

## Botany of the Manawatu Sand Country

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Cockayne's parliamentary reports on the dune areas of New Zealand (1909, 1911) are based largely on the Manawatu coast. These reports still provide an adequate general account of the botany of this area. The sand country had been settled for 50 or 60 years at the time of Cockayne's reports, and extensive management had already greatly modified the original vegetation and soils. Further, the problem of deterioration was already being met by pioneer attempts at reclamation. It is true that reclamation has been continued, both through afforestation and through more intensive pastoral management, the latter being aided by the development of high-producing pasture plants and of fertilizing, but it is not even necessary to leave the main roads in order to see many places where the conditions of 50 years ago still apply. Therefore, the present paper does not pretend to offer much that is new. Its purpose is to provide a botanical background for this symposium on sand-country, and for the associated excursion.

The vegetation is probably best treated as in Cockayne's reports, that is, in terms of succession, and with separate consideration for dunes and for sand-hollows.

### DUNES

An account of vegetative succession on sand-dunes usually assumes that the shoreline is moving out to sea. It then begins with the pioneers of the newly-formed foredune and ends with the climax or subclimax vegetation of the stabilized innermost landward dune. This treatment is valid for the Manawatu district, with certain obvious modifications. One is that the induced instability of some landward dunes has resulted in the sand country presenting a mosaic of successional stages rather than a regular development landwards. The other is that human influence is now an important factor in determining the nature of the climax or subclimax vegetation.

The pioneers of the true foredune are the usual sand-binders, *Spinifex hirsutus*, *Desmoschoenus spiralis*, and *Ammophila arenaria*. On induced sand-drifts further inland, *Ammophila* tends to be the principal species, presumably because there is usually a source of supply from

areas that are being reclaimed. *Desmoschoenus* may be found at a considerable distance from the sea where the landward sand-drifts are continuous, for example in the Lake Beamish area, where this species penetrates inland in quantity for more than a mile. *Spinifex* is more of a true foredune plant, showing less inland penetration than *Desmoschoenus* under similar conditions.

Shrubs start to appear on the inland slope of the foredune where that is relatively stable. They are the typical four species, namely *Cassinia leptophylla*, *Coprosma acerosa*, *Pimelea arenaria*, and *Lupinus arboreus*. Where there is some degree of stabilization, the landward slope of the foredune also tends to be colonized by scattered exotic herbs, notably such rosette-forming Compositae as *Gnaphalium luteoalbum*, *Leontodon hispidus*, and *Erigeron* sp. It is evident that these colonizing herbs tend to be those with efficient means of dissemination. The indigenous grass *Deyeuxia billardieri* is also liable to be present.

For a varying distance landward from the foredune, it usually requires careful examination to detect successional tendencies. Throughout this distance, the pioneer sand-binders of the foredune will be found colonizing drifts and the pioneer shrubs will be found appearing among the sand-binders. However, there is eventually an increasing tendency for the shrubs to aggregate. Such shrub-aggregations are accompanied by the greater development of the subordinate herb and grass layer, characterized by such exotic species as *Sonchus oleraceus*, *Holcus lanatus*, and *Festuca arundinacea*.

This development is accompanied by the appearance of other shrubby species, such as *Olearia solandri*, *Leptospermum scoparium*, *Ulex europaeus*, *Cytisus scoparius*, and (more particularly in the north-west) *Discaria toumatou*, together with various species that are not strictly shrubs, such as *Arundo conspicua*, *Phormium tenax*, *Cordyline australis*, *Pteridium esculentum*, and *Muehlenbeckia complexa*.

In pre-European times, the dune succession appears to have culminated in stable shrubland.

\* Exotic species.

For much of the Manawatu sand country, with its relatively low rainfall, shrubland is probably the climatic climax, as far as the indigenous vegetation is concerned, and Buick, in "Old Manawatu," has spoken of the sand country as having been occupied by grass and scrub. It is unlikely that any of this original climax vegetation has escaped modification. Today it is necessary to look for the later stages of dune shrubland succession on former wandering dunes that are now more or less stabilized, or on formerly grazed dunes that have now reverted to scrub. *Pteridium esculentum* and/or \**Lupinus arboreus* tend to be the principal species, with a varying admixture of the other shrubby species.

#### SAND-HOLLOWS

Sand-hollows, often better called sand-plains, are a notable feature of the Manawatu sand country. The first colonists include *Carex pumila*, *Selliera radicans*, and *Gunnera arenaria*. There is usually a scattering of exotic herbs as on the rear of the foredune. Because of its tolerance of sand-drift, *Carex pumila* is often regarded as a pioneer of drier hollows, but in the Manawatu sand country it tends to reach its maximum expression on wet flats. The pioneers are followed by larger monocotyledons, such as *Scirpus nodosus*, *Leptocarpus simplex*, and *Mariscus ustulatus*. These usually provide a relatively close cover, beneath which there may be a dense turf, consisting largely of such

exotic species as *Holcus lanatus*, *Trifolium* spp., *Leontodon hispidus*, *Ranunculus repens*, etc. This type of vegetation may persist for a considerable distance landward, but eventually shrubs begin to enter the community. These are essentially the same shrubs and associated species as the later entries into the dune succession.

As in the case of the dune vegetation, the climax was probably shrubland. Most of this has long been replaced by sown pasture, but a few examples of sand-hollow shrubland can still be found. These probably represent the regeneration of shrubland that has been modified in the past by burning and by cattle. In some sand-hollows, the pre-European succession appears to have proceeded to semi-swamp forest, which is not so dependent on rainfall as is forest of dry ground. The most notable relic is Omarupapaku or Round Bush, just north of Foxton. It is largely dominated by *Podocarpus dacrydioides* and *Laurelia novaezelandiae*, but *Beilschmiedia tawa* is also present, and there is a rich flora of smaller trees.

Today some sand-plains are occupied by sown pasture as good as that of any other ploughable land, but many sand-plain pastures reflect the former vegetation in the presence of tall monocotyledonous herbs like *Scirpus nodosus*, *Mariscus ustulatus*, and *Leptocarpus simplex*.

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\* Exotic species.