch and supplies are available at Manzanita Lake.

TWO DAYS AND LONGER

Stay at Manzanita Lake Lodge (see accommodations), or at private resorts elsewhere in the park.

If camping, the Manzanita Lake camp ground, equipped with tables and fireplaces, running water, and modern sanitary comfort stations, is recommended. Fishing is good in Manzanita Lake; groceries and supplies are available at this point; and all daily conducted trips and hikes by ranger-naturalists originate here.

Nightly camp-fire programs, consisting of informal talks, music, stories, and stunts by campers and rangers, are held at Manzanita Lake, and occasionally in the other camp grounds.

OTHER SECTIONS OF PARK

WARNER VALLEY

Famous Boiling Lake and Devils Kitchen. Several private resorts in this section offer comfortable accommodations and feature guided horseback trips to various points of interest in the park. A good dirt road leads in from Chester. Camp grounds are located beyond the ranger station.

JUNIPER LAKE

In the neighborhood of splendid fishing. A private resort on Juniper Lake offers tent and cabin accommodations, with a grocery store, post office, and boats for rent. There is a free public camp ground at the south end of the lake, the largest body of water in the park; 12 miles from Chester; low-grade dirt road.

BUTTE LAKE

Perhaps the most unusual section of the park. The remarkable Cinder Cone is only a short hike from the lake. Excellent camp grounds, but no accommodations or supplies are available. Accessible from the east by the Westwood-Pittville Road; from the south and west by the Lassen Peak Loop Highway and Hat Creek Road. About 15 miles of poor road from either direction.

Events

OF HISTORICAL IMPORTANCE

1820	Arguello exploring party first to record and name Lassen Peak (St. Joseph's Mountain).
1850–51	Last lava flow from the Cinder Cone.
1864	Helen Brodt, first white woman to climb Lassen Peak; made the ascent with Major Reading. Lake Helen named after Helen Brodt.
1906	Lassen Peak and Cinder Cone National Monuments set aside May 6 by President Roosevelt.
1914	May 30. First known eruption of Lassen Peak since coming of white man.
1915	May 19 and 22. Two major eruptions of Lassen Peak occurred on these dates, and resulted in the devastation of several miles of fine timber and forest land.
1916	Lassen Volcanic National Park created by act of Congress.
1917	Lassen Peak ceases to erupt and subsides into a state of quiescence.
1925	Active development of park began. Lassen Peak Loop Highway started.
1931	Lassen Peak Loop Highway completed. Three-day dedication celebration held in park.
1932	Winter snow removal work on Lassen Peak Loop Highway commenced.

The last vigorous activity of Lassen Peak in 1915. *Loomis photo.*

LASSEN VOLCANIC

National Park

• SEASON FROM JUNE 1 TO SEPTEMBER 30 •

LASSEN VOLCANIC NATIONAL PARK, in northeastern California, was created by act of Congress approved August 9, 1916, to preserve Lassen Peak and the area containing spectacular volcanic exhibits which surrounds it. This impressive peak, from which the park derives its name, stands near the southern end of the Cascade Mountains and is the only recently active volcano in continental United States. Its last eruptions, occuring between 1914 and 1917, aroused popular and scientific interest in the area.

GEOLOGIC HISTORY [1]

The Cascades are volcanic in origin and are dotted with numerous inactive volcanic peaks or craters, the most noted being Mount Rainier, Mount Baker, Mount Adams, Mount Hood, Mount Saint Helens, Mount Jefferson, Mount Shasta, the Three Sisters, and Crater Lake. Twenty-five miles south of the park this range meets abruptly the northern end of the Sierra Nevada, which is a great tilted block of the earth's crust, with lofty summits near its eastern border and long westward slopes dipping gently into the Central Valley of California.

The Cascade Range is not ancient measured in geologic time. Its beginning dates back about 2 million years, into the geologic period known as the Pliocene, about a million years before the great Ice Age, or Glacial Period. The character and arrangement of the older rocks indicate that earlier mountains, long before worn down, had occupied the region. The present range rests upon a great platform of lava flows, which issued from many vents and fissures. These lavas accumulated, flow upon flow, to depths of several thousand feet over wide areas in Washington, Oregon, southern Idaho, and northern California. Later this platform was bent,

[1] Abstracted from Geology of Lassen Volcanic National Park, by Howel Williams

or arched, slightly upward along the line of the Cascades. No more widespread floods of lava came forth, but numerous localized eruptions produced the magnificent series of peaks which are now snowcapped and for which the Cascades are famous. Old sediments deposited in ancient seas in adjacent regions, indicate that the Lassen area was probably at one time covered by an arm of the sea and that the volcanic formations which now cover it are underlain by much older strata, late Mesozoic or Tertiary in age.

Throughout the volcanic history of the Cascade region long intervals of quiescence have separated the periods of intermittent activity. During the active periods both explosive eruptions and quiet flows of lava were common. Cinder cones, widespread beds of fragmental material such as tuffs, and the so-called ash beds, are explosion products. Flows produced lava fields and broad, gently sloping volcanoes. At many places both types of eruption have issued at different times from the same vent; in this manner most of the great volcanoes have been built.

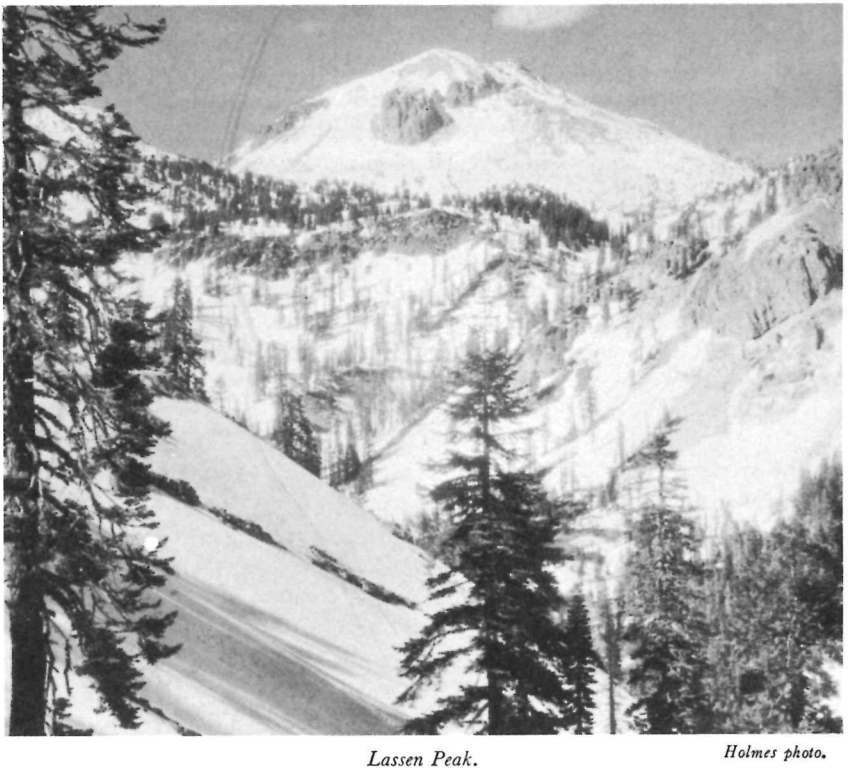
At Lassen Peak the activity has been so recent that there has been very little time for the modification of its volcanic features by erosion. The greatest modifying agent has been glaciation, but even its effects are concealed in part where volcanic activity has continued after the close of the Glacial Period.

LASSEN PEAK AND VICINITY

The western part of the park includes a profusion of volcanic peaks of the "dome" type, of which Lassen Peak itself is the outstanding example. Others include White Mountain, Chaos Crags, Eagle Peak, and Bumpas Mountain, all closely related in origin. They represent a northward-stepping succession of outlet vents from the same parent lava reservoir which fromerly found outlet through the earlier and greater volcano of Mount Tehama, of which only relics are now found in Brokeoff Mountain, Mount Diller, Black Butte, and Diamond Peak.

The great cone of Lassen Peak, rising 10,453 feet above sea level, on the north slope of an ancestral mountain, is almost completely wrapped in a smooth-sloping mantle of rock fragments, broken from its own cliffs. Lassen differs from the "strato-volcanoes", the most common type, which are built up of alternate beds of lava and fragmental material, sloping away steeply from a central crater. The mountain as it stands today has passed through two stages of growth. The earlier Lassen was a broad, gently sloping volcano of the "shield" type, built of lava beds, like the volcanoes of the Hawaiian Islands and like the neighboring Raker and Prospect Peaks, Red Mountain, and Mount Harkness. It rose by a succession of lava flows to an elevation above 8,500 feet, with a

base 5 miles across from north to south and 7 miles from east to west. In the second stage the steep Lassen cone was built on this broad, substantial platform. This, the more conspicuous portion, represents a still rarer "dome" type of volcano, formed by stiff, viscous lava which was pushed up through the vent, like thick paste squeezed from a tube. Piling up in and around the old crater, this stiff lava rose in a bulging dome-like form high above it.



Lassen Peak. *Holmes photo.*

Movements due to the rise of lava into the upswelling mass, the pressure of steam and gases imprisoned within it, and the chill of the outer portions on exposure to the air caused a continuous breaking away of huge blocks and slabs of rock accompanied by many smaller fragments. These accumulated about the rising dome while the mountain was still growing and formed great rock slides on its slopes, much as they appear today. This rock mantle (talus) in places reaches almost to the summit and caps the bulging dome in the form of a cone.

The large boiling pool near the east end of Bumpas Hell. *Grant photo.*

Compared with the slow upbuilding of the more common type of volcano, the rate of growth of an upswelling dome is phenominally rapid, as witnessed by the history of Santa Maria, in Guatemala, and Mont Pelee, in the Island of Martinique. By comparison with the growth of these two domes it has been estimated that the steep cone of Lassen Peak may have been thrust up in the surprisingly short period of 5 years.

Most dome volcanoes have no crater at the top, but at Lassen Peak, gases escaping from lavas deep below maintain open conduits through the softer, central part of the cone. The violence of their discharge at times shoots forth lava in dustlike form, producing the so-called volcanic "ash" of the tuff beds and "mud" flows. Such activity opens a funnel-shaped or cuplike crater at the top. Before the eruptions of 1914–17 the crater of Lassen Peak was an oval bowl approximately 1,000 feet across and 360 feet deep.

Following the rapid rise of the Lassen Dome, there was a long period of quiescence. Nevertheless, prior to the activity of 1914–17 one or more "mud" flows had swept down the northeastern slope, probably within the past 500 years, as judged from the state of preservation of logs that were buried in the lava and recently have been uncovered along the course of Lost Creek.

On May 30, 1914, a series of eruptions began which lasted through June 1917, the most recent volcanic activity in continental United States. Unfortunately, during this period no scientific observer was stationed in the region to record and report the detailed account of events. The story has been pieced together from fragmentary reports of occasional witnesses and by inferences from the study of the remaining evidences of the activity.

The first eruption, which was short and mild, opened a new vent within the old crater. Water from melting snow, trickled down through crevices deep into the volcano and there was converted into steam. This may have aided or served to start the action, which was due primarily to rising heat within. The materials thrown out during the first year were not hot; in fact, most of them were too cold to melt the snow upon which they fell. By March 1915 more than 150 explosions had occurred, most of them mild. The coarser materials fell on the slopes of the peak, but the finer dust was spread over a much larger area, mostly toward the northeast; due to the prevailing winds, some fell as far as 15 miles to the south.

Another violent eruption occurred in May 1915, possibly set off by the melting of the exceptionally heavy snow which had accumulated during the preceding winter. On May 19 the first glowing lava made its appear-

ance, rising in the new crater and spilling through the western notch in the crater rim in the form of a tongue which reached down the slope 1,000 feet. During the night of May 19 the snow was melted on the northeastern slope, causing destructive flows of mud which swept boulders up to 20 tons in weight 5 to 6 miles into the valleys of Hat Creek and Lost Creek.

Three days later, on May 22, another and lesser mud flow moved down the same slope, and minor flows took place on the north and west flanks of the volcano. At the same time a terrific hot blast, heavily charged with dust and rock fragments, was discharged down the northeast flank of the peak. So violent was this outburst that trees on the slopes of Raker Peak, more than 3 miles away, were felled uniformly in the direction of the on-

Steam vents and boiling pools in Bumpas Hell. *Holmes photo.*

rushing blast. At the same time a vertical column of smoke and ash rose more than 5 miles above Lassen crater.

The energy of the volcano was largely spent by the end of the 1915 eruption. With only occasional outbursts of steam and ash, the activity definitely subsided during the next 2 years. A final series of violent explosions occurred in May and June 1917, again following the melting of considerable quantities of snow. The activity of 1916 and 1917 produced little effect besides modifying the form of the crater by opening new vents within it.

Most of the crater is now filled by the rough, blocky lava which rose into it in May 1915; but at the northwest a yawning chasm through the crater wall was opened by later explosive eruptions. In view of the volcanic history of the region, renewed activity at Lassen is not probable for many years, although there is no reason to suppose that the volcano is yet extinct.

OTHER DOME VOLCANOES NEAR LASSEN PEAK

Almost surrounding Lassen Peak on three sides, north, east, and south, are several other peaks which are similar to Lassen in their dome type of origin, although Lassen is the only one which has a crater in the top of its dome plug. The more common type of dome, without a crater at the top, is represented by White Mountain, Chaos Crags, Eagle Peak, Vulcans Castle, Mount Helen, Bumpas Mountain, and the hills north of Chaos Crags. With the exception of these hills, the domes named appear to be progressively younger from south to north. Those at the south, between Lassen and the old Tehama Volcano, are preglacial in age, or were thrust up early in the Glacial Period. However, the lava forming the broad foundation of the Lassen dome is older than these domes.

CHAOS CRAGS AND CHAOS JUMBLES

Chaos Crags and Chaos Jumbles present the most spectacular scene of turbulent disorder to be found in the entire region. No words can convey an adequate picture of the piles of huge angular blocks, thrown together in wild confusion over the surface of these domes, or of the bristling pinnacles and stacks that project above them. Enormous banks of angular talus, many of them more than 1,000 feet high, encircle the domes, merging at the northwest into the choppy disarray of the Jumbles.

The activity at Chaos Crags, like that of many volcanic domes the world over, was divided into three phases: First, explosive eruptions building a series of cinder cones, then the thrusting up of the molten viscous lava as steep-sided domes, and lastly the partial destruction of these domes by renewed explosions—all only about 200 years ago.

The early violent eruptions formed several cinder cones at the north base of Lassen Peak. A portion of one of these cones, with its crater 600 feet in diameter and 60 feet deep, is still preserved against the south flank of the Crags, and the disorganized remains of at least two others are recognizable. The pushing up of the viscous lava doubtless followed soon afterward, forming two domes, each about a mile in diameter, the older south dome partially encircling the later and higher north dome. Unable to flow for more than a short distance, this stiff lava piled up about the vents. Great

strains were set up in the solidifying mass by the upward surge of the lava into the swelling dome and probably by frequent violent explosions of steam and gases from various parts of the stiffening mass. Thus vast talus slopes were formed by the breaking and crumbling of the rising masses, and the domes were thrust up through their own accumulating debris, as the famous "spine" of Mont Pelee.

The north dome had risen 1,800 feet above the surrounding country when explosions at the base of the rising mass blasted away the support from the north face and hurled vast quantities of broken and falling lava out upon the cinder-covered region below. This rock blast was shot

Lake Helen. In the distance are Brokeoff, Diller, and Pilot Pinnacle Mountains.

forward with such momentum that its front rushed 400 feet up the opposite slope of Table Mountain, 2 miles distant from the craters at the north foot of the Crags, and stopped there with an abrupt front. An area 2½ square miles in extent was thickly covered by angular rock, mingled with finer, sandlike material. Manzanita Lake was formed where the Jumbles obstruct Manzanita Creek. The neighboring Reflection Lake is but the largest of many pools that occupy depressions in the Jumbles.

Three miles southwest of Lassen Peak once stood a great mountain, with a base more than 12 miles in diameter and rising approximately 4,000 feet above the steaming vents and boiling springs of Sulphur Works. This

mountain was built by a long succession of quiet lava flows, producing a sloping cone of the "shield" type, similar to the volcanoes of the Hawaiian Islands. After this activity ceased, the crater and the upper parts of the volcano collapsed and sank into the lavas beneath, thus forming a great bowl, or caldera, with a jagged rim. Brokeoff Mountain, with an elevation of 9,232 feet, is the largest remnant of this old rim. Other remnants are Mount Diller and Black Butte.

The beginning of this ancient mountain dates back a million and a half years to the late Pliocene Period. Before the Ice Age its great eruptions had ceased and the broad basin of the caldera was formed. Numerous steam and hot gas vents (fumaroles) and hot springs in the old caldera, including Sulphur Works, Bumpas Hell, and Steamboat Springs, show that the lava beneath the surface has not yet entirely cooled. Farther east similar types of activity may be seen at Cold Boiling Springs Lake, Devils Kitchen, Boiling Springs Lake and Terminal (Opal) Geyser. These fumaroles are of the type known as solfataras, because of the sulphur content of the gases. They decompose the lavas with which they come in contact and change them into soft olive green, yellow, or red earthy material, or into a white claylike substance. The vents are characterized by escaping vapors (mostly steam), thermal springs, and churning mud pots of various colors. Their activity is most striking in the early or late hours of the day, when the colder air causes rapid condensation of the steam into visible cloudlike masses.

VOLCANOES OF THE CENTRAL PLATEAU

Four prominent volcanoes in the landscape eastward from Lassen Peak are Raker and Prospect Peaks, Red Mountain, and Mount Harkness. They belong to the "shield" type and were built up during the Glacial Period, about the same time as the steep cone of Lassen Peak, by a sequence of numerous quiet flows of lava, like the broad base of Lassen itself.

CINDER CONE AND THE EASTERN RANGE

One of the most beautiful and unusual features of the park is Cinder Cone, 10 miles east-northeast from Lassen Peak, with its rugged and fantastic lava beds and its multicolored explosion products. The almost total absence of vegetation intensifies the appearance that the eruption occurred not long ago. Actually its last lava flow is not much older than the recent activity of Lassen itself, dating back only to the winter of 1850–51. The beginning of its history was considerably earlier, although it is entirely post-glacial and hence very recent in the geologic sense.

After most of the present cone had been piled up by explosive cinder eruptions, lava flowed out from its base; then followed a second series of

cinder eruptions and also a second series of lava flows. Their magnetic properties indicate that the two earliest flows appeared about the first half of the sixth century A. D. The last of the second series was erupted in 1851, when flaring lights which persisted for many nights, were observed from various distant points. Later examination has shown that this activity produced the prominent black lava stream which emerged from the southern base of the cone, curved to the south, then east and northeast, and flowed into Butte Lake. An earlier flow of this late series separates Butte and Snag Lakes, which may formerly have been connected as one large lake.

All eruptions from the crater of Cinder Cone have been of the cinder-producing explosive type, that have pushed their way through the loose cinders at or near the base of the cone.

Some lava flows can be dated with a fair degree of accuracy by estimating the age of trees that are growing upon them. The flow which now separates Butte and Snag Lakes and which preceded that of 1851, is thought to be about 200 years old. The eastern Ridges, including the prominent Bonte Peak and Mount Hoffman, embody some of the oldest lavas of the park; hence their original volcanic features have been modified not only by glacial action but also by the pre-glacial erosion of streams.

GLACIATION

During the Glacial Period parts of the valleys and much of the Central Plateau were under a thick, slowly moving cover of ice and are now mantled by a thick blanket of glacial drift. Such material is seen in great abundance at Badger Flat, Corral Meadow, and about the shores of Snag and Juniper Lakes. Few mountain peaks rose above the ice at the time of its maximum thickness, although over most of the area this was probably less than 1,000 feet. Warner Valley, just south of the park boundary, was filled with ice to a depth of 1,600 feet.

The dominating peaks of Lassen and White Mountain and most of their neighbors, Raker Peak, Red Mountain, Prospect Peak, and Mount Harkness rose well above the general level of the ice sheet, and each of them became an ice-clad center of local glaciation, with ice moving radially down their slopes to join the general ice sheet below. At their sources on the higher peaks the local mountain glaciers were thin and their erosive powers were relatively feeble. Over broad areas where the slopes were not so steep, the ice was thicker and the scouring action on the underlying surface was vigorous, despite the slower movement.

Some of the glacial debris is arranged in well-defined ridges, elongated by the overriding ice in the direction of the movement. In the heavily

glaciated Central Plateau, where the bedrock is not covered, it is commonly striated also in the direction of movement, and many of the surfaces are polished by glacial scour.

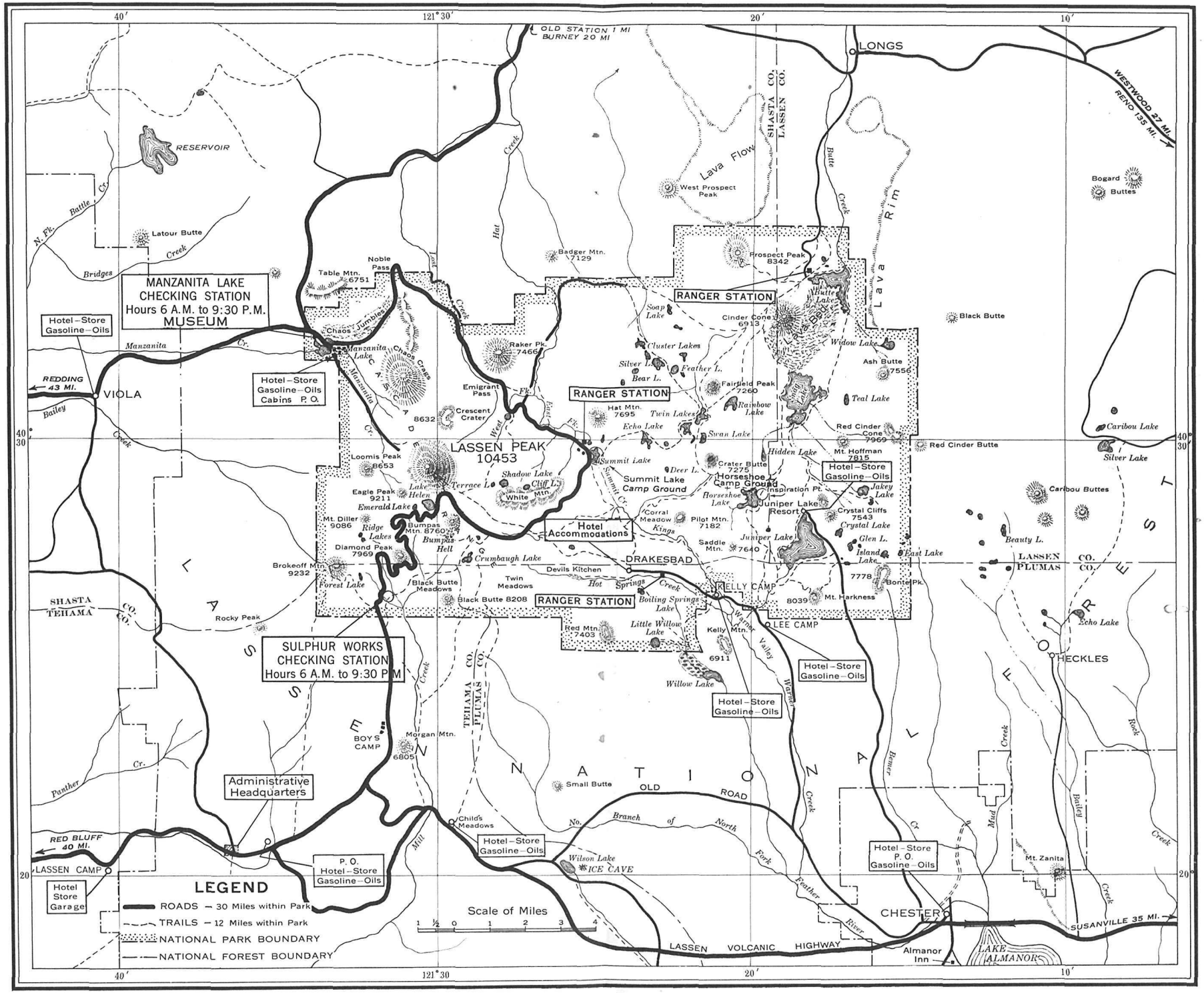
OTHER INTERESTING FEATURES

Impressive canyons, scored deeply into the ancient lavas in the westerly and southerly regions of the park, add to its attractions. Primeval forests cover the entire area, except where the loftier peaks rear their summits above timberline. In the main we find ponderosa pine, Jeffrey pine, sugar pine, lodgepole pine, incense cedar, white fir, Douglas fir, red fir, western white pine, an occasional juniper, and at the timberline the rich, dark masses of western black hemlock interspersed with occasional groups of white-bark pine. During the warm summer months a variety of flowers further enrich the profusion of color found here.

Through the forest curtain the silvery sheen and shimmer of innumerable alpine lakes greet the eye. The splendid Chain-of-Lakes in the eastern region of the park extends from Juniper, with a shore line of 5 or 6 miles at the northerly base of Mount Harkness to the northward, including Horseshoe Lake, which divides its waters between the Feather and the Pit, to flow apart for several hundred miles and meet again; then linking in Snag Lake with its broad breaches of volcanic sand formed by the ejecta from Cinder Cone; and on to Butte Lake near the eastern base of Prospect Peak with its rugged shores of lava and its scenic setting. Through the clear waters of Snag Lake, and at many places above the surface of the water, can be seen standing the remains of trees that grew at the south end of the lake before it was dammed by the lava flow and raised to its present shore level.

At a point 1.3 miles from the Lassen Peak Loop Highway are the beautiful Kings Creek Falls. The trail starts at Kings Creek Meadows at the lower crossing of the highway. By following down the left-hand side of the creek both the cascades and the falls can be seen.

A most inspiring view may be obtained from the summit of Lassen Peak. For a radius of 150 miles the magnificent panorama unfolds. To the west and southwest the Sacramento Valley spreads, like a great map, from the base of Shasta to where it merges into the great Central Valley of California, a sweep of fully 200 miles; to the north Mount Shasta looms in splendid majesty, and far beyond the peaks of southern Oregon link Lassen Volcanic with its sister park at Crater Lake; to the eastward the Susan River drainage guides the eye to Honey Lake Valley and the distant mountains of Nevada; to the south the view is over the High Sierra, across the broad expanse of forested mountain region in the Feather River country, until the picture dissolves in the purple mysteries which veil the distances.



LASSEN VOLCANIC NATIONAL PARK AND VICINITY

Early fall skiing on the shores of Lake Helen. *Holmes photo.*

In the foreground of the picture the splendid mountains viewed from the lower elevations now seem pigmies. At the base of Lassen to the north the Chaos Crags and to the east White Mountains stand out in bold relief. Curving from the southerly base the serrated edges of the ancient crater rim, with Lake Helen, a gemlike setting in its crescent, include six peaks which attain a height of over 9,000 feet above sea level. Brokeoff Mountain and Mount Diller stand out prominently among the encircling peaks which form the amphitheater marking the location of the once dominating volcano of the region. Compared with this ancient mountain our Lassen Peak is very recent.

WILDLIFE

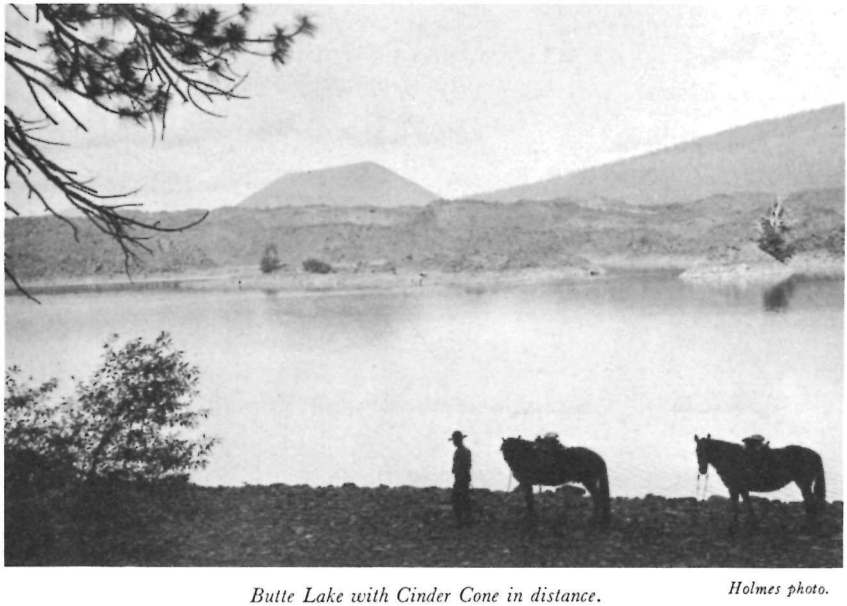
Lassen Volcanic National Park, like all the other national parks, is an absolute game sanctuary. Before active administration of the park began, hunting in certain sections was carried on excessively, and consequently wild game was seldom seen in any quantity. Under the protection afforded during the past few years, the park has apparently succeeded in establishing itself as a sanctuary for wild animals, which are now more numerous than before. Blacktail and mule deer may be seen in most any section of the park, and a variety of smaller animals affords much pleasure to visitors. Occasionally a black bear appears.

A ranger's pet. *Holmes photo.*

FISHING

There are dozens of lakes and streams in Lassen Volcanic National Park that have been regularly stocked for years and but relatively seldom fished. The great number of lakes, the fact that they have hitherto been rather inaccessible, and the intensive fish-planting program have made this park one of the finest fishing areas in the State. The most numerous species is the rainbow trout. Brown trout, Loch Leven, and eastern brook are also found in abundance. The waters are very cold, and the clean, sandy bottoms of the lakes and plentiful food supply make the trout very fine eating.

All fishing waters in the park are now within an easy half day's hike from some entering road. The completion of the Lassen Peak Loop Highway brought such well-stocked waters as Cluster Lakes, Twin Lakes, Lower Kings Creek, and the White Lakes within easy walking distance from the road. Manzanita and Reflection Lakes usually offer the best fishing on the highway, with Kings Creek, Hat Creek, and Summit Lake good at times. In Manzanita Lake, bait (hellgramites and eggs) is most successful, although at times the trout will rise to flies and spinners very well. In the approximate center of the park are a group of lakes known as the Twin Lakes. They are reached by trail from Summit Lake, going by Echo Lake and thence down the long draw terminating at the upper Twin Lakes. The distance is 3½ miles. The Cluster Lakes also offer good fishing, and are most easily reached by driving to Badger Flat and hiking to the lakes on the marked trail. Distance, 2½ miles. Cluster and Twin Lakes are at their best from the 1st to the middle of July and again from September 15 to October 31.



Butte Lake with Cinder Cone in distance. *Holmes photo.*

In the northeastern section of the park Butte Lake has long been famous for the size of its trout. Near Butte Lake and accessible by trail are Snag and Widow Lakes, two excellent fishing waters.

Perhaps the most consistently good fly lake in the park is Horseshoe Lake. It is reached after a mile hike from the end of the Juniper Lake

Road. The Twin Lakes group is not far from Juniper Lake. The best creek fishing is in Warner Valley. Upper Kings Creek may be reached on the Lassen Peak Loop Highway and by trail from Summit Lake.

The trout in park waters will almost always rise to a fly. The wet fly is usually the most successful. The Professor, Black Gnat, Blue Upright, Queen of the Waters, Improved Governor, mosquito, and gray hackle flies are recommended.

In the early spring and throughout the summer an insect known as the hellgramite is found under logs and debris along the edges of many of the park lakes. This insect makes very good bait. Salmon eggs are extensively used, and in the early spring trolling with a no. 2 or 3 spinner is recommended. To prevent carp and other objectionable species from taking over the fishing waters in the park, the use of live bait not obtained in the park is strictly prohibited.

The limit for a day's catch is 10 pounds and 1 fish, with a maximum of 10 fish, and State angling license is required. Where not inconsistent with special park regulations, the fishing laws of the State of California apply and are enforced.

CAMPING

Lassen Volcanic National Park is primarily a campers' park. On the Lassen Peak Loop Highway, three ideal camping spots have been selected,

Summit Lake Camp Ground. *Holmes photo.*

The Raker Memorial Gate on the Lassen Loop Highway. *Sager photo.*

developed, and set aside as free public camp grounds. Summit Lake Camp Ground is the most central to all points, and is excellently located for fishermen who desire to hike to the wilderness lakes. Kings Creek Camp Ground has the advantage of being near Lassen Peak and Bumpas Hell. Manzanita Lake Camp Ground, situated near the northwest entrance to the park, is located beside a good fishing lake, and is convenient to supplies. It is at present the best developed as to conveniences.

While the days are warm, nights are often chilly, and it is well to have plenty of warm bedding. Camp-fire programs are given nightly in the larger camp grounds.

HOW TO REACH THE PARK

Stages connect with Southern Pacific trains at Red Bluff, Calif., and Reno, Nev., and with the Western Pacific Railroad at Keddie. These stages serve only the Warner Valley and Juniper Lake entrances at this time.

The park may be reached by automobile over all-paved highways from Redding and Red Bluff, on Pacific Highway (U. S. No. 99) and from Reno on the Lincoln Highway. Roads also extend down to the park from the Redding-Alturus lateral at Burney and Pittville. The State highway from

Red Bluff to Reno passes within a few miles of the park, connecting with three park entrance roads. Several roads from the south connect with this highway.

High speed, de luxe airplane service from all points in the United States to Reno, Nev., Medford, Oreg., and Sacramento, Calif., is available through United Air Lines. For persons of limited time this provides an excellent opportunity to visit the park.

ADMINISTRATION

The park is administered by the Department of the Interior through the National Park Service, with the superintendent in immediate charge. His office is located at administrative headquarters, one-half mile west of Mineral on the Red Bluff-Susanville State Highway. Maps, information, and bulletins may be obtained there. Address communications for the superintendent to Mineral, via Red Bluff, Calif. Mail for campers and the park utility operator should go to Manzanita Lake, Calif.

ACCOMMODATIONS AND EXPENSES

Manzanita Lake Lodge is operated by the Lassen National Park Camp, Ltd., under Government supervision. It is a half mile from the Manzanita

Manzanita Lake Lodge. *Loomis photo.*

Lake entrance. Modern housekeeping cabins of a standard and de luxe type may be rented at various rates. Without bedding, kitchen equipment, etc., the charge for one or two persons for a bedroom is $1.50 standard and $1.75 de luxe and $2 and $2.50, respectively, for a bedroom and kitchen. If bedding and kitchen equipment are furnished the rates are $2 standard and $2.25 de luxe for a bedroom and $2.75 and $3, respectively for a bedroom and kitchen. No charge is made for children under 3 years of age; from 3 to 11 years, half rates are charged.

A 10 percent discount is allowed to persons staying a week or more. Rowboats are available at a cost of from 35 cents an hour to $7 a week.

The Loomis photographic shop at Manzanita Lake. *Loomis photo.*

Mrs. B. F. Loomis maintains a photographic shop at Manzanita Lake. Groceries, gasoline, and other supplies may also be purchased at this concentration point.

Mail for guests or campers in this section of the park should be addressed to Manzanita Lake, Calif., and will be held at the post office until called for.

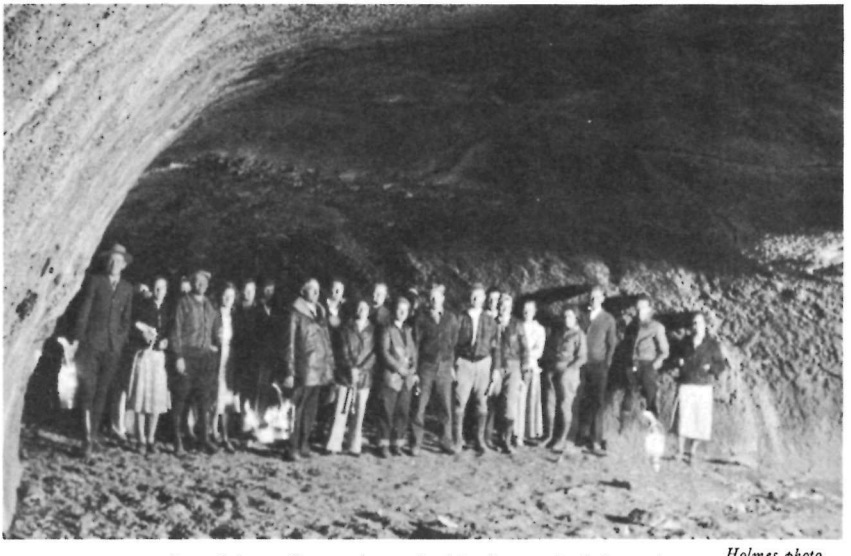
Juniper Lake and Drakesbad.—These two resorts are located on private lands within the park, and are operated entirely as private enterprises without any supervision by the Government. At Juniper Lake, tent and cabin American-plan accommodations are available at prices ranging from $4 a day to $27.50 a week for one person. Saddle horses are available

at $3 a day. Rowboats cost 50 cents an hour and motorboats $1.50. The services of a guide may be obtained for $6 a day. At Drakesbad, in the upper end of Warner Valley near the Devils Kitchen and Boiling Lake, similar accommodations are available at $4 a day or $24 a week, and up. Saddle horses cost $2 a day, and guide service is $5.

This booklet is issued once a year. The rates mentioned herein may have changed slightly since issuance, but the latest rates approved by the Secretary of the Interior are on file with the superintendent and park operator.

INTERESTING PLACES NEAR THE PARK

Subway Cave.—Seventeen miles north of the park, on the Hat Creek Road to Burney, an old lava tube has been discovered. This tube is several



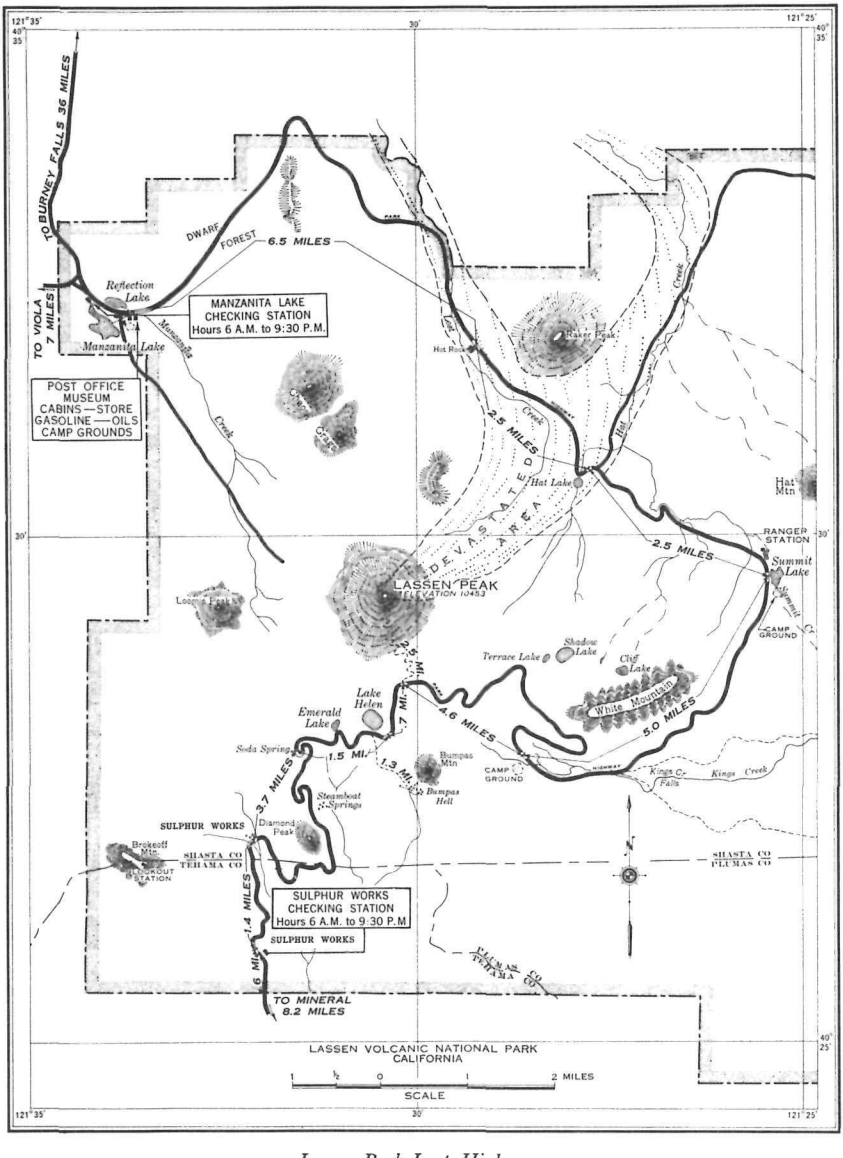
In a Subway Cave, a lava tube 14 miles north of the park. *Holmes photo.*

hundred feet long, with a flat, level floor, 6 to 25 feet high, and runs through an old lava flow. It can safely be explored with flashlights and makes a very interesting side trip from the park.

Lumber Mill, Westwood.—One mile off of the Red Bluff-Susanville Highway is the town of Westwood, owned and operated by the Red River Lumber Co. This huge mill normally employs several thousand men.

Mount Shasta.—This famous mountain may be seen looming up in the distance from several points along the road to the park from Redding and Red Bluff.

Lake Almanor.—Said to be one of the largest of artificial lakes, Lake Almanor has long been known for its excellent trout fishing. The name of this lake was taken from parts of the first names of the three daughters—



Lassen Peak Loop Highway.

Alma, May, and Eleanor—of the president of the power company developing the lake.

Foothill Craters.—Several extinct volcanoes—with their characteristic craters, flat tops, and conical shapes—may be seen when passing through the valley foothills. In this same area, where a mass of boulders strews over the acres of land a short distance out of Red Bluff, is broken lava rock carried down in mud flows and landslides from volcanoes higher up. Later the lighter soil surrounding these boulders eroded, with the result that today the ground is covered with thousands of lava blocks.

POINTS OF INTEREST—LASSEN PEAK LOOP HIGHWAY

Miles from southwest entrance	Name	Remarks	Miles from northwest entrance
0.0	Southwest Park Boundary.	Raker Memorial Gateway. Elevation, 6,550 feet. Mineral, 8.2 miles. Viola, 36.7 miles.	29.7
0.6	Sulphur Works—Checking Station.	Stop and obtain permit. Firearms must be declared and sealed.	29.1
2.0	Sulphur Works.....	Steam vents, boilers, mud pots, etc., can be seen from the road.	27.7
4.0	Diamond Peak.....	The highway from the park boundary to Lake Emerald winds up inside of the old original Brokeoff Crater, one side of it having been broken through by Mill Creek. Rounding Diamond Peak a ragged agglomerate point sticking up in the center, it is often possible to see steam vents in the old crater wall across the canyon and Steamboat Springs in the bottom of Little Hot Springs Valley.	25.7
5.7	Soda Spring.....	Water considered medicinal.....	24.0
6.7	Lake Emerald.....	Rainbow trout in lake can be seen from bank.	23.0
7.1	Bumpas Hell Trail....	Bumpas Hell, one of the largest areas of spectacular hot springs, mud pots, boiling pools, and other types of volcanic activity, is reached from this point by trail, 1.3 miles long. About 2½ hours.	22.6
7.2	Lake Helen.....	Named after the first white woman to climb Lassen Peak, Helen Tanner Brodt.	22.5
7.9	Lassen Peak Trail.....	A good trail, 2½ miles in length, to the top of the only recently active volcano in continental United States. About 3 hours.	21.8

POINTS OF INTEREST—LASSEN PEAK LOOP HIGHWAY—Continued

Miles from southwest entrance	Name	Remarks	Miles from northwest entrance
8. 2	Summit of Highway...	Elevation, 8,512 feet. Descending and going east, Lake Almanor and surrounding country are seen in the distance.	21. 5
12. 6	Kings Creek Meadows .	Free public camp ground. Elevation, 7,400 feet.	17. 2
17. 5	Summit Lake.....	Excellent camp ground, convenient for hikes, fishing, and to points of interest.	12. 2
20. 0	Devastated Area.....	An extensive area denuded of all vegetation by hot blasts and mud flows from the May 1915 eruptions of Lassen Peak.	9. 7
22. 5	Hot Rock.....	Large black lava rock carried by mud flow from Lassen Peak. Observers state this rock remained quite warm over a week.	7. 2
27. 5	Chaos Crags and Chaos Jumbles.	The Chaos Crags are old lava plugs, believed to have been pushed up only 200 years ago, the top of which broke off and avalanched down to form Chaos Jumbles.	2. 2
29. 0	Manzanita Lake—Educational Headquarters, Post Office, Stores, Lodge.	Mae Loomis Memorial Museum. Free public camp ground; cabins, lunches, groceries, rowboats, gas and oil, photographs, and supplies.	0. 7
29. 4	Manzanita Lake—Checking Station.	Stop and obtain permit. Declare and have guns sealed.	0. 3
29. 7	Northwest Park Boundary.	Viola, 6.3 miles. Butte Lake, 30 miles. Mineral, 37.9 miles.	0. 0

For information, service, or assistance of any kind, ASK A PARK RANGER.

DISTANCES TO PRINCIPAL PLACES

BY AUTOMOBILE FROM MINERAL, PARK HEADQUARTERS

To—	Distance between points	Distance from Mineral	Remarks
Manzanita Lake:	*Miles*	*Miles*	
Park boundary	8. 2	8. 2	Elevation, 6,300 feet; declare guns.
Summit	8. 2	16. 4	Elevation, 8,512 feet.
Manzanita Lake	20. 8	37. 2	Museum, cabins, store, gas, camping.
Park boundary	. 8	37. 9	Road continues on to Redding and Red Bluff, to Hat Creek, and to Butte Lake.
Warner Valley (Devils Kitchen and Boiling Lake):			
Chester	32	32	Red River Lumber Co. holdings.
Lee Camp	12	44	Resort accommodations.
Kelly Camp	2	46	Do.
Ranger Station	. 5	46. 5	Park boundary, information, maps.
Drakesbad (Warner Valley).	2. 5	49	Resort accommodations (private land); 25 cents charge for nonpatrons.
Juniper Lake:			
Chester	32	32	
Juniper Lake Camp Ground.	11	43	On south shore of Juniper Lake.
Juniper Lake Resort	1	44	Resort accommodations (private land).
Butte Lake:			
Chester	32	32	
Westwood	13	45	Turn right on Pittville Road.
Park boundary	45	90	12 miles of rough, dangerous road.
Butte Lake	2	92	Good fishing, Cinder Cone (via trail) 2 miles.
Butte Lake via Lassen Peak Loop Highway:			
Park boundary	8. 2	8. 2	See Mineral to Manzanita Lake.
Summit	16. 4	16. 4	Elevation 8,512 feet.
Manzanita Lake	37. 2	37. 2	Educational headquarters.
Old station	13. 3	50. 5	Store, gasoline, post office.
Subway Caves	. 9	51. 4	Interesting lava tubes.
Butte Lake	17. 2	69	When approaching Butte Lake over sand stay strictly in ruts in the road.

BY TRAIL FROM THE LOOP HIGHWAY TO—

	Miles
Lassen Peak	2. 5
Bumpas Hell	1. 2
Brokeoff Mountain Lookout	3. 0
Kings Creek Falls	1. 3
Echo Lake	1. 8
Twin Lakes	3. 2
Cluster Lakes (from Badger Flat)	2. 7
Shadow Lake	0. 8
Cliff Lake	1. 5
Devils Kitchen (from Summit Lake)	5. 3

Manzanita Lake, showing Mount Lassen.

Grant photo.

REFERENCES

COLBURN, F. E. W. The Kingship of Mount Lassen. 69 pp. 1922. Nemo Publishing Co., San Francisco.

COLLINS, G. L., and LIND, H. C. Lassen Glimpses. 32 pp. 1929.[1]

DAY, A. L., and ALLEN, E. T. The Volcanic Activity and Hot Springs of Lassen Peak. 1925. Carnegie Institute of Washington Publication No. 360.

DILLER, J. S. A Late Eruption in Northern California and Its Peculiar Lava. 33 pp. 1891. United States Geological Survey Bulletin No. 79.

FAIRFIELD, A. M. Fairfield's Pioneer History of Lassen County, California. 1916. H. S. Crocker & Co., San Francisco.

FINCH, R. H., and ANDERSON, C. A. The Quartz Basalt Eruptions of Cinder Cone, Lassen Volcanic National Park, Calif. Bull., Department of Geological Sciences, University of California Publications. Vol. 19, 1930.

GRINNEL, DIXON, LINSDALE. Vertebrate Natural History of a Section of Northern California through the Lassen Peak Region. 594 pp. University of California Publications in Zoology. Vol. 35, 1930.

HOLMES, A. G. When Will Lassen Peak Again Erupt? The Scientific Monthly, January 1935. Vol. XL, pp. 21–32.

KELLY, EDGEMOND and CHICK. Three Scout Naturalists in the National Parks. Lassen Volcanic National Park, pp. 194–209. 1931. Brewer, Warren & Putnam, New York.

LOOMIS, B. F. Pictorial History of the Lassen Volcano. 141 pp. 1926. California Press, San Francisco.[1]

RUSSELL, I. C. Volcanoes of North America. 346 pp. 1897.

WILLIAMS, H. Geology of the Lassen Volcanic National Park. Bulletin of the Department of Geological Sciences, University of California Publication, Vol. 21, No. 8, pp. 195–385, 1932.

——— A Recent Volcanic Eruption near Lassen Peak, California. Bulletin of the Department of Geologic Sciences, University of California Publications. Vol. 17, pp. 241–267, 1928.

——— The Dacites of Lassen Peak and Vicinity. American Journal of Science. Vol. 18, October 1929.

——— The Volcanic Domes of Lassen Peak and Vicinity. American Journal of Science. Vol. 18, October 1929.

[1] On sale in the park.

Do You Know Your National Parks?

Acadia, Maine.—Combination of mountain and seacoast scenery. Established 1919; 21.81 square miles.

Bryce Canyon, Utah.—Canyons filled with exquisitely colored pinnacles. Established 1928; 55.06 square miles.

Carlsbad Caverns, N. Mex.—Beautifully decorated limestone caverns believed largest in the world. Established 1930; 15.56 square miles.

Crater Lake, Oreg.—Astonishingly beautiful lake in crater of extinct volcano. Established 1902; 250.52 square miles.

General Grant, Calif.—Celebrated General Grant Tree and grove of Big Trees. Established 1890; 3.96 square miles.

Glacier, Mont.—Unsurpassed alpine scenery; 250 lakes; 60 glaciers. Established 1910; 1,533.88 square miles.

Grand Canyon, Ariz.—World's greatest example of erosion. Established 1919; 1,009.08 square miles.

Grand Teton, Wyo.—Most spectacular portion of Teton Mountains. Established 1929; 150 square miles.

Great Smoky Mountains: N. C.-Tenn.—Massive mountain uplift covered with magnificent forests. Established for protection 1930; 615.76 square miles.

Hawaii: Islands of Hawaii and Maui.—Volcanic areas of great interest, including Kilauea, famous for frequent spectacular outbursts. Established 1916; 245 square miles.

Hot Springs, Ark.—Forty-seven hot springs reserved by the Federal Government in 1832 to prevent exploitation of waters. Made national park in 1921; 1.58 square miles.

Lassen Volcanic, Calif.—Only recently active volcano in continental United States. Established 1916; 163.32 square miles.

Mesa Verde, Colo.—Most notable cliff dwellings in United States. Established 1906; 80.21 square miles.

Mount McKinley, Alaska.—Highest mountain in North America. Established 1917; 3,030.46 square miles.

Mount Rainier, Wash.—Largest accessible single-peak glacier system. Established 1899; 377.78 square miles.

Platt, Okla.—Sulphur and other springs. Established 1902; 1.33 square miles.

Rocky Mountain, Colo.—Peaks from 11,000 to 14,255 feet in heart of Rockies. Established 1915; 405.33 square miles.

Sequoia, Calif.—General Sherman, largest and possibly oldest tree in the world; outstanding groves of Sequoia gigantea. Established 1890; 604 square miles.

Shenandoah, Va.—Outstanding scenic area in Virginia section of Blue Ridge. Established 1935; 275.67 square miles.

Wind Cave, S. Dak.—Beautiful cavern of peculiar formations. No stalactites or stalagmites. Established 1903; 18.47 square miles.

Yellowstone: Wyo.-Mont.-Idaho.—World's greatest geyser area, and an outstanding game preserve. Established 1872; 3,471.51 square miles.

Yosemite, Calif.—Valley of world famous beauty; spectacular waterfalls; magnificent High Sierra country. Established 1890; 1,176.16 square miles.

Zion, Utah.—Beautiful Zion Canyon 1,500 to 2,500 feet deep. Spectacular coloring. Established 1919; 148.26 square miles.

AREAS ADMINISTERED BY THE NATIONAL PARK SERVICE

Government Publications

Glimpses of Our National Parks. Contains brief descriptions of the principal national parks. Address Director, National Park Service, Washington, D. C. Free.

Recreational map. Shows principal recreational areas in the United States with brief descriptions of principal ones. Address as above. Free.

National Parks Portfolio. By Robert Sterling Yard. More than 300 illustrations; cloth-bound. Superintendent of Documents, Washington, D. C. $1.50.

Fauna of the National Parks. Series No. 1. By G. M. Wright, J. S. Dixon, and B. H. Thompson. A survey of wildlife conditions in the national parks. Illustrated. 157 pages. Superintendent of Documents, Washington, D. C. Price, 20 cents.

Fauna of the National Parks. Series No. 2. By G. M. Wright and B. H. Thompson. Wildlife management in the national parks. Illustrated. 142 pages. Superintendent of Documents, Washington, D. C. Price, 20 cents.

Topographic map of Lassen Volcanic National Park; 24 by 20 inches.

Address Director of the United States Geological Survey, Washington, D. C. Price, 10 cents.

Illustrated booklets about the following national parks may be obtained free of charge by writing to the Director, National Park Service, Washington, D. C.:

Acadia National Park, Maine
Carlsbad Caverns National Park, N. Mex.
Crater Lake National Park, Oreg.
General Grant National Park, Calif.
Glacier National Park, Mont.
Grand Canyon National Park, Ariz.
Grand Teton National Park, Wyo.
Great Smoky Mountains National Park, N. C.-Tenn.
Hawaii National Park, Hawaii.
Hot Springs National Park, Ark.
Mesa Verde National Park, Colo.
Mount McKinley National Park, Alaska.
Mount Rainier National Park, Wash.
Platt National Park, Okla.
Rocky Mountain National Park, Colo.
Sequoia National Park, Calif.
Shenandoah National Park, Va.
Wind Cave National Park, S. Dak.
Yellowstone National Park, Wyo.-Mont.-Idaho.
Yosemite National Park, Calif.
Zion and Bryce Canyon National Parks, Utah.