

October 1975

REPORT ON THE GLACIERS OF MOUNT SHASTA - 1975

Introduction

Accumulation on the glaciers during the 1974-75 budget year was way below normal. This was the case even though snowfall at Horse Camp and other snow survey sites on Mt. Shasta was considerably above the mean. Precipitation at Mt. Shasta City for the period July to June totaled 34.56 inches, only 1.21 inches less than the average for the period of record (1888-1974).

The poor accumulation above 10,000 feet was the result of less measurable factors. First of all, the major storms of the season were quite cold, their snowlevel being about 2,000 feet lower than normal. A low cloud deck and the very cold air associated with these disturbances greatly inhibits snowfall at high elevations. The second contributor, one which was probably quite important, was the March wind storm. This ground blizzard, apparently the strongest in years, produced hurricane force winds that caused an extreme redistribution of the snowpack. Wind erosion and drifting of snow was noticeable even well below timberline. Observations made just after the storm suggest that much of the snow was blown off the upper reaches of the mountain, even from normally sheltered areas.

Fortunately, the ablation season was generally favorable. The coolest spring since 1971, delayed significant melting of the snowpack until mid-May. July through September closely followed the trend of 1974. July and August being rather cyclonic and below normal in temperature while September was

dominated by stagnant high pressure and thus experienced well above normal temperatures. A September with daytime temperatures over six degrees above normal is less harmful than the same situation in July or August because of lessened insolation and a lower incidence angle. This may be somewhat compensated by lower glacier albedo late in the ablation season. As of this writing (October 4), the glaciers of Mt. Shasta are still melting as above normal temperatures under clear skies continue.

Note: Significant ablation ended on Oct. 6 with the arrival of the first of a series of Pacific Firn Cover cold fronts.

In general, firn volume on Mt. Shasta was quite good as of my trip there in late September. Coverage and thickness of the névé was still much better than in 1973, however, many large snowfields present at the end of the 1974 ablation season are now absent, greatly reduced, or thinned. Unfortunately, only a few thin patches of 1975 snow were visible. The vast majority of the remaining firn snow was from the 1973-74 accumulation season, a season which from this year's viewpoint was far more favorable than previously imagined.

The Whitney Glacier had its usual low, circa 40%, firn cover. Having never seen the glacier close up later than mid-August, my basis for comparison with past years was somewhat tainted. However, it appears that in most years snow quickly melts back to a few key areas on the glacier where abnormally massive accumulation occurs. Once this happens, there is little further change in firn area.

On the Bolam Glacier, firn accounted for 80% \pm 10% of the

glacier's surface. Essentially all this firn dated from 1974, and was for the most part very thin and dirty. Considerably more of the terminus was exposed than last year.

Perhaps $60\% \pm 10\%$ of the main trunk of the Hotlum Glacier was firn covered. The extensive snowfields and minor glaciers northwest of the main trunk had a cover estimated at close to 80%. Most of the snow covering the northern end of the Hotlum's terminus last year has melted. The lack of accumulation on the glacier this year caused many crevasses, which never opened last year, to become wide and dangerous. Just below the rock called "Gibraltar" by Oliver Kehrlein, at about 11,000 feet, in an area of accumulation where a large crevasse had opened, the 1974 firn layer was 30 to 40 feet thick. This layer comprised nearly half the visible depth of the crevasse. Higher on the glacier, 1974 firn of approximately 10 to 30 feet was recognized on seracs and crevasses.

The Wintun Glacier, main trunk, was 70 to 80% firn covered. This névé cover was all 1974 snow as far as the investigator could tell. Much of the snow around the glacier last year has disappeared.

Volume Fluctuations

Wastage is continuing on the eastern margin of the Whitney Glacier in its lowest half mile. Till covered ice has been forming moraines here, while nearby, ice has retreated 50 to 100 feet from the moraines. No change in the position of the east lobe terminus has occurred. On the west lobe a slight change was

noted when 1974 and 1975 photos from station W3 were compared. Slight growth of this lobe has obscured landmarks visible behind it in 1974. In contrast, the relatively clean central "lobe" of the Whitney Glacier has downwasted considerably in the lowest half mile, resulting in an almost complete separation of the east and west lobes. (Note: That the different parts or "lobes" of the Whitney Glacier react differently, can be explained by their various source areas. (see map)) The possibility exists that a kinematic wave is traveling down the glacier, but no good evidence has yet been obtained.

In 1974, the terminus of the Bolam Glacier was heavily mantled with snow, so that an accurate picture of its position could not be taken. Accordingly, no recognizable change was seen in the snout this year. One measurement was made. At the rock rib extending down from the terminus, it was 45 feet \pm five feet to the glacier from the 1974 station marked "35 feet to snow". The ten foot difference could be solely the result of the snow melting.

As at the Bolam Glacier, much of the Hotlum Glacier was hidden by snow in 1974. By September 25th of this year virtually all this snow had melted, exposing in contrast to most of the front, a relatively clean, gently sloping terminus at the northern end of the snout. In this area new moraines were evident, in most cases ten to thirty feet from the ice. These moraines are only two to four feet high except where ice cored. The short ice cored stubs are around ten feet tall. The Hotlum Glacier has retreated from these moraines in the last few years, however,

while the rest of the glacier has remained stationary. The moraines are only two to four feet high except where ice cored.

whether any of this recession happened during the past year is not known due to the 1974 snowcover. Moraines appear to be forming on the northwest margin of the glacier over the lower third of its length. Currently, they have only a thin veneer of till and may contain active ice. Still, they suggest the early stages of retreat.

At the time the Wintun Glacier was observed, no changes in its extent were recognized. After receiving this year's photographs and comparing the station U2 photo with that of last year, it was apparent that an advance has occurred. Even in 1974 this terminus was mostly free of snow and the most active looking on Mt. Shasta. The advance was on the order of 15 feet \pm 10 feet, judging from the photographs.

Conclusions

Apparently, the two largest glaciers on Mount Shasta, namely the Hotlum and Whitney, are responding at their termini to the marginal to unfavorable years 1970 to 1973. On the other hand, the Wintun Glacier, being smaller, is already beginning to respond to the snowfall of 1973-74. Although the terminus of the Konwakiton Glacier was not observed this year, it also is probably advancing.

Study of climatic records of Mt. Shasta City and other Northern California locations suggest that the next four or five years should be generally favorable for the glaciers. We can expect one or two very snowy winters, two or more marginally favorable winters, and one very dry winter. Summers will get warmer, but the heavy winter snowfall will more than offset it.

Whitney Glacier 1975

Sketch Map 10-8-75

