The Glaciers of Mt. Jefferson

By LAURA HATCH

It has been known for some time that there are glaciers of fair size on Mt. Jefferson,* but as few details had been gathered, and practically nothing written about them, they offered an attractive field for investigation by the writer. So few people, indeed, had visited this section of the Cascade range of Oregon, that the three most important glaciers on Mt. Jefferson, those on the north and east slopes, were not named until 1915, when Mr. Ira A. Williams of the Oregon Bureau of Mines did so in his delightful description of the scenic features of the neighboring region.†

Although the time at the disposal of the writer was very limited, a number of interesting facts have been gathered concerning the glaciers, and with these in hand for comparison it will be easier at some future time to make observations of greater value.

The glaciers of Mt. Jefferson are practically confined to the north, east and southeast slopes of the mountain. On the south and west the snowfields are small and seem barely able to cling to the very steep slopes of the mountain (Fig. 1), and no glaciers are seen from the distance. On closer examination, however, a thin ribbon of stagnant ice is discovered at the head of Milk creek, which drains the western slope of the mountain, and which occupies a very narrow and deep canyon near its source. As this ice is undoubtedly the remnant of a former active glacier, it will be called for convenience the Milk Creek glacier. It is not now connected with any large snow-field and during August, 1917, water from the small patches of snow above was seen falling over the cliffs above the glacier before dropping beneath it. (Fig. 2.) The roar of the river beneath the ice could be distinctly heard throughout its length of about half a mile.

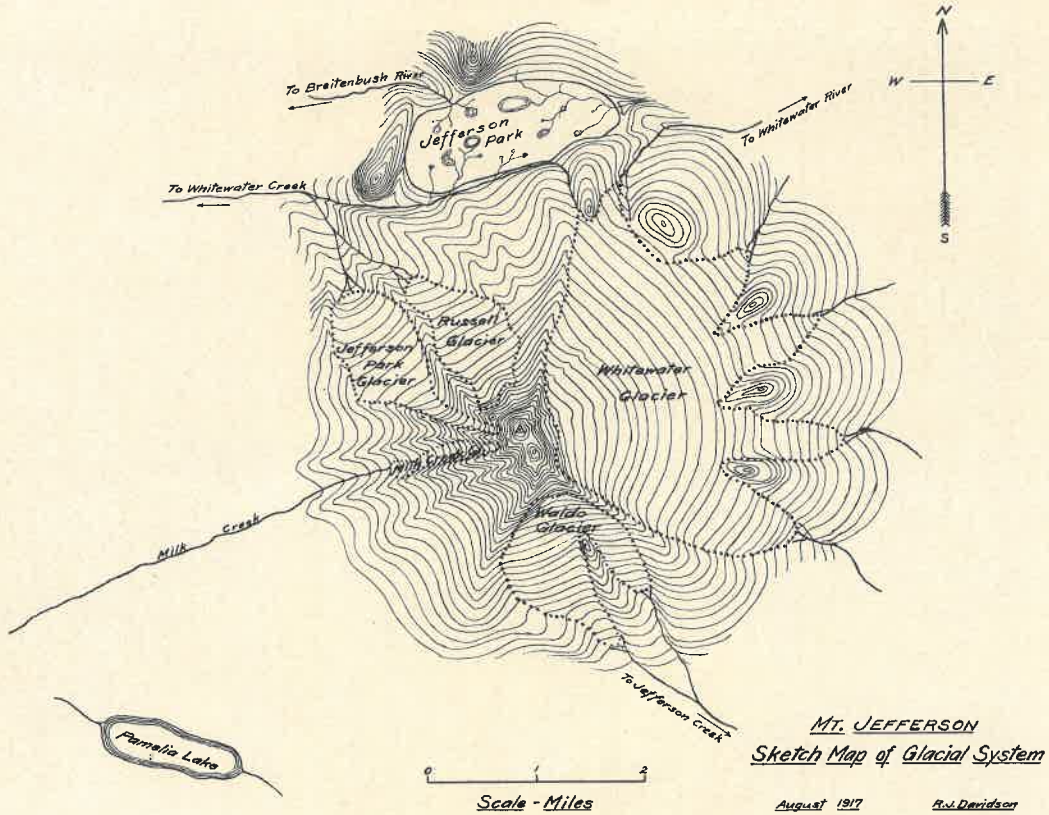
The Milk Creek glacier in 1917, beside being stagnant and covered to a certain extent with debris from the neighboring walls, was really only a shell or crust over the water that flowed beneath. This condition was best seen at the lower end of the glacier where the combined attack of the sun's rays above and the river below, has thinned the ice so that sections of it have fallen in, leaving caves and ice bridges. (Fig. 3.) For 300 feet or more farther down the valley, ice can be

*See brief notes by I. C. Russell in Journal of Geology, 1904, p. 261, and also in Bulletin 252 U. S. Geological Survey 1905, p. 124.

†Bulletin 1, volume 2, Oregon Bureau of Mines and Geology, 1915, pages 43-44.

Mt. Jefferson from Jefferson Park

Photograph by Winter Photo Company



MT. JEFFERSON

Sketch Map of Glacial System

August 1917 R.J. Davidson

found in the valley wall, showing a very recent and rapid retreat of the glacier.

As this ice tongue is so narrow (from twenty to fifty feet wide) and so thin, one might be willing to consider it just the result of the accumulation of snow of the preceding winter, if it were not for the abundant evidence of strong glacial action on all sides. Below the glacier the stream has intrenched itself in a sheet of coarse glacial drift, only here and there uncovering a ledge of lava over which it develops falls. As the valley widens to the west this sheet of morainic material is spread out over a fan-shaped area and terminates about a mile from the ice. No distinct terminal ridge was noted, showing that the glacier did not remain long in this position. On this coarse moraine only bushes and very small trees were found, proving it to be of very recent date. The writer was fortunate enough to meet Dr. A. J. Montgomery and his son, who had seen the glacier in this position in 1907. This date corresponds with that which had been worked out from the size of the vegetation, the largest trees being only about ten years old.

The size of the glacier in 1907 was great, of course, compared to its present extent, but it was slight compared to what it must have been when it built the high terminal moraine another half mile down the valley. (Fig. 4.) Here it must have been two or three hundred feet thick at least near its terminus and probably much thicker in the narrower part of the valley above.

The lack of connection of the glacier with the present snow-fields, and their very small size (at least in the late summer) make it hard to see what could have brought about these former glacial advances. If the head of the valley is studied it will be seen that the snow from practically all the western slope of the mountain would be concentrated at the head of Milk Creek canyon. As this valley is so very narrow and deep a small change in the amount of annual snowfall might bring about a great change in the amount of ice in the canyon. The advances might have followed a series of years with a somewhat greater snowfall than usual or with cooler summers, or with a combination of climatic factors bringing about the greater accumulation of snow in the valley. The exact causes and conditions for the advance could of course be worked out only after careful records had been kept for a number of years and these compared to records from neighboring regions. Unfortunately no data has so far been obtained concerning the position of the ice in the few years preceding 1907, nor of the snowfall or other climatic factors, but as Mazamas and others have visited

the region before that time, it is hoped that some information may be obtained.*

On the north and east slopes of the mountain, however, are glaciers that compare favorably in size with other glaciers in the United States. The largest one is that which covers the whole eastern face of the mountain and is fully five miles in greatest width, and a mile or two in length. It is more or less fan-shaped, radiating from the base of the pinnacle on the top of the mountain. From here it spreads out into five separate lobes to the edge and partly below the shoulder between the main mountain mass and the general plateau level. This glacier, or at least, the northern lobe of it which can be seen from Jefferson Park, Mr. Williams† has called the Whitewater glacier, because it drains eastward into the Whitewater and Deschutes rivers. The name is rather unfortunate, as there is a Whitewater creek on the northwest side of the mountain and as a glacier also drains into that, the two may well become confused. A view of the three middle lobes of the Whitewater glacier as seen from the summit of Mt. Jefferson is given in figure 5.

To the southeast is Waldo glacier which although in line with the lobes of the Whitewater glacier occupies a separate basin. In the summer of 1917 it was particularly characterized by three great crevasses which crossed it near its head. (Fig. 6.)

On the north slope of the mountain, overhanging Jefferson Park are two glaciers occupying distinct hollows at somewhat different elevations. The one farthest east, Mr. Williams has named the Russell glacier,‡ and the other one the Jefferson Park glacier. Excellent views of these glaciers can be obtained from the ridge at the head of Jefferson Park. (Fig. 7.) Little detailed work could be done on these glaciers for lack of time. Pictures, however, were taken from advantageous points of their termini, and it is hoped that they may be used at some future time to help determine the extent and rate of glacier movement.

The most interesting thing observed was distinct proof of a very rapid recent decrease or recession of the ice. The best evidence was found at the lower end of the Whitewater glacier where a double-crested moraine fringed the ice. In the inner ridge, glacier ice is found up to twenty and twenty-five feet above the present surface of the glacier. (Figs. 8 and 9.) The double-crested moraine is probably to be

*Anyone able to give information on these points is earnestly asked to communicate with the writer as soon as possible through the corresponding secretary of the Mazamas.

†Loc. cit.

‡Loc. cit. As there are already a glacier and a fiord named after Russell, in Alaska, it would be wise to rename this glacier too, if possible.

Fig. 5.—The lobate front of the Whitewater glacier from the summit of Mt. Jefferson, looking northeast.

Fig. 7.—North side of Mt. Jefferson, showing Russell glacier on left and Jefferson Park glacier on east. *Photographs by Laura Hatch*

Fig. 6.—Waldo glacier as seen from near the summit of Mt. Jefferson and the irregular patches of snow on the plateau to the south.

Fig. 8.—Double-crested moraine of the Whitewater glacier, showing evidence of ice within the inner moraine up to twenty feet above the present glacier surface.

Fig. 1.—Southwest slopes of Mt. Jefferson as seen from Grizzly Flats, south of Pamelia lake.

Fig. 2.—Head of Milk Creek glacier, August, 1917, showing water from snow-fields above falling over rock cliffs before dropping beneath ice of glacier.

Fig. 3.—Ice caves and bridges developed in lower end of Milk Creek glacier.

Fig. 4.—High terminal moraine ridge about one and one-half miles below terminus of Milk Creek glacier.

Fig. 9.—Near view showing glacier ice in the inner moraine.

Photographs by Laura Hatch

interpreted as due to the melting down of the surface of the glacier, rather than to a second advance after the first had been deposited. The two moraines are very nearly parallel and the inner one usually stands at about the same relative height compared to the outer higher ridge. The idea seems to be that the ice by melting has lowered its surface so much that the inner side of the moraine has gradually sunk down, making a separate ridge. As the glacier ice is still found so high in this inner moraine, it shows that the lowering of the surface has been very recent and very rapid. If this twenty-five feet is added to the twenty to forty feet that the inner ridge must have slumped down if it was ever continuous with the outer moraine, it makes the total thinning of the glacier a considerable amount.

Whether this recession of the glaciers in the Mt. Jefferson region points to a gradual amelioration of the climate or is a local or temporary phenomenon, can only be determined after observations have been continued over an extended period of time, and compared with evidence from other parts of the world.

Other interesting things were noted but can be only mentioned at this time, for instance, the crevassing of the glaciers. All of them (except the Milk Creek glacier) had some cracks, showing that the ice was moving, but the most interesting ones were seen in the second lobe of the Whitewater glacier. From the top of the mountain the eye is caught by the unusual grouping of the crevasses into radiating curved lines. Nearer the surface of the glacier it is observed that the ice is really very much shattered, and impassable below a certain level on the mountain side. A very sharp hill evidently rises from the floor over which the glacier passes, for a mass of rock is exposed, on the upper side of which the layers of ice are upturned and deeply cracked. The structure of the ice is well shown by the layers of debris. The ice rides over the summit of the hill but breaks off just beyond and reforms below, making a tumbled mass of dirt-covered ice blocks which at a distance give the appearance of a medial moraine. In all the glaciers the deep crevasses near the heads (*bergschrund*) are most noticeable, but as these are clearly defined and the ice or snow between them is relatively smooth, they do not offer serious obstacles to the crossing of the glaciers, as do the crevasses farther down. The author hopes at some future time to go on with the study of these little-known glaciers, and in the meantime to gather data concerning the former positions of the ice and conditions of snowfall from any who have visited the region and are willing to furnish it.