underlie moderately flat surfaces. A notable exception is the ash covering of Motutapu which has blanketed the former topography and tended to smooth it out by being later washed and blown into the valley and flats sometimes forming dunes which have dammed valleys giving lake deposits.

Most of the information in this brief review is gleaned from the under-mentioned sources, with but little new material from the writer's own observation added. In addition, however, the author wishes to acknowledge the helpful discussions with Mr. E. J. Searle and Dr. R. N. Brothers of the University of Auckland, each of whom has carried out detailed surveys of portions of the Auckland area, and the help of Mr. J. C. Schofield, New Zealand Geological Survey, who prepared the geological map which was used on the New Zealand Ecological Society's excursion to the area.

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Soils of the Inner Islands of Hauraki Gulf

N. H. Taylor

Soil Bureau, D.S.I.R.

Soils are of interest to students of ecology in two ways for not only do the soil conditions influence the flora and fauna of any particular area but in their turn the flora and fauna also modify the soils. This intimate inter-relationship merits ecological study.

The soils of the inner islands of Hauraki Gulf have not been examined in detail and what little is known of them was obtained from observations at some typical sites during a brief visit in 1940. The general survey of the soils of North Island summarises these observations together with additional information inferred from terrain in North Auckland with similar parent rocks and vegetation.

The soils of Motuihe, Waiheke, Ponui, and adjacent islets, illustrate well the zonal soils of the area (the northern yellow-brown earths and their podzolised counterparts) which are developed on freely draining relatively stable sites from ordinary siliceous rocks such as greywacke and mudstone.

Under the warm moist subtropic climate, the rocks weather rapidly to form clays leaving little weatherable material in the sand fraction. These clays, as they form, are leached during heavy rains, a process which is intensified or retarded according to the ability of the particular kind of vegetation to return nutrients to the topsoil in its leaf fall. In the younger soils, fertility is determined largely by the composition of the weathering parent rock, and deep rooting of vegetation is encouraged; as the soils become mature, the elements of fertility tend to be concentrated in a relatively thin topsoil while the subsoil becomes exceedingly impoverished and in consequence the vegetation tends to be more shallow rooted. With changing vegetation, such soils may degrade fairly rapidly but, having little or no reserve

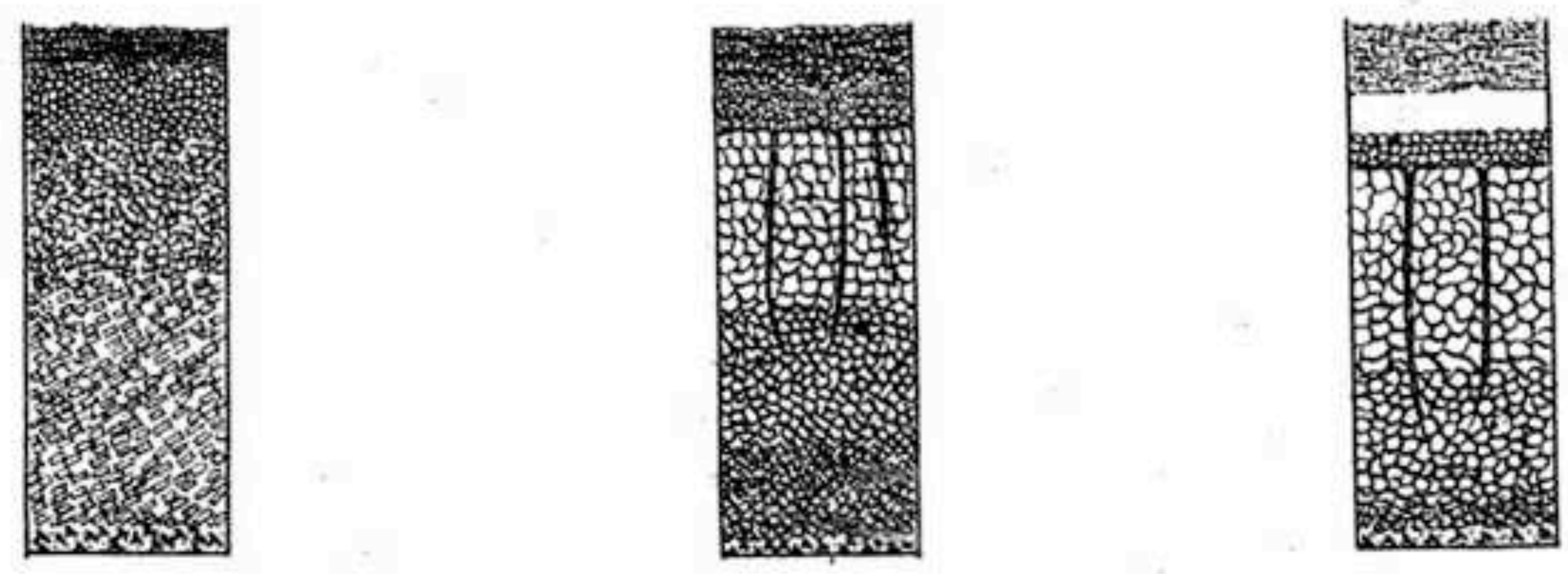

FIGURE 1.—*Northern yellow-brown earth to podzol sequence illustrating stages in degradation.*

of readily weatherable minerals, are slow to regrade.

A series of soils showing progressive degradation occurs on the easy rolling land (see figure). Where the native vegetation was predominantly dicotylous forest, the forest floor was mull: topsoils are some 4 inches thick, are friable, have a coarse granular structure, and have a pH of approximately 5.5 and base saturation near 40 per cent; the subsoils are brown to yellowish brown, slightly mottled, and have a pH close to 5.0 and base saturation of 20-30 per cent. Where the native vegetation contained a larger proportion of mor-forming trees—podocarps and kauri—the soil is more acid and leached: topsoils are more silty and have weaker structure; subsoils are more mottled and have coarse prismatic and blocky structures. Where kauri dominated the vegetation for considerable periods, the soil under the thick peaty mor of the forest floor was markedly podzolised: the topsoil is a structureless light-grey silt loam with a pH commonly about 5.0 or less and base saturation near 15 per cent; the subsoil is typically a mottled yellowish grey clay with coarse prismatic structure and with pH below 5.0 and base saturation commonly below 10 per cent. Although the soil pattern has not been studied in detail on the islands in question, adjacent areas show evidence of an intimate mosaic of such soils reflecting the influence of the former forest mosaic.

On the steep slopes, the soils are more youthful owing to downhill movement of the soil mantle. They are for the most part shallower and contain a greater proportion of weatherable minerals, and their horizons have boundaries that are less distinct. Other soils occupying small areas are the brown granular clays formed from andesitic rocks in the north-eastern part of Waiheke Island, the gleyed soils of the swamps, and the recent soils from alluvium that fringe the small streams.

The soils of Rangitoto, Motutapu, and Rakino are entirely different from those of Waiheke and the other eastern islands. They are formed from basaltic ejecta erupted from Rangitoto within the past few hundred years. The soils of Rangitoto are very young: those of the scoria cones are regosolic and consist of 6-12 inches of brown fine gravelly sand on scoria gravel; those of the lava flows are lithosols which are forming from fragments of the rough aa surface and pockets of scoria—much of the surface of the flows is bare rock.

The soils of Motutapu and Rakino Islands are formed from the fine basaltic ash described by Mr. Grant-Mackie in the previous paper as having been erupted 700 years ago. On the southern part of Motutapu, the ash is approximately 2 ft. thick, but it becomes thinner towards the north-east and on the northern side of Rakino Island is about 7 in. thick—probably a thin dusting of it has influenced soil fertility on the Noisies Is. further north. On both islands, it covers fossil yellow-brown earths which, on Motutapu, appear to have been podzolised in places, indicating that at some stage prior to the eruption kauri had been a component of the vegetation.

A profile near Islington Bay is:

Rangitoto ash	A_1	6 in. black sandy loam with fine granular structure,
	A_{11}	10 in. dark grey free medium sand,
	C	5 in. slightly compact dark greyish brown structureless sand,
Buried podzolised soil		3 in. white structureless silt loam,
		on yellowish clay.

On Rakino Island, the profile is:

Rangitoto ash	A_1	7 in. black to dark grey-brown friable fine sandy loam, with strongly developed medium granular structure,
Buried yellow brown soil		*on* yellowish brown clay.

The pH of the soil from Islington Bay is 6.9 in the topsoil and 7.3 in the subsoil. The base saturation of the topsoil is 83 per cent, and of the subsoil 6.3 per cent. Both of the soils are youthful, having reached the nigrescent stage of soil formation, the main morphological features being a deep dark topsoil containing much well-decomposed humus and the absence of a B horizon.

The ash appears to be only slightly weathered, but the high base saturation figures indicate that weathering is almost sufficiently rapid to keep pace with the rate of leaching. Considering the age attributed to it, the soil appears to have undergone little development.

The lack of old forest roots in exposed profiles of the buried soils suggests the possibility of a scrub cover at the time of the eruption and calls for further work.

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Forest Vegetation of the Inner Islands of the Hauraki Gulf

I. A. E. Atkinson

Botany Division, D.S.I.R.

Forest Remnants and the Primitive Vegetation

The primitive vegetation of Auckland's larger inshore islands, with the exception of Rangitoto, has been either destroyed or greatly modified. Nevertheless, on some islands, particularly Waiheke (26,000 acres) and Ponui (4,400 acres), there are many remnants of both primary and secondary forest. When considered in relation to the present soil pattern and to early accounts, these indicate an original pohutukawa-taraire-kauri forest pattern in which kauri *(Agathis australis)* was associated with the strongly leached and in parts podzolised northern yellow-brown earths of the upper valley walls and ridges; taraire *(Beilschmiedia tarairi)* was associated with the moderately leached northern yellow-brown earths of the sheltered coastal and inland valleys; and pohutukawa *(Metrosideros excelsa)* occurred on the weakly leached and skeletal northern yellow-brown earths of the coastal slopes and cliffs exposed to wind-carried salt spray (cf. Taylor, 1960).