

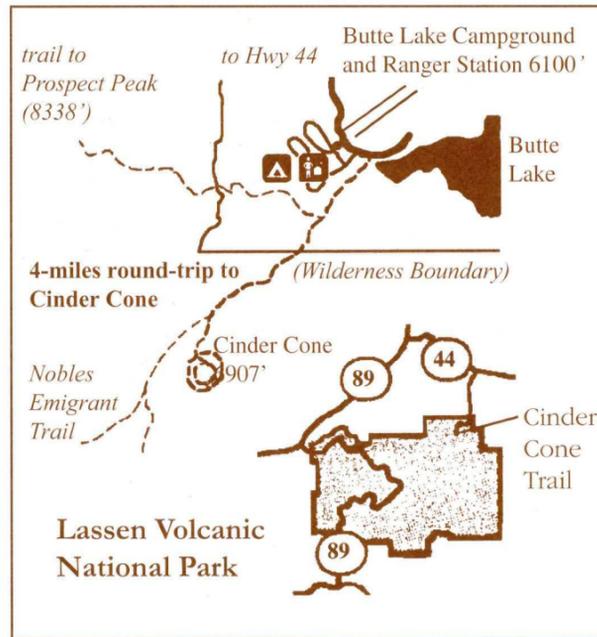
View from the Rim of Cinder Cone

Fantastic Lava Beds

## IN THE WILDERNESS

From this point, it is almost 1/2 mile to the base of Cinder Cone, there 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. This slope is as steep as possible without cinders rolling off the sides. The cone rises 750 feet above its base and is slightly asymmetrical as prevailing winds carried ash and cinders during eruptions and deposited them slightly to one side.

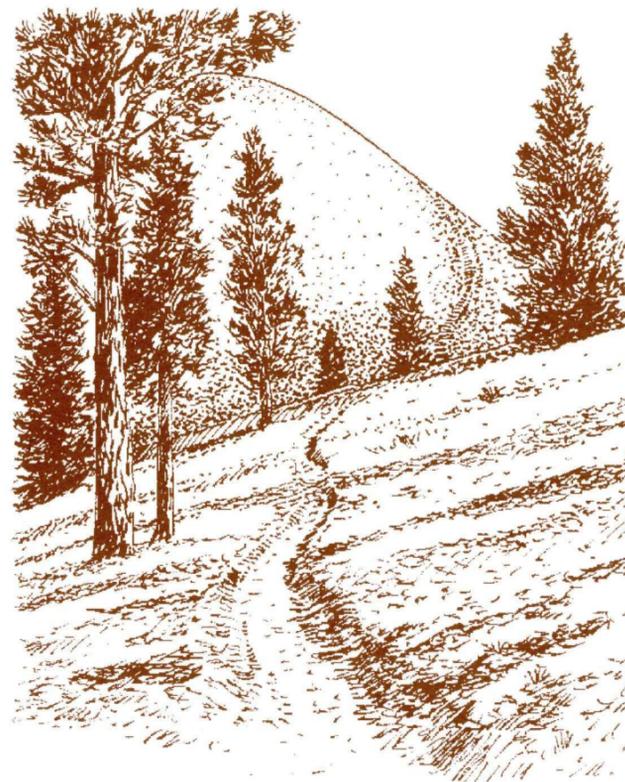
Help preserve the beauty and character of the cone and cinder fields by staying on the trails. Footsteps on the volcano may last indefinitely. From the top of Cinder Cone notice the colorful landscape below. As the Fantastic Lava Beds were cooling, cinder and ash fell from the summit and were oxidized to create the Painted Dunes. How many different colors do you see?



Produced with cooperation from the National Park Service for the Lassen Association. (530) 595-4464  
 Art and design by Larry Eifert  
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# CINDER CONE NATURE TRAIL



## LASSEN VOLCANIC NATIONAL PARK



Welcome to the Cinder Cone Nature Trail located in the northeastern corner of the park accessible from Butte Lake.

The round trip is almost 4 miles and takes about 3 hours to leisurely hike.

Numbered posts correspond to stops in this leaflet. The trail then continues past the numbered posts to Cinder Cone. There is no water along the trail so you will need to bring your own.

There are no restrooms beyond the trailhead.

Boots are recommended as the hike is on loose cinders. All features in the park are protected - collecting is not allowed.



## STOP 1

You are about to travel through an area rich in geologic, cultural and natural history. Have you ever been where there are remnants of volcanic eruptions, an emigrant trail, protected wilderness and a national park all in one place? Reach down and pick up some of the cinders and let them flow through your fingers as you walk where emigrants did in the 1850s. You are on the Nobles Emigrant Trail, a small section of the California Trail.

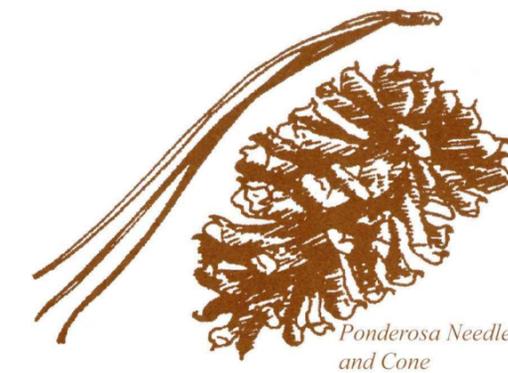
## STOP 2

As the emigrants, or pioneers, traveled with their wagons on this path of cinders, can you imagine what they thought of this odd-looking landscape? President Theodore Roosevelt proclaimed this area as Cinder Cone National Monument in 1907 so it would receive special protection. No one knew for certain when Cinder Cone formed or last erupted, but some thought it was in the mid 1800s. When did the last flames lick Cinder Cone's rim? As you walk along the trail, you'll see some of the evidence used to solve this scientific puzzle.

## STOP 3

In the winter of 1850-51, H.W. Harkness visited the Lassen area and recognized the youthful appearance of Cinder Cone and its lava flows. Based on the then-current reports and the cone's appearance, Harkness concluded that Cinder Cone was just 25 years old at that time.

In the 1880s the first geologist, J.S. Diller, visited Cinder Cone. He observed the surface of the lava flows and the volcanic ash ejected during past eruptions. He noted that some of the trees growing on the thick ash deposits were about 200 years old. He then concluded that the ash must have erupted and cooled before the trees took root, so the eruption that ejected the ash must have ended over 200 years ago.



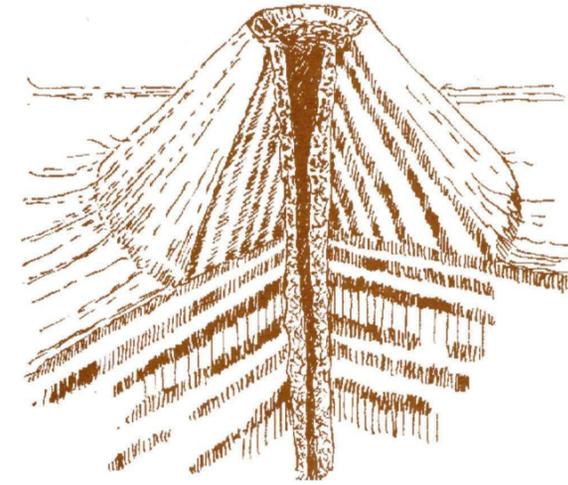
## STOP 4

So when did Cinder Cone really last erupt? Was it around 1850 or several hundred years ago? The answer was recently discovered by U.S. Geological Survey geologist, Michael Clyne. Mike had a tool and a method that earlier workers did not: radiometric dating. Mike knew that if he could find something that had died when Cinder Cone erupted, he could use measurements of radioactive carbon, present in every living thing, to determine when it died. After many hours of searching the Fantastic Lava Beds flow, Mike found what he was looking for - a tree that had been engulfed and killed by flowing lava! An age for the death of the tree and the Fantastic Lava Beds was established at about 1650 AD.

2000AD	Today you are hiking the Cinder Cone Trail.
1900AD	1916 - Lassen Volcanic National Park created. 1907 - Cinder Cone National Monument created.
1800AD	
1700AD	
1600AD	1650's - Cinder Cone is formed 1620 - Plymouth Colony founded in New England.
1500AD	1492 - Columbus lands on American soil.

## STOP 5

Cinder Cones (or tephra cones) are a type of volcano. Cinder cones are mostly formed by basaltic lava, very dark lava that is low in silica (what window glass is made of) and rich in iron and magnesium. Cinder Cone ejected material that varied greatly in size and weight. The lightest and smallest cinder pieces blew the farthest away, while the heavier, chunkier bombs fell closer to the vent. Look for large volcanic bombs at the base where they rolled after they were blown out of the volcano.



*Cross-section of a typical tephra cone such as Cinder Cone*

## STOP 6

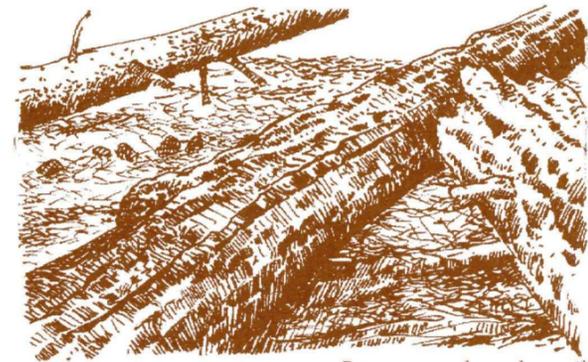
Ahead is the great mass of basalt lava called the Fantastic Lava Beds. The lava of these beds is similar to the basaltic lava that erupted from the top of the volcano as cinder and ash. It had less dissolved gas and less explosive power, and instead of bursting up through the vent, quietly broke through the base and flowed outward. Walk up and touch the lava beds and feel rock that was once magma.



*Fantastic Lava Beds*

## STOP 7

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 soil. The small patches of gray and green you see on the rocks 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 new plants.



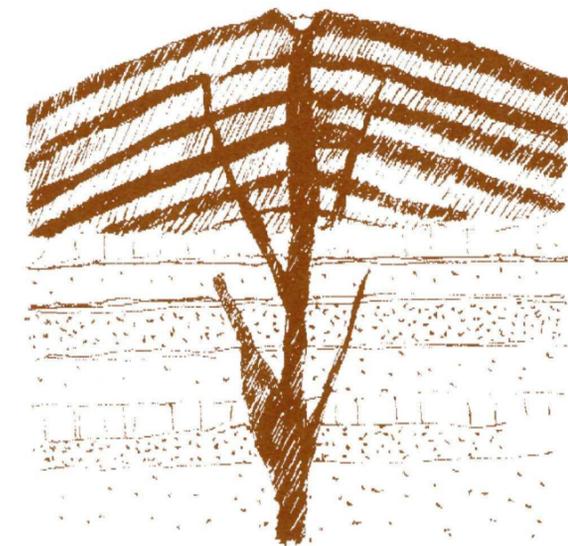
*Burnt trees along the trail*

## STOP 8

Look for signs of burnt trees along the trail. These trees are growing on top of the Cinder Cone ash deposits which grew after Cinder Cone erupted. These fire-scarred trees testify to the natural occurrence of fire in this area, probably started by lightning strikes. Many trees are dependent on fire for reproduction and have developed strategies to benefit from fire.

## STOP 9

A trail to Prospect Peak leads off to the right. Prospect Peak is a shield volcano which was built up from many relatively quiet eruptions of a thinner lava. Layer after layer of basaltic lava built up a low, broad mound reminiscent of a Roman shield.



*Cross-section of a typical shield volcano such as Prospect Peak*

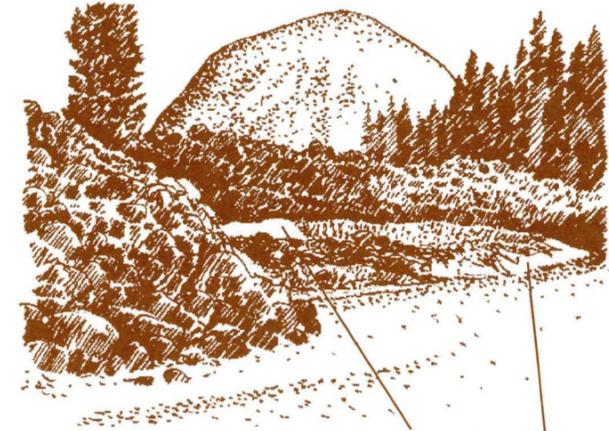
## STOP 10

There are two types of basalt flow textures; the most common is A'a (ah-ah). From above, the surface of these flows looks like a jumble of rough, sharp-edged blocks and plates. Imagine lava moving slowly forward from the base of Cinder Cone. Although it progresses steadily downhill, you could easily outrun it. Searing lava, over 1000C°, inundated the land and as the lava advanced, every living thing that couldn't escape was cremated and the moisture-rich soil released a cloud of steam. You can see evidence of a reddish color at the base of the lava flow, which is "rust" or iron oxide that forms when the soil's steam chemically reacts with the iron-rich lava.

## STOP 11

The other type of basalt flow texture is Pahoehoe (pah-ho-EE-ho-EE). Pahoehoe is about as runny as lava can get. These lavas are so fluid and have such a low viscosity (thickness) that, even when solidified, they look like a black liquid frozen in time. Freshly solidified pahoehoe has a smooth glossy or glassy surface. The meandering paths of individual streams form rope-like surfaces, overlapping folds of lava that look like shiny draperies left on the rocks. Cinder Cone does not have pahoehoe.

Why is pahoehoe not found here?



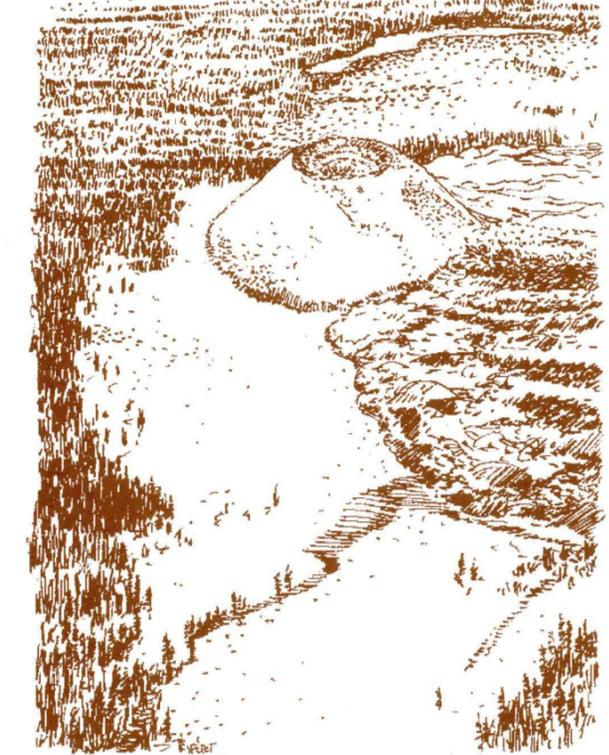
*Whitish diatomaceous earth*

## STOP 12

Here at the edge of the lava flow is one of the few 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 and provide food for plant-eating organisms. We know that Butte Lake existed before Cinder Cone formed as the diatomite lies beneath the lava flow and must have been present before the volcano erupted.

## STOP 13

This area is a small part of what is now Lassen Volcanic National Park, established in 1916 because of its active volcanic landscape. Units of the National Park system have been set aside because of their national significance and are managed to "...conserve the scenery and the natural and historic objects and wildlife therein and to provide for the enjoyment of same in such manner...as will leave them unimpaired for the enjoyment of future generations." There are over 375 units in the National Park Service which include national parks, monuments, battlefields, recreation areas, and seashores. Which units have you visited and do you understand why they were set aside as nationally protected areas?



*An aerial view of Cinder Cone*



## STOP 14

An increasing population and expanding settlement inspired the Wilderness Act of 1964. Wilderness in Lassen Volcanic National Park was designated in 1972 and now encompasses more than 78,000 of the park's 106,372 acres. Wilderness areas are "undeveloped Federal land retaining its primeval character and influence" with "outstanding opportunities for solitude" for the "public purposes of scenic, scientific, educational, conservation, and historical use". Wilderness is "...an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain."

Signs are allowed in wilderness, for directions and safety. The numbered posts that you have been following end at this point as you are now at the wilderness boundary. As you continue from here, does the lack of development, noise, and signs affect your experience? Do you think that this area will look much the same for generations to follow? Once you've reached the top of Cinder Cone, ask yourself these same questions, as much of what you see is wilderness.

*"The tendency nowadays to wander in wilderness is delightful to see.*

*Thousands of tired, nerve-shaken, over-civilized people are beginning to find out that going to the mountains is going home; that wilderness is a necessity."*

—John Muir