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Land forms of the Manawatu

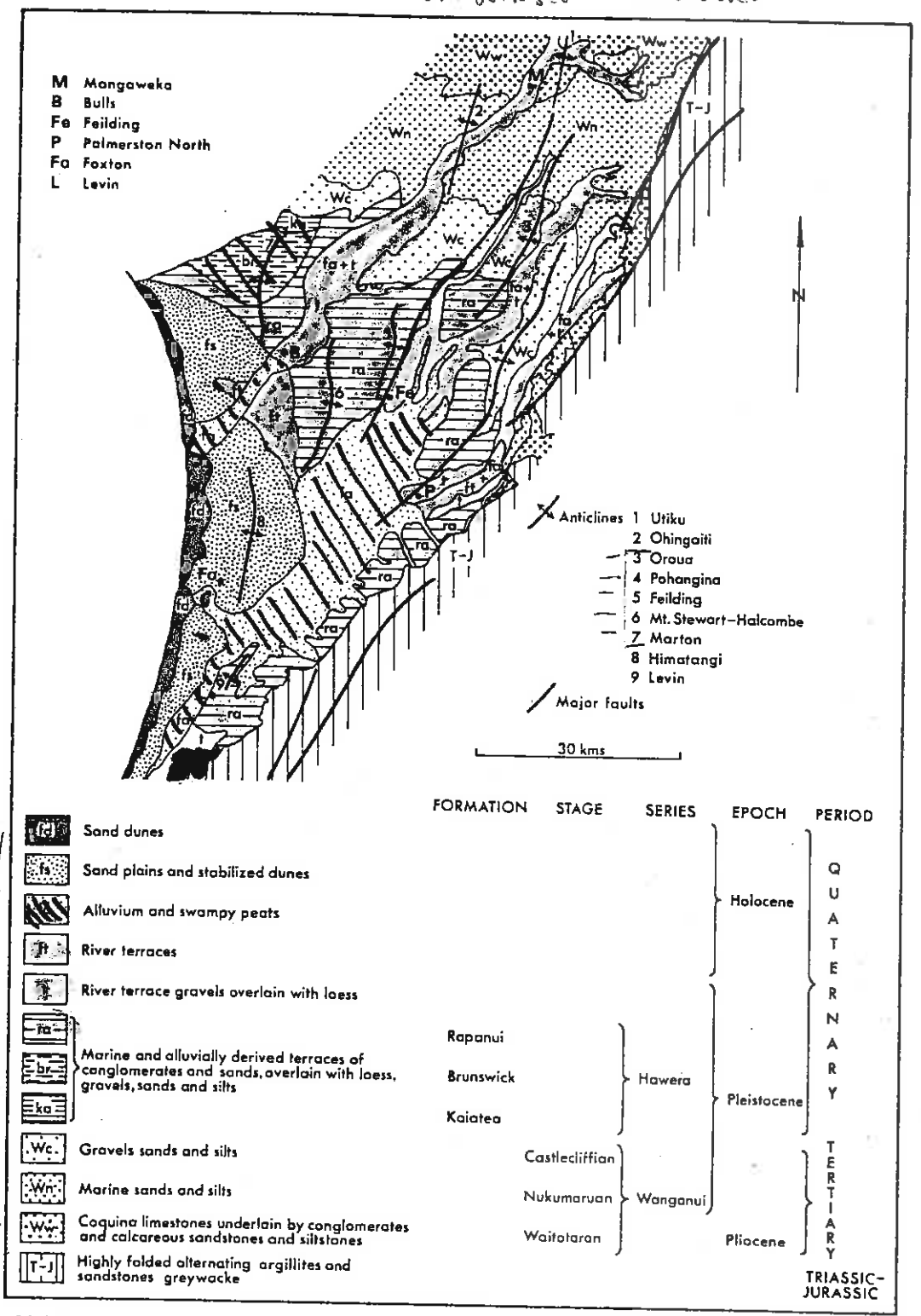

Figure 11.1 Geology of the lower Rangitikei, Manawatu, and Horowhenua.

the Aokautere Ash, which is correlated with the Oruanui Ash of the Taupo area (Cowie, 1964). This ash, which is distinctively airfall in character, being graded from coarse to fine within the layer, is prominent in road cuttings because of its resistance to erosion and its distinctive grey-white colour. It has been dated as 20 000 ± 500 years old, and consequently sets a permanent dating record on the geomorphic events of that time.

Third, as the risers backing each terrace increase in age, their slope angle is reduced by the removal of material at the top of the slope and its deposition as colluvium at the base. This, together with loess aggradation and dissection by small streams, produces terraces much modified from their original form.

The Alluvial Plains

Between the coastal sand country and the coastal lowland lies an extensive area of alluvium deposited by rivers which drain the hinterland. Like most alluvial plains, it is characterised by low elevation (less than 15 m); even topography; a typically mixed composition of gravels, sands, and silts; and recent origin.

Recent alluviation in the Manawatu below the terraces has been aided by several factors, not the least of which has been a rising sea level. Because river gradients are tied to base level at the coast, any rise in sea level causes alluvial deposition in the lower channel. Consequently, the 135 m rise in sea level during the late Pleistocene has drowned an extensive former plain surface, but has subsequently led to the creation of another delta plain.

South of the Manawatu River, the alluvial plains consist mainly of coalescing fans of gravel, thinly veneering a coastal plain of marine sediments. In places there is an indistinct boundary between this area and the adjoining sand country, while in others, such as just south of Otaki, there is a very distinct sea cliff marking the limit of the post-glacial transgression.

The Sand Country

The sand country of the Manawatu is an unbroken belt of sand, sand dunes, and sand plains which borders the coast and varies in width from 2–20 km (see Plate 1.11, page 12). Throughout the period of rising sea levels following the maximum of the Otira Glaciation, the Manawatu rivers continued to discharge considerable quantities of debris into a shallowing sea. As sea level stabilised near its maximum, the coastline established itself adjacent to the emerging Himatangi Anticline. Behind this barrier an estuary formed and was gradually infilled by debris from the rivers. These alluvial and estuarine deposits, together with excess volcanic debris from the central North Island volcanoes, transported to the coast by rivers, would have been sufficient to produce dune-building phases at the coast; although Shepherd (1979) suggests that a 3–4 m uplift in the Rangitikei-Wanganui area also shallowed the offshore profile and made available large quantities of sediment for shoreward transport by wave action. The relative coastline stability is marked by the virtual absence of beach ridges, or old shorelines, which might mark the position of a prograding coastline, apart from a small series of gravel beach ridges 2 km inland from the Rangitikei River mouth (Reaburn, 1978). Indeed, the only feature which nears any degree of parallelism to the present coast is a line of small lakes immediately behind the foredune area, which may indicate a former shoreline. Early devegetation of the coastal foredunes by human pastoral activities, coupled with increasing waste supply in the rivers caused by accelerated erosion inland, may be responsible for this current small-phase progradation beyond the lakes.

The sand country may be divided into three broad zones: the recent foredune area, a young and unstable dune complex immediately behind, and an older and more consolidated and older inland sand country. The foredune, which fronts the entire coast, rises to 10 m in height and like most dune faces has a gentle windward and steeper leeward slope. It has been very unstable, with much sand being added to and removed from it, but recent marram-grass planting and other conservation measures are gradually stabilising it. Behind the foredune lies a belt of young dunes (Waiterere Phase) which are clearly different from the older dunes, being lower, narrower, and more closely spaced.

Inland of the younger dune complex lies the older dune complex, the Motuiti and Foxton Phases, its origin probably related to the high sea level of 5000 B.P. (Figure 11.8). In general there are three major dune types, all built on extensive sand plains that appear to bear little genetic rela-

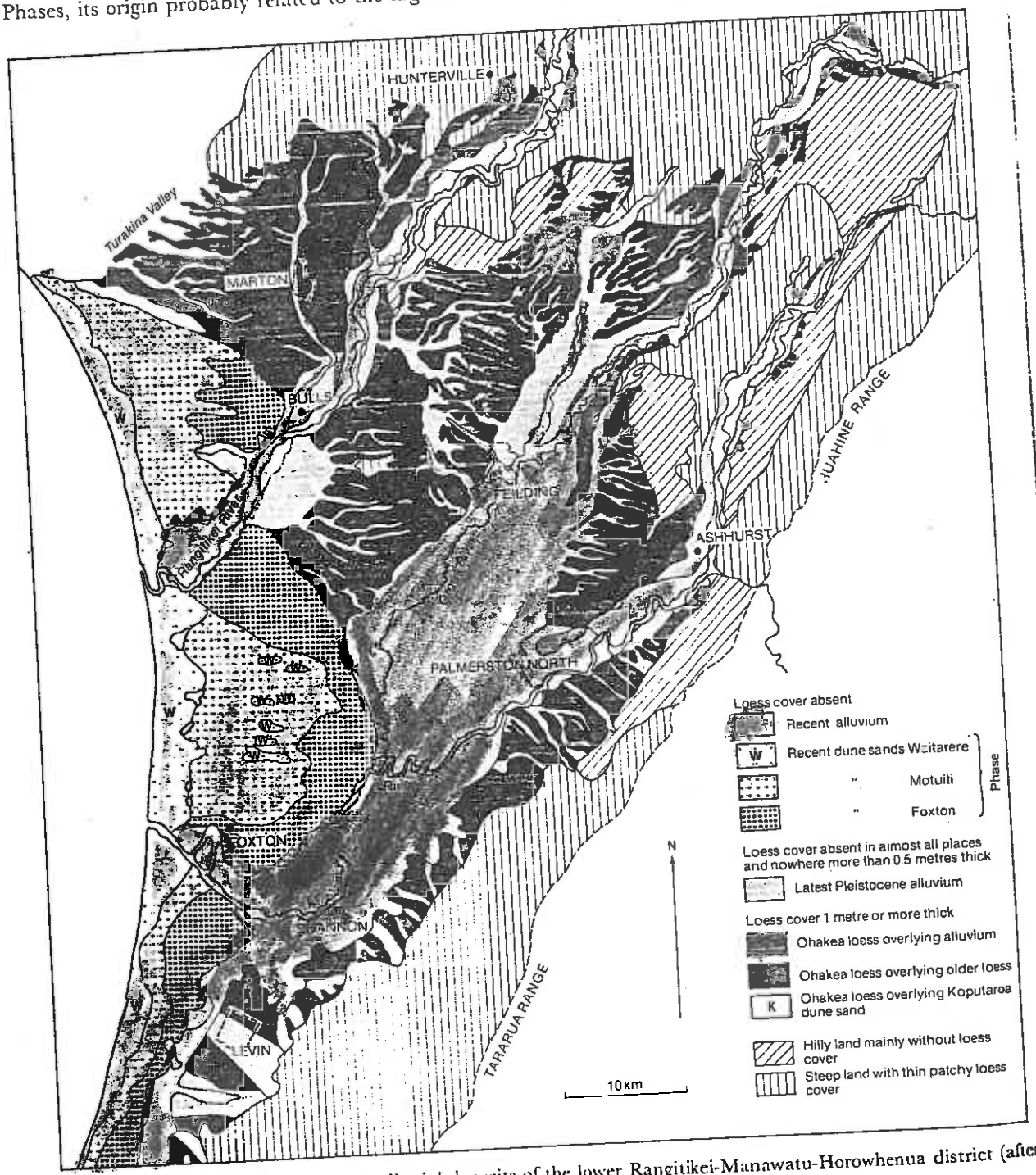

Figure 11.8 Loess, sand, and recent alluvial deposits of the lower Rangitikei-Manawatu-Horowhenua district (after Cowie, 1963, 1964; Cowie and Milne, 1973; Kingma, 1962, 1967; Fleming, 1953).

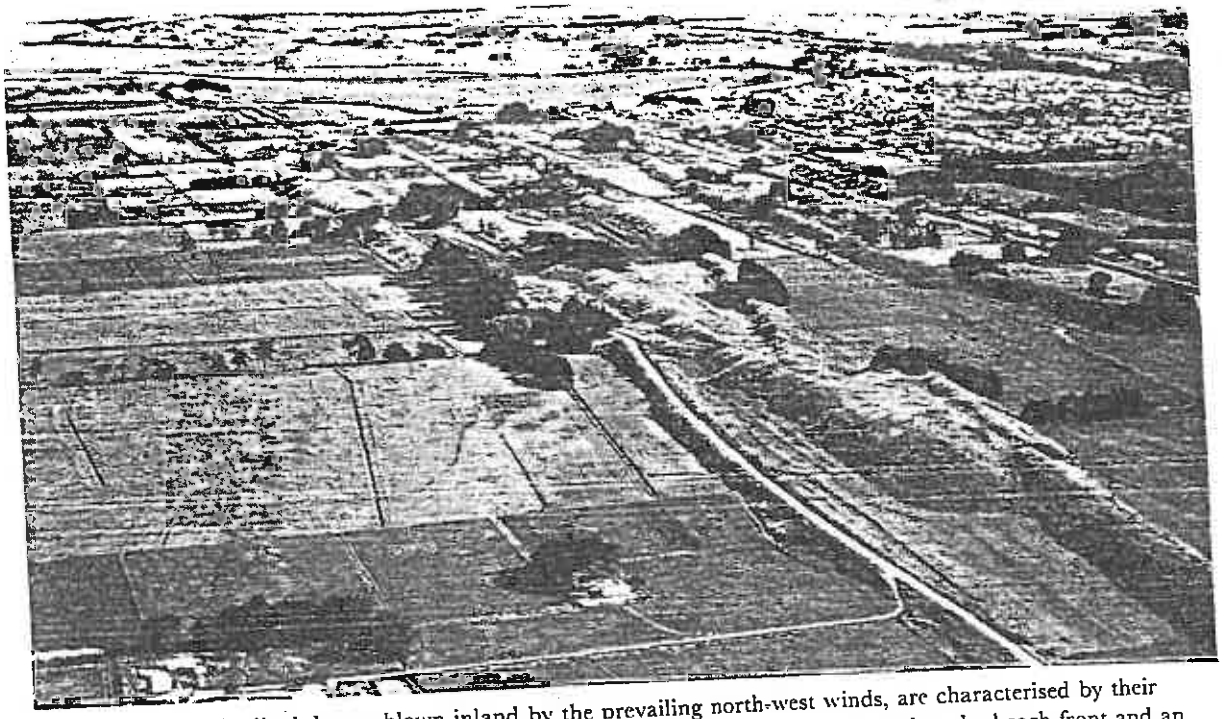

Plate 11.11 Longitudinal dunes, blown inland by the prevailing north-west winds, are characterised by their hairpin or canoe shape. The growth of such dunes relies on a constant supply of sand at the beach front and an unvegetated surface. The dune in the foreground is now isolated from the coast by a wide meander of the Manawatu River and much of the sand plain on which it stands has been removed and replaced by river silts (left-hand side of the photo). (*Photo*: B.G.R. Saunders)

tionship to the dunes themselves. Between the Rangitikei and Manawatu Rivers, the dune ridges continue inland for many kilometres and are usually longitudinal or windrift dunes. These dunes are long and hummocky, reaching 30 m in height, and often feature adjoining downwind tails which give them a 'hairpin' or 'canoe' shape (Plate 11.11). The Motuiti and Foxton Phases are distinguished by their different soils, although their form suggests that the Motuiti Phase dunes overlie the older Foxton Phase sand plains (Cowie, 1963).

South of the Manawatu River the elongate-blowout dune is more characteristic and the dunes generally have more of a festoon shape. The elongate-blowout dune is crescentic, with wings trailing downwind from the central part in a similar fashion to the classical barchan dune, except that the wings are more closely packed and nearly parallel. To the south of the Ohau River the dunes have no apparent orientation to the prevailing north-west wind but lie parallel to the coast as a series of irregular sand hummocks.

The change from longitudinal festoon-type to parallel sand hummocks might best be explained as a close relationship between topography and wind. In the north an extensive plain was sufficiently wide so that the prevailing north-west wind was uninterrupted by topographic irregularities, and sand could be blown inland in long trailing dunes. Towards the south the coastal plain becomes narrower and the mountain range behind becomes higher; so deflection of the prevailing wind, especially near the surface, must take place. Consequently, the effect of the wind is lessened southwards to the point where it is of