

afternoon before the weather broke, or else we should have been cut off from food-supplies for nearly a week. As it was we had considerable difficulty in making our way down the bank of the flooded river to our main camp.

In order to complete the survey of the Mikonui Subdivision a visit to the mouth of the Wanganui was required, but this could not be accomplished for over a week owing to the flooded state of the river. Finally, however, the necessary work was done, and on the 16th March, leaving Mr. Bartrum in charge of the party, I left camp *en route* to Wellington in order to prepare my report.

The fine weather which prevailed during January and February led me to hope that the whole of the southern part of the Wanganui watershed (in the South Westland Division) could be geologically and topographically surveyed before the close of the season. In order to traverse the watersheds of the Lambert, the main affluent of the Wanganui, and of its tributaries the Lord and the Adams, fine weather and a very low condition of the water in the streams are essential. Usually, however, these conditions obtain only in the dead of winter, when frost and snow would prevent detailed or complete work being done. It is possible, however, for ideal conditions to prevail when a fine autumn follows a good summer. In the hope that this might be the case, Mr. Bartrum was instructed to proceed with the survey of the Lambert and its tributaries, as well as of some other streams on the south side of the Wanganui.

After much trouble, occasioned by adverse weather and the difficulty of fording the Wanganui, a camp was established in the fork between this river and the Lambert. Mr. Bartrum carried a chained traverse some distance up the south bank of the Lambert, but on coming to a deep gorge was forced up by the precipices to a point above the bush-line, overlooking the inaccessible U-shaped valley of the Lord. Descent into the Lambert Valley from this point was also impracticable. Owing to both the Lambert and its northern tributary the Adams being unfordable, no route was available on the north side of the former river. Early snowfalls made the mountains difficult and dangerous to traverse, and on the approach of the winter it was deemed advisable to recall Mr. Bartrum from Westland. In April and May during intervals in his attack on the Lambert he had traversed the smaller southern tributaries of the Wanganui.

It is now evident that unless a most unusually favourable set of conditions should prevail, a detailed survey of the Lambert watershed is impossible without going to great expense in providing boats and cutting tracks.

Area of Country examined.

The country traversed during the progress of the field-work has already been indicated. The area surveyed in detail includes nearly the whole of the Waitaha and Big Wanganui watersheds, as well as the greater part of the Hokitika watershed, and amounts to over four hundred square miles. Much of this was not only surveyed geologically, but also topographically.

Physiography.

Probably quite three-fourths of the area examined is high mountainous country belonging to the alpine range, and includes such peaks as Park Dome (7,688 ft.), Artist Dome (7,061 ft.), Mount Bowen (6,516 ft.), Red Lion (7,941 ft.), Mount Evans (8,612 ft.), Mount Louper (8,164 ft.), Mount Whitcombe (8,656 ft.), and many others over 7,000 ft. in height, all far above the permanent-snow line.

The marked uniformity of the summits, more particularly on the Canterbury side of the main divide, points to the former existence of a peneplain over the whole alpine area, of which the Wainihinihi peneplain described in the "*Hokitika Bulletin*,"* probably formed part. The complications produced by faulting, unequal uplift, and irregular erosion render it difficult to determine whether peneplanation was ever complete or not. Further references to this subject will be found in the bulletin on the Mikonui Subdivision now being prepared.

The main river-valleys are deep, and, in some cases, gorgy, with steep grades, but without waterfalls of any size. The larger tributaries may join at grade, but these and tributaries of medium size as they are ascended enter deep gorges with waterfalls or steep grades, which at heights of 2,800 ft. to 3,000 ft. open out into wide flat hanging valleys. These have evidently been excavated by ice, or at least owe their main features to glaciers. Most of the minor streams, as well as the larger rivers, have glacier sources, maintained by snowfields of considerable size.

The lower portions of the major river-valleys were once occupied by enormous glaciers, but stream erosion has gone on to such an extent since the retreat of the glaciers that characteristic glacial topography has almost disappeared in many places. It is believed that during recent times a considerable amount of warping and perhaps faulting accompanied by uplift has taken place in the area. From these causes probably result many of the gorges and most of the rock basins which are so common in the main river valleys.

The lowland country examined includes the lower Waitaha Valley, where there are five or six thousand acres of good agricultural land, and the Wanganui Plain, a much larger area suitable for settlement. The most interesting feature of the lowlands is presented by the old morainic deposits, which cover a comparatively large area, more particularly in the Waitaha Survey District. Towards the Wanganui River the morainic hills rise to heights of over 1,000 ft., and reach the sea-coast, where they present lofty cliff-faces to the ocean. These remarkable deposits are referred to the ancient Wanganui Glacier, which must have been of enormous dimensions. Further north is Bold Head, an isolated hill over 400 ft. in height, formed of moraine deposited by the old Waitaha Glacier, which also reached the present sea-coast.