

## A Recent Volcano in Plumas County.

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From time to time, during the period between the years 1850 and 1854, vague rumors had been circulated that evidence of active volcanic action existed in the northern portion of Plumas County, and that strange lights had apparently been seen by different observers, which were referred to by them as the result of an eruption somewhere to the eastward of Lassen's Butte. As the Indians in the immediate vicinity were exceedingly hostile no effort appears to have been made to verify the correctness of these reports, and the subject seems to have dropped from the minds of men.

While traveling in Plumas County, during the past summer, I heard reports of the existence of a lava bed in the vicinity of Lassen, which bore traces of a recent upheaval, the central point of this disturbance being commonly referred to as the Cinder Cone. While camping in the neighborhood I had ample opportunity to make a pretty thorough examination of the locality.

This cone is marked upon the map as being within the limits of Lassen County. This, however, is a mistake, its true location being at a point which would place the whole, or at least the larger portion of the cone, with its outlying lava bed within the limits of Plumas.

Two lakes are laid down upon the State Geological Map as lakes Anna and Louisa; these lakes lie to the eastward and about twelve miles distant from Lassen's Butte, and are known to the residents in that portion of the State as Snag Lake (Anna) and Juniper Lake (Louisa). The Cinder Cone and lava bed which I refer to lie directly across the northern end of Snag Lake.

When viewed from the southern point of the lake—1½ miles distant—the lava bank rises directly from the water to the height of eighty or ninety feet, and extends across the whole breadth for a mile or more, with as regular a gradient and as sharp a definition as a railway embankment. The surface beyond is

studded with a few abrupt elevations twenty or thirty feet high, while to the left rises a huge cone with a crater at its summit. On the eastern end this lava embankment turns abruptly to the north as it strikes the lake shore, and from this point the line extends in a northerly direction for a distance of one and a half miles, or more, when it strikes another lake, or as is most likely, what was once the lower end of Snag Lake. At this point the line turns sharply to the west, the lava dyke crossing the lake to its western shore, when it again deviates to the southwest, until it strikes the lake line previously described. Nearly midway, on the western side, the Cinder Cone rises abruptly from the border of the lava bed, one side of it resting upon the plain. It will be seen that, should my estimate prove to be correct, the entire circumference of the lava bed is between four and five miles. For the entire distance, except at the cone, the embankment rises from the plain or water eighty or ninety feet, at a sharp angle of about sixty degrees, and in no instance is there in this border the slightest trace of a lava flow to indicate that it was in a molten state when thrown out.

The surface of the blocks shows a bright metallic luster, the colors varying in different parts of the field from black to a reddish brown. On climbing to the surface of the lava it is found to be very irregular, with ridges and depressions alternately, forming a surface so uneven as to make it very fatiguing to walk for any distance upon it. Near the center of the field I observed a mass of lava which showed signs of having been in a molten state when thrown upon the surface; this was a somewhat narrow strip, a hundred feet or so in length, lying in a horizontal position, but slightly broken, and its rough, uneven, corrugated surface clearly indicating that it had been cooled by contact with the atmosphere. A few sickly-looking pine trees—a dozen or two at the most—were struggling for existence, wherever a little collection of burnt earth rendered such an existence possible. These trees were quite small, being only two or three inches in diameter.

As I before stated, the cone rises from the western side of the field. In making the ascent I selected a point to the southeast of the cone, as the side there rests against the lava, and its level of a hundred feet can be reached without much effort. From this point, however, owing to the loose and sliding material, the ascent proved a very severe task, far exceeding anything I had previously undertaken.

Barometrical measurement showed the summit of the cone to be six hundred feet above the plain at its base, the exact height, I believe, of that of Vesuvius. It possesses a well defined outer rim of some six hundred feet in diameter. Within the rim, after a descent of about sixty feet, a level bench is reached, on which one may walk entirely around the inner crater, which is funnel-shaped, and about ninety or one hundred feet in depth.

The crater exhibits no signs of having contained water. A few small willow twigs are to be seen growing within the outer rim. Judging from the appearance of the lava bed, as viewed from the summit, and the present condition of the material, it would seem that the present cone has thrown out but a small

portion, if any, of the lava in view, but rather that it has been elevated by forces acting directly beneath the site it now occupies. The amount of ashes and pumice which have evidently been discharged from this cone is, however, amazing. In the immediate neighborhood of the cone the deposit is from twelve to twenty inches in thickness, and two miles away it is five or six. I traced this deposit for four or five miles to the southwest, and Obed Field, one of my guides, informed me that to the northwest it extends fully ten miles. To the eastward the deposit is not so extensive. Yet it is safe to say that a breadth of eighty or one hundred square miles has been covered by the ashes from this volcano. Small bits of pumice of the size of a bean are plentifully mixed with the deposit.

The ashes are of a dull gray color, differing in this respect from any other I had previously observed in the State; and as they offer but little resistance to the wind no signs of drifting are apparent, and they rest evenly upon the surface as they fell. My reasons for believing this volcano to have been of recent origin may be briefly stated. In Snag Lake, across which the dike of lava extends, there are several dead trees still standing, while on the lake shore are many trees and stumps battered and torn by ice, which have been driven upon the beach by the wind. This is notably the case upon the eastern border of the lake, where they may be counted by the hundred.

These facts clearly indicate that a large portion, at least, of what is now the bed of the lake has but recently been a forest, and that the presence of the lava has been the cause of the change in the level of the water. Again, along the borders of the lava bed there are a number of trees still standing with lava nearly or quite encircling them, their dead and blackened trunks furnishing incontestable evidence that the eruption occurred while they occupied their present positions.

To the west and northwest of the cone an open space exists of a hundred acres or more in extent, the trees upon which have nearly all disappeared. There exists, to my mind, the clearest evidence that the vegetation upon this tract was destroyed by the shower of hot ashes. The trees still standing are burned upon all sides, precisely as a green tree burns, a thin stratum of charcoal still adhering to the surface of the remaining wood. A few trunks have fallen, and they rest on the surface of the heavy ash, not partially buried in it. No traces are perceptible of fallen timber lying beneath the ash, as that would naturally have been entirely burned away.

I observed many concave depressions dotting this field of ashes. These depressions were from six to ten inches in depth and from one to four feet in diameter, with sides sloping towards the center. Where one of these occurred, on digging through the ashes I invariably found traces of a charred or decaying tree stump. In the forest beyond, the trees were invariably surrounded by a zone of ashes. Further evidence of this recent shower may without doubt be obtained by a thorough examination of the living trees in the vicinity. Many small cavities at the point where the branches are thrown off will yet disclose a store of ashes to reward the search.

A large number of trees still living in the adjoining forest show scars, and the new wood formed by the reparative process is apparently of but a few years' growth, although, as I had no ax, I was unable to verify this statement by count of the annular rings in the new wood. I had forgotten to state that there was one living tree in the field of ashes; but it has lost its top, and its scarred trunk indicates a desperate struggle for life.

I have endeavored to place before you this evening all, as I believe, of the more important facts upon which I base the supposition that this volcano has been in active operation within twenty-five years. Much of this evidence will soon disappear. The ice in another winter, perhaps, will have lifted the last tree from its place in the bed of the lake, the concave depressions in the ashes will gradually become less distinct, and the trees encircled in the stony embrace of the lava will soon decay; yet the characteristics of the volcano itself are so marked that it will, for a century to come, be recognized as of recent origin. I had traveled for weeks over a country every inch of which exhibited traces of volcanic action. Yet there always existed something to show that nature was endeavoring to repair the mischief which had been wrought. By disintegration the unsightly lava blocks were being converted into soil, on which vegetation was luxuriating and where animal life can find subsistence. I had climbed very many well wooded volcanic peaks to find that within the very craters large trees were growing, and the sides converted into grassy slopes. Here, however, the lava bed was as sharply defined as though it was a fortress in an open plain; and although surrounded on all sides by volcanic ruins, it appeared as fresh and new as though the creation of but a day.

Since my oral report to this Society four different gentlemen have furnished me with reports which, in my estimation, must be considered as corroborative proof of the existence of an active volcano about the period named. Dr. Wozencraft informs me that during the winter of 1850-51 he was residing at a point some distance above Red Bluffs, when he observed a great fire to the eastward of Lassen, which continued for many nights without change of position. The Doctor states that some of the observers expressed the belief, on the first night of its appearance, that it was the light from a large Indian camp-fire. The reappearance of the great body of flame for so many nights in succession, however, seemed to shake their faith in the camp-fire theory. The Doctor, at the time and since, has earnestly advocated the theory that the phenomenon was the result of a volcano in active operation.

Dr. J. B. Trask also states that at about the same period he was near Rich Bar, on the north fork of the Feather River. He, too, distinctly remembers the display for many nights in succession. From his point of observation the distance cannot be more than forty miles to the cone.

Mr. Charles Gibbes stated that he and a party of miners witnessed the same spectacle while at Angel's Camp, and referred it to an eruption of a volcano. Himself and comrades, in their estimate of the distance to the supposed volcano, placed it at 150 miles; in point of fact, it is about 160.

Mr. Henry Chapman, a member of the Academy, writes that during the

summer of 1851 he resided for a short period at a wayside hotel near Georgetown, El Dorado County. One evening two prospectors arrived at the hotel, who stated that they had been since early spring in search of the mythical gold lake. They informed the company that they had traveled toward the north for a distance of more than two hundred miles without discovering gold. They stated that they had, however, discovered a boiling lake and a volcanic mountain, which "threw up fire to a terrible height," and a large breadth of country still on fire, as the result of an eruption. They stated further, that at one point they traveled for a distance of ten miles across a strip of country where the rocks were still so hot as to entirely destroy their boots, they losing a horse and one mule during the transit. They placed the location of the mountain at an estimated distance of 100 to 125 miles in a northerly direction from Georgetown. By referring to the new geological map of the State, it will be seen that the distance from Georgetown to the Cinder Cone I refer to is about 115 miles. If this statement can be relied upon, the burning country they mention must have been the belt of hot ashes which I have described.

The boiling lake referred to is doubtless one which is still in existence, it being located about eight miles to the south of the Cinder Cone.

It is oval in shape, and contains an area of a little more than four acres, with an elevation of 5,976 feet, and is surrounded by hills of 100 feet in height, broken only at one point by a fissure which admits the escape of surplus water. Around the borders of this lake I found a large number of mud cones, from one foot to four feet in height, formed of finely pulverized volcanic rock. These miniature craters were in a state of ceaseless activity, ejecting mud and sulphurous vapors.

The water of the lake itself was hot, of a creamy color, and the surface from time to time disturbed by the escape of gases from the earth beneath.

My guide informed me that the lake is much more tranquil than at the period when he first beheld it, ten or twelve years since; and, indeed, there exists abundant evidence to prove that this district is rapidly cooling. A mile or so to the south of the lake there is a geyser ejecting boiling water to the height of ten feet, and Field assured me that in former times the water was elevated to a height of twenty or twenty-five feet. While three or four miles to the westward there exists a huge geyser cañon with hundreds of springs still in action, yet there are many large cauldrons which have ceased action altogether.

S. C. Hartney read a communication, in the form of a memorial to the trustees of the Lick Estate, relative to the terms of the "Lick Donation," and asking for a modification of said terms.

Dr. Dall moved that the memorial be referred to the Trustees, with power to act. Mr. Dameron moved to amend this by appointing a committee of three to act with the Trustees. The amendment was carried, and the Chair appointed as such committee, S. C. Hastings, R. C. Harrison, and J. H. Smythe.