From the earth's interior through many volcanic mountain or hill about each orifice. One of the streams are broader and contain more arable land. Differences of elevation are much less and the ridges and peaks which locally known as Yallo Bally, Bally Cheep, Pit River, Grizzly, Trinity, South Fork, Salmon, Marble, Scott, Skilak, yuoan, and Rouge River mountain.

Lassen Peak marks the southern terminals of the Cascade Range and fills a great depression in the earth beneath the Klamath Mountains and the northern ends of the Sierra Nevada. It is wholly of volcanic origin, and thus, from a geologic point of view, it is like the summit in the long line of extinct volcanoes extending from Mount Shasta to Mount Rainier.

The geographic features enumerated above are not all of the same geologic age. Some were dry land while others were beneath the sea, and still others were built up in later ages by accumulating basaltic lavas. The geographic history of the region must be read in the geologic records—the rocks of which the mountains are composed.

TOPOGRAPHY.
Within the district there are three distinct types of physiographic features. Beginning at the west, it includes (1) a small portion of the eastern border of the Sacramento Valley, ranging in altitude, with gentle slopes, from 800 to 4,000 feet; (2) the Lassen Peak volcanic ridge, whose highest point is near Mount Lassen (10,887 feet) and rises above the sea; and (3), upon the eastern margin of the Great Basin, with an average elevation of about 5,000 feet.

The included border of the Sacramento Valley consists chiefly of a dry, stony plain, across which the Lassen Peak volcanic ridge cuts a high, dry valley. The lower border of the plain is marked by a well-defined bluff a few miles east of the river. At this bluff the canyons are deep and the streams emerge from them to the alluvial plains of the Sacramento. Northward the stony plain continues near Pit River, but it is not as well defined, for the valleys of the mountain streams are broader and contain more arable land.

The Lassen Peak volcanic ridge is formed by a belt of volcanic cones about 30 miles in width and 50 miles in length, and extends northward and southeast directly across the middle of the district from the North Fork of Feather River to the Great Bend of Pit River. Its great peaks, such as Mount Lassen, Lassen Peak, Crater Peak, Burney Butte, and those at the head of Burney Creek, as well as a host of smaller cones, which are all ancient volcanoes. The lava which issued from the earth's interior through many volcanic chasms, which were in the heart of the mountain or hill about each orifice. One of the most characteristic views of the ridge is seen from near its northeastern terminus, from the slopes of the 11,160 feet high Crater Mountain, looking northward towards Crater Mountain.

The Great Basin plain, which is the general level of the plains of the eastern portions of California and Nevada, occupies the northeastern part of the district. Although mountainous, its differences of elevation are much less and the slopes are gentler than those in the Lassen Peak volcanic ridge. It extends from Susan River to Pit River, and its western border north of Lassen Peak and ending near the western edge of the district. The southeastern portion of this area is drained by Pit River, but the western portion belongs to the Great Basin and drains into the Truckee River. The Lassen Peak district is a narrow strip of land while others were beneath the sea, and still others were built up in later ages by accumulating basaltic lavas. The geographic history of the region must be read in the geologic records—the rocks of which the mountains are composed.


descriptions of the Lassen peak sheet.

DESCRIPTION OF THE Lassen Peak SHEET.

GEOGRAPHY.

GENERAL RELATIONS.

The Lassen Peak district is situated in north-
several small peaks are nearly buried beneath the Tuscan formation.

Pyroclastics.—In this group are included alluvial sand and gravel which are derived from the disintegration of eruptive rocks, especially pyroclastics such as the rhyolites and basalts. The most important of these is the Lassen Peak district, which has been extensively mined. The Lassen Peak district is located in the northern part of California and southern Oregon.

The oldest rocks in this area are those of the Gneiss group, which are believed to be of Precambrian age. These rocks are generally characterized by a mottled appearance and consist of alternating layers of quartzite and schist.

The volcanic rocks of the Lassen Peak district are largely of the andesite type, with minor amounts of basalt and rhyolite. The andesite is typically a dark, porphyritic rock with large crystals of plagioclase and feldspar.

The Lassen Peak district is characterized by a series of large volcanic cones and calderas, the most prominent of which is Lassen Peak itself. The Lassen Peak district is one of the most active volcanic regions in the world, with numerous volcanic vents and fumaroles.

The volcanic activity in the Lassen Peak district is believed to be the result of tectonic stresses associated with the movement of the Pacific and North American tectonic plates. The Lassen Peak district is located at the boundary of these two plates, and the resulting stresses have caused a series of volcanic eruptions and earthquakes in the region.

The Lassen Peak district is one of the most valuable natural resources in the United States, with significant deposits of gold, silver, and other metals. The district has been extensively mined for these minerals, and continues to be a major source of revenue for the region.

MINERAL RESOURCES.

Upon the economic map special attention is called to the distribution of the seriferous slates, in which alone there is any probability of discovering the valuable deposits of precious metals. These rocks are exposed in the southwestern and northwestern portions of the area mapped, and extend through, under the lavas of the Lassen Peak district, from the Sierra Nevada to the Klamath Mountains. The broad stretch of unaltered lavas about Lassen Peak does not contain an appreciable amount of the precious metals, and may be wholly neglected by the prospector.

Among the seriferous slates seven formations have been distinguished, ranging in age from the Silurian to the Jurassic, inclusive. Of these the Chico beds are considered as the most important, the Carboniferous age, and the Calsan formation, of Carboniferous age, have been the most productive. Their disintegration has furnished the gold for the placer mines of Indian Creek below Shoo Fly, of Soda Creek, Rush Creek, the North Fork of Feather River, the Salmon, and Dutch Hill. The mines near the North Fork of Feather River are on this belt, and active prospecting is going on this year.

Numerous copper prospects have been discovered in the Pit River region, and at present prospecting is going on in the area.

Intermingled with the seriferous slates are eruptive rocks, such as diabase, porphyrite, and andesite, in which there has been little to do in determining the distribution of certain classes of ore bodies. The areas of eruptive rocks have
been outlined, and it has been found that the most promising prospects of that region are located near the borders of these eruptive masses. The ore deposits may be in the auriferous slates or the eruptive rock, but in either case they are not far from the contact. The eruptive rocks in which the active mines of Crescent and Greenville are located do not extend into this area.

Limestone is abundant in the Cedar formation, and occurs also in the Calaveras formation, as indicated upon the economic sheet. It is most conveniently located by the stage road along Cedar Creek in Shasta County, and has been burned, making good lines, near Prattsville.

The coal of the Comment formation has been prospected on Little Cow Creek and elsewhere in the same region. At several places small quantities have been taken out for local use, but nowhere has a sufficient outcrop been seen upon the surface to warrant extensive exploration.

The Tertiary tuft, when fine-grained and sufficiently indurated, stands fire well and may be used to advantage in building chimneys and hearths. On account of its porosity, which allows considerable evaporation, it is used for water coolers. The same sort of material, especially when highly colored, is used quite extensively in the manufacture of cement.

The large deposit of infusorial earth on Pit River below the mouth of Hat Creek is of economic importance. The beds have a thickness of nearly 100 feet. This earth makes an excellent polishing powder, and it is used also in the preparation of cement and explosives, as well as for protecting steam boilers and pipes.

The minerals in the basalt are such that by decomposition and disintegration it furnishes an excellent soil for agricultural purposes, much richer than that derived from the other lavas of the district. As the basalt was more liquid at the time of its eruption than the other lavas of the region, it spread farther and formed comparatively smooth surfaces; this also is in its favor from an agricultural point of view.

ILLUSTRATIONS OF RECENT VOLCANIC ACTIVITY.

THE CINDER CONE, CALIFORNIA.

The general view.—Looking southeast from the summit of Prospect Peak, one sees the general view represented in fig. 1. It is the scene of a comparatively recent volcanic eruption at the Cinder Cone, 10 miles northeast of Lassen Peak, California. The dark, dusky, treeless lava field and cinder cone present a strong contrast to the deep-green pine forest by which they are surrounded. From this point, better than anywhere else excepting the summit of the cinder cone itself, is obtained a view of the hopper-shaped depression of its crater. On the right of the lava field is Snag Lake, whose waters escaped through the lava into Lake Bidwell on the left.

When one obtains the first near view of this scene the impression of its vastness is vivid, and he looks in the expectation of seeing steam rising from the crater or lava field. The feeling of disappointment is somewhat alleviated, however, when he observes charred trunks of trees (fig. 2), apparently long since dead, yet attesting the searching temperature of that place in recent times.

The cone.—Descending from the summit of Prospect Peak toward the cinder cone, attention is at once arrested by the soft, dull-black volcanic sand which covers the surface and renders walking tiresome. At first it is fine and only a few inches deep, but as we approach the cinder cone the sand becomes coarser and deeper. How thick the layer of sand may be at the base of the cone is unknown, but one-fourth of a mile away in all directions it is about 7 feet in thickness, and it decreases so as entirely to disappear at a distance of 8 miles. Encircling the cinder cone at its base, as shown in figs. 3 and 7, is a collection of volcanic bombs, ranging in size from a few inches to 1 foot in diameter. They are much fissured, and many of them have fallen to pieces, showing an interior of compact lava, while the surface is somewhat scoriaceous andropy.

The general form of the lava field is tabular, being covered with a deposit of soft, white material which, when examined under the microscope, is found to be infusorial earth, mixed with vegetable matter, such as grows on lake bottoms. It is evident that this was once the bed of a lake, and as it connects directly with the present bed of Lake Bidwell, it shows that Lake Bidwell was once larger than it now is, occupying not only its present area but also much of that now covered by the lava field. The thickness of the ancient lacustrine deposits is at least 10 feet, and they are well exposed at several points. Near the western end of Lake Bidwell, where the sheet of volcanic sand which covers the

![Image](image-url)
country about the cinder cone may be seen adjoin ing the ancient lake bed and the lava field, a trench was dug to determine their relation, and it was found that the lake bed was deposited on the surface of the volcanic sand. The sheet of volcanic sand formed the foundation on which the ancient lake bed was deposited, but this in turn was covered by the flow of lava, which has no sand on its surface.

Second, of the formation.—Beneath the ancient lake bed, and to some extent covered by volcanic sand, is a lava which corresponds to that occurring near the southern end of the cinder cone. The general relations of all these parts are shown in fig. 3, a section of the cinder cone and lava field.

The country rock on which the cinder cone and sheet of volcanic sand are basaltic. In the section, the presence of the cinder cone must have not less than 200 rings of time separated by a time interval sufficiently large to allow the development of a new forest, a thin layer of volcanic sand which lay above the cinder cone, and in the section of fig. 3, a section of the cinder cone and lava accumulation, the cinder cone must have not less than 200 rings of volcanic sand which may have given rise to the cinder cone and ash field; the second, by a quiet effusion of a large mass of lava.

The first eruption began with an explosion and the ejection of a great deal of light, scoriaceous, almost ash-like matter, blown chiefly by escaping steam from the upper portion of the molten lava (magni) in the throat of the volcano. The succeeding eruption of the ancient lava and continuous withdrawal of new cinder cone must have not less than 200 rings of volcanic sand which may have given rise to the cinder cone and ash field; the second, by a quiet effusion of a large mass of lava.

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