

# The Ecological Significance of the Central North Island Ash Showers

Chairman — Prof. G. T. S. Baylis

## The Soil Pattern

*N. H. Taylor*

The volcanic ash showers of the central North Island have not been the object of separate detailed study since 1931 (Grange, 1931) until the present detailed work of I. L. Baumgart in the area north and east of Taupo. The data presented in this paper have been gathered in the course of soil survey reconnaissance work, and many of the groupings must be regarded as tentative. Ash has been spread over North Island as recognizable deposits from near Feilding and Napier in the south to near Auckland in the north, and at one time or another must have given rise to the soil over the greater part of the Island. The former extent of the showers is perhaps least understood in the southern districts.

Ash-beds can be divided into two classes according to the type of eruption that produces them. These are—

- (1) ash-beds of paroxysmal origin.
- (2) ash-beds of intermittent origin.

The ash-bed of paroxysmal origin results from a single paroxysmal outburst. Over a large area a relatively thick layer of ash is deposited, which completely covers the former soil and destroys most of the existing vegetation. Then comes a period of quiet during which the soil-forming processes act on the virgin material and a new type of vegetation appears. The bed becomes weathered on top while the lower parts are still comparatively fresh. The ash is usually sorted into layers, the heavier and coarser material forming the base of the deposit, with finer material on top. Examples of deposits of this type are the Tarawera ash, which is 6 in. and more thick over 600 square miles, and the Taupo shower, which is more than 6 in. thick over 8,800 square miles of the central North Island.

The ash-bed of intermittent origin accumulates gradually by the slow addition of dust from eruptions of the intermittent type. Over the greater part of the area covered each coating of ash is generally thin; the existing vegetation is often little affected, and the soil forming pro-

cesses are continuous, although they are modified by the addition of unweathered material to the surface. Thus the bed is generally finer in texture than one of paroxysmal origin, and tends to be weathered throughout its whole depth. Such an ash-bed, accumulating at present, occurs over more than 2,000 square miles of country around Ngauruhoe and Ruapehu, dust from even a small eruption having been carried as far south as Wellington, and as far east as Hastings. An ash-bed of intermittent origin need not necessarily have a uniform composition throughout, for the accumulating dust is transported through the air many miles and more than one volcano may contribute to the deposit.

It must be noted that these are not suggested as two rigid classes into which all the ash-beds under discussion should be placed, for an ash-bed of intermittent origin if traced towards its parent volcanoes, ultimately divides into a number of separate beds, many of which have the characters of beds of paroxysmal origin.

For convenience the ash showers have been grouped somewhat arbitrarily into periods of accumulation.

### *First Period—*

The andesitic Hamilton ash together with showers grouped as older Hamilton ash appear to be of intermittent origin. They form a well weathered cover over the drowned downland topography of the Waikato basin—the Hamilton Hills (early pleistocene). They are recognized below younger ash-beds extending south to the King Country, and somewhat similar deposits have been recorded in the Bay of Plenty and Hawkes Bay, and on remnants of the early pleistocene surface north of Feilding.

### *Second Period—*

In the King Country, unconformable between Hamilton ash and the later ash-beds, are a multiplicity of "intermediate ash-beds" of intermittent origin, which nowhere are significant soil-formers.

*Third Period—*

Ash-beds of the third period are all of the intermittent type. The Tirau ash, recognized from the Waikato to Tirau, passes underneath the Taupo ash towards Taupo. It is hypersthene-rhyolitic ash attributed to a source near Taupo. It feathers out westwards beneath the more andesitic Mairoa ash which, when traced southwards, merges into the Egmont ash of augite-hornblende andesite. To the east of the Hauraki depression the ash coarsens and thickens to 5 or 6 ft. and the mineral assemblage changes to hornblende andesite. This is the Waihi ash which margins the Bay of Plenty and East Cape areas, and consists of at least two separate beds. The Mairoa shower is older than the Waikato fan of the Cambridge-Hamilton area and the greater part of these ashes were probably erupted before the Waikato abandoned its course through the Hauraki Lowlands. (Taylor, 1933.)

*Fourth Period—*

The fourth period ash showers are mainly the result of paroxysmal rhyolitic eruptions. The Whangamata ash, a coarse yellow-brown pumice containing hornblende and augite, is distributed on the east coast of Coromandel Peninsula. The Gisborne (old Taupo) ashes are multiple beds with four persistent members. They extend from near Lake Taupo to Tolaga Bay and to Whana-whana on Ngaruroro River. Their chief ferromagnesian mineral is hypersthene. Two of the members of this group of showers have well developed old soils. The uppermost buried soil, that of the bed covering Gisborne, was overwhelmed by later deposits at Taupo about 1000 B.C. (approximate age  $3100 \pm 300$  years (Fergusson and Rafter, 1953)). The Maihihi ash covers a small area in the King Country but no detailed study of it has yet been made. The Whakatane shower is a coarse rhyolitic ash overlying the Gisborne shower in the neighbourhood of Opotiki.

Two andesitic showers are assigned to this period. The Tongariro shower is a brown fine-grained ash erupted from Tongariro and interbedded with members of the Gisborne ashes. It probably coincides in time with the Stratford ash surrounding Mt. Egmont. Also belonging to this era are the showers of the Rotorua group described by Grange (1929). The Rotorua shower itself is the oldest deposit covering the sides of the steep V-shaped valleys in the plateau surface near Mamaku.

*Fifth Period—*

In the fifth period are two important paroxysmal rhyolitic showers. The Taupo ash was apparently the result of almost a single outburst, and the large amount of charred wood associated with it is evidence that it was hot and successfully destroyed the forest over large areas. This eruption took place about the year 250 A.D. (approximate age  $1700 \pm 150$  years (Fergusson and Rafter, 1953)). It was followed by the Kaharoa shower, a hard coarse pumice distributed in two loads north-east and south-west from the Tarawera area. It was probably erupted between the years 1100 A.D. and 1200 A.D. (Baumgart—personal communication).

*Sixth Period—*

The sixth period includes mainly basic showers such as the Burrell ash, a later eruption from Mt. Egmont which occurred about 1500 A.D. (Burrell) (Oliver, 1931); the Rangitoto ash, a product of the last eruption from Rangitoto and probably of similar date; the Rotomahana mud and Tarawera ash, the products of the eruption of 1886; and the Ngauruhoe ash which is still accumulating.

*Soils:*

The ash showers form the parent materials of various kinds of soils which have different characters due to climate, topography and vegetation as well as to parent material. The finer intermittent ashes give rise to yellow-brown loams, the coarser pumice ashes to yellow-brown pumice soils. Soils from very young ashes, in which little change by soil-formation is evident, are classified as recent.

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