

NATURE TRAIL

Lassen Volcanic National Park

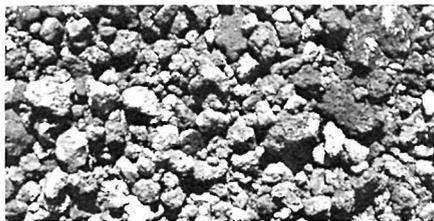
Cinder Cone will stand for thousands of years. Its shape will hardly change from the normal erosion power of melting snow and freezing water. Cinder Cone is a classic volcano, a type known as a tephra cone, made from volcanic ash, cinder and bombs building up a nearly perfect cone around a central vent. In the past, magma or molten rock from an underground pool, welled up and with explosive power sprayed the surrounding land with red hot lava. During these eruptions, less explosive power flowed from the base of the cone forming the fantastic lava beds. Ash falling on one flow created the painted dunes.

Eruptions from the Cinder Cone have occurred as many as five times in the past, beginning around 1567. The top of the crater cone shows at least two distinct rims. Flowing lava, falling ash and cinder cover a wide area around the cone. With each eruption the forest covering this area burned and life retreated

from the seething landscape. But following each eruption, life would crowd back in fighting tenaciously to regain a foothold on the barren landscape.

This is the Cinder Cone Nature Trail. Pioneers from the Oregon and California trails walked part of this path in the 1850's and probably shared the feeling of expectation of something about to happen here. It is a five-mile round trip, taking about three hours. From here to the base is one and one-half miles with an additional one-half mile climb of about 750 feet to the top of the cone. Carry drinking water and a snack for along the way. You will burn a lot of energy walking in the loose soil. Follow the numbered paragraphs in this leaflet.

1 Molten lava, violently blown out of the vent of a volcano, breaks up into small coarse cinders as it hurtles through the air. Pick up a handful of these cinders that cover the ground around you. The small holes that honeycomb each cinder were where gas, originally trapped in the lava, steamed out of the cinder as it was ejected from the volcano. Cinder from the last eruption covers an area of over 35 square miles.



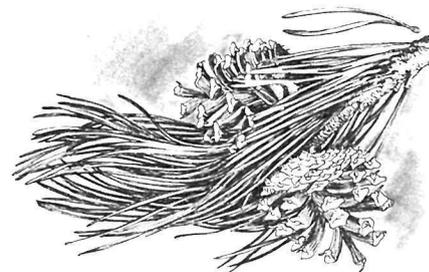
VOLCANIC CINDERS

2 Not all of Cinder Cone's eruptive history is the story of violently ejected rock and ash. Lava flows like the Fantastic Lava Beds, visible from here, moved slowly from vents at the base of the cone. Lava flows originate from chambers containing molten rock or magma miles below the surface. Lava is merely magma that has reached the surface and escaped from the chamber where it had pooled.

3 From here to the base of Cinder Cone, you will be following in the footsteps of overland emigrants struggling to cross the last mountain barrier between them and the Sacramento Valley. Peter Lassen's trail passed east and south of the present park boundary and probably added weeks of unnecessary hardship to the already long odyssey of the overland emigrants. This trail, developed by William H. Nobles in 1852, was a vastly improved, shorter alternative to Lassen's way.

4 By late summer, the great trains of wagons carrying families of pioneers carried little more than desperate dreams. Most of their baggage, the remains of the lives they left behind, lay rotting back in the Great Plains or scorching deserts over which they had struggled months to cross. Nearly

broken and spent, they still pushed on. By now they had seen the elephant; a travelers' expression for seeing truth, for seeing, in fact, the great American West. Today, in this land set aside as a national park, you can still see the "elephant" in the American West.

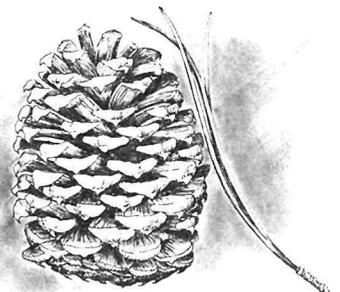


LOGEPOLE PINE

5 The evergreen pines or conifers, common in this area and throughout the park, are an ancient lineage. The conifers, common to the Cascades and the Pacific Northwest, originated in Asia in an age older than the dinosaurs. One of the common pines in this group is

the lodgepole. Its straight, narrow trunk was prized by American Indians for tepee poles, thus the name lodgepole pine. Conifers are so called because they all bear cones.

6 Another of the pines, the Jeffrey, has needles that grow in groups or bundles of three. On a warm day the sap smells strongly like vanilla or pineapple to some. The different pines all have different tolerances for soil, water, sunlight and temperature. Their shallow roots, long-lived needles and overall shape make the most of their opportunity to survive in the short growing season and deep snows of the Cascade Mountains.



JEFFREY PINE

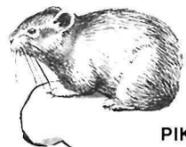
7 In the natural community the web of life is complex. Insects, disease, fire, wind and heavy snow take their toll on the pine forest. But overall, the forest has evolved and adapted to these elements. In the long run, all organisms here make a living and a kind of natural balance is reached even with fire and snow. Heavy snow loads for example may severely bend a tree; but through natural interactions of light and chemicals the tree will grow more rapidly on the underside than on the topside. Eventually the tree will right itself and continue to grow straight upward, but with a telltale bend in the trunk to mark forever the year of a heavy winter snow.

8 Ahead is the great mass of basalt lava called the Fantastic Lava Beds. The lava of these beds is similar to the lava which erupted from the top of the volcano as cinder and ash. The difference is the smaller amount of gas trapped in the magma as it rose toward the surface. It had less dissolved gas and less explosive power, and instead of bursting up through the vent, quietly broke through the base and flowed outward.

9 Although these blocks of lava seem dominating and resistant to change, they have already begun breaking down and will eventually form the base of new soft soil. The small patches of gray and green you see on the blocks are part of this process. Lichens, fungi and algae, living together as one organism are secreting acids that slowly break down the rock to which they are anchored. The soil being built will provide nutrients for plants generations away.

10 The fire that scorched these trees may have been started by lightning or red hot lava flows of over a century ago. Many trees are dependent on fire for successful seeding and have developed strategies that actually benefit from the regular occurrence of fire. Individual trees, of course, may be damaged beyond recovery. Insects will attack a breach in the bark and eventually kill the tree. Notice the holes drilled by woodboring beetles.

11 A short spur trail to the left leads to a pocket of cold water at the edge of the lava flow.



PIKA

12 The surface of this pool marks the ground water level. As the summer sun desiccates the land, the water table is lowered and this pool is frequently dry at summer's end. This water is not suitable for drinking.

13 An old trail to Prospect Peak leads off to the right. The search for valuable minerals was extensive in this area, although nothing important was found. Prospect Peak is an old shield volcano, the same kind of volcano that forms the Hawaiian Islands. Basaltic lavas, like those that formed the Fantastic Lava Beds, flowed out layer upon layer and gradually built up the characteristic broad, shallow cone or shield.

14 Even as boulders are slowly broken down into soil, so all things decay over time. Once living but now dead organisms are quickly attacked by insects, fungi and bacteria. This process of decay is critical for all life. Trees decaying enrich the soil by returning important minerals and nutrients to it, making them available for other living organisms. This process of decomposition releases atoms and molecules of nourishment to be used over and over again.

15 Engraver beetles eating and boring under the bark of trees are always present in the forest. If you look at the wood on this down tree you can pick out the galleries made by beetle larva hatched under the bark. Older trees are less resistant than younger ones. Generally, only a few trees in any healthy forest will be seriously hurt by insects. The entire forest community flourishes. Trees grow and age. Insects attack weakened individuals. A fungus from the invading insect spreads within the tree. A woodpecker arrives and feeds off the insects, limiting their ability to damage other trees. These controls help keep natural systems in balance.

16 Here at the edge of the lava flow is the only exposed sedimentary soil in the park. This whitish soil is the silica rich remains of diatoms, microscopic plants that live at the bottoms of both salt and fresh bodies of water. Lava flows from Cinder Cone may have disrupted the water level of Butte Lake, and a subsequent drop in the water level exposed this layer of diatomaceous earth.

17 Several eruptions of Cinder Cone produced the Fantastic Lava Beds. If you look closely at the basaltic blocks, you may see glassy fragments of quartz crystals. Generally, because lavas reach the surface quickly, they cool very rapidly, usually within a few hours or days. This quick cooling often prevents extensive growth of crystals in the rock mass. Rocks that cool much more slowly tend to form a wide variety of crystals dependent on the chemical composition of the parent rocks.



FANTASTIC LAVA BEDS

18 The volcanic ash in this area is around eight feet deep and water percolates through it quickly. The growing season is short and under these conditions, plants do not germinate too successfully. Testimony to the difficulty of life here is given by the large number of pine cones covering the ground and the very few seedlings.

19 Straight ahead the nearly symmetrical cinder cone rises 750 feet above its base. It is not quite perfect in shape because prevailing winds carried ash and cinders during eruptions and deposited them slightly to one side, causing the cone to be slightly asymmetrical.

20 All volcanoes begin from a vent or opening at ground level. Magma reaching the surface at this vent either flows outward in layers, or if large amounts of steam and gas are present, explodes upward in violent eruptions of small fragments of lava. As this material fell around the vent, it quickly built a cone. As you look at Cinder Cone and realize that the ash and cinder is eight feet deep all around the cone, you can sense the vast amount of ash and cinder erupted from this vent.

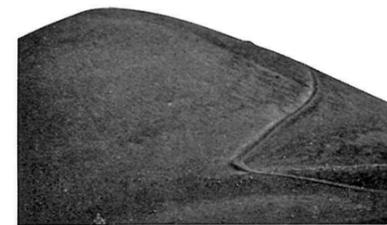
21 Because the great thickness of the layer of cinders in this area, the soil has virtually no ability to hold water; trees develop shallow root systems to take advantage of water when it does occur near the surface. Occasionally roots may be exposed at the surface as they are here.

22 A severe storm in October, 1962, toppled a number of trees in this area. You can see the very shallow root system exposed in this fallen Jeffrey pine. It is remarkable that such towering trees depend on such a shallow root system. But over the long run, it has worked in that the numbers that survive outweigh those that fall under strong winds.

23 Keep the nature of the cinder soil in mind. Footsteps on the volcano may last indefinitely.

● Help preserve the beauty and character of the cone and cinder fields by staying strictly on the trails.

24 Because the cinders are so porous and water seeps through the soil quickly, surface runoff and streams do not form and erosion of the cone is minimal. The volcano's shape will hardly change at all, even as vegetation completely covers the cone in years to come.



CINDER CONE SLOPE

25 Here at the base of Cinder Cone, you come face-to-face with an illustration of the "angle of repose." The slope of Cinder Cone forms an angle at 30 to 35 degrees with the earth's surface around it. This slope is as steep as possible without cinders rolling off the sides.

26 The eruption Cinder Cone ejected material of widely varying size and weight. The lightest and smallest pieces of cinder are blown the farthest away, while the heavier, chunkier bombs fall closer to the vent. Look for large volcanic bombs at the base where they rolled after being blown out of the top of the cone.

27 Lassen Peak is visible in the distance over the shoulder of Cinder Cone. Lassen Peak is a plug dome volcano. The entire mass of the mountain was pushed up as one gigantic plug of very thick, pasty lava, much different from the basalts which make up the lava from Cinder Cone.

28 Prospect Peak to the right or northwest is different from both Lassen Peak and Cinder Cone. It is a shield volcano which was built up from many relatively quiet eruptions of a thinner lava. Layer after layer of this lava built up a low, broad mound reminiscent of a Roman shield. It is a little more complex at the top, where a cinder cone of its own developed and was more violent in the last eruptions than the earlier ones.

● The self-guiding trail leads along the rim to the right.

29 The elevation here is about 6900 feet. You are standing on one of two or possibly three rims, each formed during a different eruption. Scouler willow, western white pine and lodgepole pine have established a precarious foothold just inside the crater. These and other plants will eventually completely cover the cinder cone, assuming no new eruption occurs.



CRATER RIMS

30 Features in this panoramic view are identified in the drawing at the bottom of the leaflet.

31 As part of the eruption of 1851, black basaltic lava flowed from vents near the base of Cinder Cone. You can trace its path toward Snag Lake and then left toward Butte Lake. An earlier flow dammed the creek that then flowed into Butte Lake. Water backed up from this flow and formed Snag Lake. Today overflow from Snag Lake seeps through the lava beds and supplies Butte Lake with a constant source of fresh water.

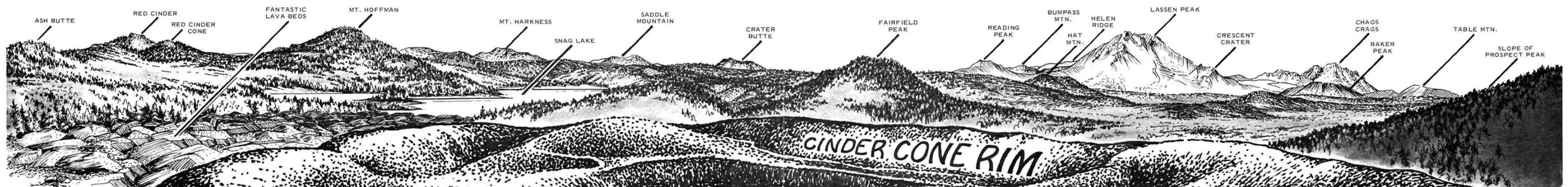
● From here, take the trail behind you to the center rim and look into the main crater.

32 The last known eruption of Cinder Cone was in 1851. Can you sense the violence in this land, the fiery eruptions and quiet outpourings of lava that have built up cones and shields over this entire area? The last eruptions were not long ago and future ones are certainly possible.

● Continue along this inner rim and then go back to the outer rim on the first trail to the right.

33 In eons past, this entire vista would have been a relatively flat plain. Today, there is no place within view that has not been touched by great volcanic events. Ice ages have also come and gone, creating lakes, carving cliffs and rounding valleys. These forces working in the past have created the experience before you now. In time the same forces will probably reshape the landscape again. We are standing on a spot in the middle of all of this change. These changes are so massive, yet so subtle, that we are hardly aware of them, even now as it moves under our feet.

● The self-guiding trail continues down this side of the cone and around the base to the right. If you prefer, you may return to No. 29 on the opposite side of the crater and go back down the way you came up.



PANORAMIC VIEW

34 During one of the eruptions of Cinder Cone, possibly the one in 1666, there were violent eruptions of both cinders and ash from the crater and a lava flow from a vent near the base of the cone. As cinders and ash fell on the flowing lava, heat and steam oxidized the iron in them creating the beautiful colors of the Painted Dunes below you.



SULPHUR FLOWERS

35 A volcanic landscape is a barren one. It will take thousands of years for fertile soils to develop from the cinder, ashes and lava flows. So much of the Lassen area is now covered with

dense forest and vegetation that the overall difficulty of life in starting here may have been overlooked. But a beginning has been made. Even on this hotter, less hospitable southfacing side, sulphur flowers and blue penstemons grow in early summer.

36 Before leaving the world of devastated volcanic change, think about that unending cycle. Searing, choking ash and churning lava obliterate all life in their path. And yet, within seconds as the lava cools, life begins patiently again to claim its own.

37 In time, most of this area will be covered with trees; some have already invaded the Painted Dunes. Eventually the blocky lava flows will also be broken down into soil. The violent events of the past will be hidden as if they had never happened.

38 The lava flow here is known as block lava. It flows from its vent in a very thick pasty form. It is different from Hawaiian-type lava flows which are much thinner (less viscous) and flow more quickly. Hawaiian lava flows typically form smooth unbroken crusts while the thicker basaltic flows here broke up into large blocks.

● You may bypass this spur loop and continue straight ahead to No. 40 by the twin trees.

39 You are standing near the vent or source of the 1851 lava flow. Lava from this vent reached Butte and Snag Lakes and covered about three square miles (eight square kilometers). There is evidence for five separate lava flows beginning in the middle 1500's.

40 The Painted Dunes are one of the five separate lava flows probably dating from around 1666. An erupting Cinder Cone would have had both cinder and ash ejected from its cone and lava flowing from the base. In this particular eruption, the wind condition, location of the eruption and timing allowed the hot cinders and ashes to fall on the hot lava and upon cooling formed the colorful dunes.

● Please stay on the trail to avoid marking the cinder field with footprints.



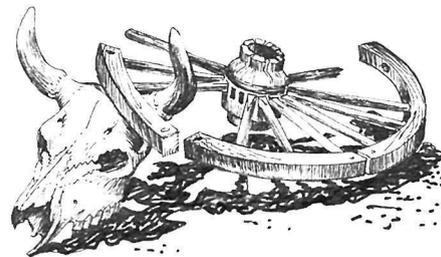
VOLCANIC BOMB

41 Ejected fragments of lava, larger than two and one-half inches (64 mm), are called volcanic bombs. Through the years they show the strain of weathering from freezing and thawing and exposure to the sun heat.

42 It is unlikely that Cinder Cone should erupt again from the Summit Crater. However, it is entirely possible that another eruption of red hot lava, cinder and ash could burst from a vent nearby.

● The self-guiding trail continues to the right.

43 These breadcrust bombs were still extremely hot when they landed here at the base of Cinder Cone. Gases trapped inside continued to expand causing the cooling skin of the bomb to stretch and eventually split into a characteristic pattern reminiscent of homemade bread.

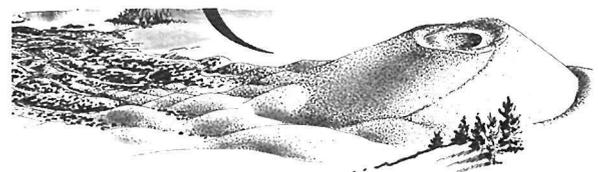


44 The Old Emigrant trail is again here. By this time you may be a little tired and thirsty from the hike to Cinder Cone. Imagine the exhaustion of the pioneers trying to get their wagons through the cinder

and ash fields and finally crossing this last barrier into the Sacramento Valley. This place is a crossroads of sorts. It is a place near the end of a great human adventure that unfolds in an area of great geologic drama.

Here for a short distance you have shared a path with pioneers and crossed boundaries of ancient processes in a cycle of life and rebirth. Did the emigrants on this trail see this landscape and sense the struggle here even as they toiled to cross it or were they just too tired to consider it? Perhaps they sensed it and made a beginning of their own in understanding this land and their place in it.

● Follow the trail to the right back to Butte Lake.



We hope you have enjoyed your hike to Cinder Cone. Information on other self-guiding trails and scenic points of interest may be obtained at the various visitor contact stations.

Please return this leaflet to the box if you did not pay for it.

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