

Throughout the year the survey has had the constant help of Mr. E. B. Glanville, local Instructor in Agriculture, and of Miss L. M. Cranwell, botanist to the Auckland Museum. The visit of the Australian pedologists—Professor Prescott, Dr. Teakle, and Mr. Leeper—to North Auckland was an occasion for much useful discussion.

Most of the area examined has been previously reported on by the late Dr. H. T. Ferrar, of the New Zealand Geological Survey, and his maps have greatly expedited the work.

#### SOILS.

The genetic soil types mapped are mainly those set out in last year's annual report. Immature podsols cover the greatest area, but mature and submature podsols are well developed on the Cretaceous claystones and on small areas of Tertiary sandstones, greywacke, and alluvium. The red-brown soils derived from basalt cover about 70 square miles.

*Podsols.*—In the south-west corner of Purua Survey District mature and submature podsols are well developed on rolling country carved from upper Cretaceous claystones. The claystones were probably formed from detritus washed from the podsolized soils of a Mesozoic peneplain. They are siliceous and low in bases, and hence mature podsols are formed on them relatively quickly.

The low hill-tops and upper parts of the slopes are covered with manuka scrub, and a typical profile is—

- A 6 in. to 12 in. light-grey structureless silt loam ;  
 B + C On compact grey and yellow-flecked clay with strong prismatic structure.

On the lower parts of the slopes and in the valleys the vegetation is largely stunted manuka, wiwi (rush), and umbrella fern, and giant podsol profiles such as the following are to be found :—

- A<sub>1</sub> 12 in. light-grey silt loam ;  
 A<sub>2</sub> 40 in. white cemented silt loam ;  
 B + C On grey and brown mottled sticky clay.

In many places bands of charcoal and fragments of what appear to be charred resin are to be found both in the A<sub>1</sub> horizon and in the now cemented A<sub>2</sub> horizon.

The presence of kauri resin and of peg roots of the kauri tree, some of which pass through the cemented A<sub>2</sub> horizon, show that both types of profile were developed under kauri forest, but the original deep surface layer of organic matter (A<sub>0</sub>) is missing and is replaced in part by an inch or so of grey powdery litter from the manuka scrub. Under large kauri trees the A<sub>0</sub> layer is 2 ft. to 5 ft. thick. Although inconclusive, the evidence suggests for this area the following cycle of events :—

- (1) Area covered with kauri forest. The natural poverty of the claystones would tend to exclude trees demanding higher fertility.
- (2) As soils became strongly podsolized, older trees lost vigour and younger trees reached maturity early, resulting in many unhealthy trees exuding gum, and a thickening A<sub>0</sub> layer.
- (3) The dying forest was destroyed by fire. Sheet erosion truncated the soils of the upper slopes, the lower slopes being covered with a layer of detritus washed from the leached layers of the soils higher up the slopes. The area was covered by scrub.
- (4) Kauri forest again invaded the area. It was during this stage that the giant podsols were formed on the detritus covering the lower slopes.

Stages 2 and 3 were then repeated, resulting in the scrub land of to-day.

The soils of the upper slopes would probably again be carrying kauri forest were the seed-dispersal of the kauri tree more efficient.

*Red-brown Soils.*—It is proposed to classify the red-brown soils in two groups—the red loams and the brown loams—following the suggestion of Professor Prescott, who recognized the soils at Waimate North as being closely related to the red loams of eastern Australia.

The red loams are compact and appear to have developed from scoriaceous basalt under a dicotylous forest (taraire dominant). The brown loams have developed on basalt flows under scrub and forest and show the stages outlined in last year's annual report. On Puhipuhi plateau brown loams in an immature stage are developed under taraire, whereas under kauri trees the soil is mature and has a similar profile to that of the ironstone land west of Kerikeri.

*Otao Fine Sandy Loam.*—An unusual soil type, the Otao fine sandy loam, covers about two square miles on easy greywacke country west of Pakaraka, and occurs in isolated patches at Waipu, Kaiwaka, Te Arai, Warkworth, and Silverdale. A typical profile is—

- 18 in. brown free, fine, sandy loam ;  
 6 in. cemented white sand ;  
 On compact brown or grey-brown flecked clay.

The cemented white sand layer appears to be the buried A<sub>2</sub> layer of a former podsol, but if so no satisfactory explanation can at present be given of the overlying brown loam.

Near Warkworth citrus and peach trees grow well in this soil, but apple trees are stunted.

#### OPUAWHANGA SURVEY DISTRICT.

The Opuawhanga Survey District has been chosen as being fairly typical of about 400 square miles bordering the east coast between Whangarei and Russell, and the map and comprehensive legend have been prepared in an attempt to find a suitable form for presenting soil survey data.

The district, which lies athwart the north-north-westerly-trending range that forms the watershed between the east and west coast, is composed almost entirely of hill land. Within the district the general height of the main watershed is 700 ft. to 1,000 ft., but the roads to Whananaki Inlet cross it in low saddles at about 400 ft.