

A NOTE ON THE FOREST EDGE AT TE WHAITI

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Summary

Following cessation of indiscriminate burning, there is some re-advance of the forest over fern land at Te Whaiti. A few mechanisms of re-advance are discussed and emphasis is placed on the part played by birds in dissemination of seed. Present successions would appear to lead to formation of scrub hardwood stands, containing scattered podocarps predominantly of poor form, more rarely to formation of densely stocked podocarp stands with trees of good form.

At Te Whaiti, in a westward extension of the large Urewera forest tract, occur the well known dense stands of podocarps on an area of relatively easy ignimbrite terrain. In this locality it is clear that the entire forest edge is a cultural one, shaped by past fires. The ragged configuration of the forest margin, with fire scars extending well into the forest, is ample evidence of this. The region once supported large Maori populations, and clearings of variable size, e.g. Te Ruke Fern and Arahake Fern, some of which have now reverted to forest, were made well within the present forest. But fires, over the past half century, have burned less frequently and, over the past few decades, since proclamation of the forest as State Forest, have virtually ceased.

As a result, the greater part of the present forest edge is approximately even-aged, and early stages in the re-advance of the forest are in evidence, a re-advance made possible by control of fire but modified by the browsing of deer and cattle, though to a varying extent in different localities. Consequent on the very recent cessation of indiscriminate burning, however, no advanced stages in the re-occupation of the fern land by forest are evident, though a range of immature stages in the re-colonization are present since many of the most recent fires did not reach right to the forest margin. The zone of re-advance is, however, a narrow one. This has led to a general assumption that re-advance of the forest can only take place over a narrow marginal fringe; but this is not so. The fact that it is narrow is solely a consequence of the past fire history. There is much evidence to show that forest re-advance can take place on a wider scale, with re-advance dependent upon bird distribution of seed. Seed of the podocarp species can be successfully carried distances greater than one mile.

In very general terms, the successions from fern to forest follow three paths:

(1) Concentrations of particular species of birds, e.g. tuis and invaded by hardwood scrub species with later incoming of scattered podocarps.

(2) But more usually the fern is replaced by manuka (*Leptospermum scoparium*) and kanuka (*Leptospermum ericioides*), followed by scrub hardwood species and scattered podocarps.

(3) Or there is the succession, fern to manuka and kanuka, to scrub hardwoods, with later development of dense podocarp stands.

It must be stressed that colonization by podocarps is an irregular and slow process. It appears to be dependent upon:

(1) Concentrations of particular species of birds, e.g. tuis and pigeons. Certain sites, for example portions of certain ridges, appear to be favoured by these birds though little is known for certain of their habits.

(2) The presence in the scrub hardwood pioneer stands of species that have fruits attractive to birds and, more particularly, that have fruits that ripen at the time podocarp seed is ripe, *i.e.* during the months March to May. The most important of these species is *Pittosporum tenuifolium*, less important species are *Edwardsia microphylla*, *Cordyline australis*, and possibly *Suttonia australis*. The exotic hawthorn can play some part in this. Manuka, kanuka, and kamahi (*Weinmannia racemosa*) are also associated with good podocarp regeneration but, as their fruits or seeds are not attractive to birds, it is thought likely that the birds are attracted by the insects occurring on them. Tuis have been seen tearing at the bark of large manuka. Old gnarled kamahi provide favoured roosting sites.

(3) Moderate browsing pressure by deer. Such pressure can reduce the growth of palatable scrub hardwoods, *e.g.* *Nothopanax arboreum* and the *Coprosma* spp., *C. robusta*, *C. lucida*, and *C. grandifolia*. Heavy browsing pressure is, however, harmful, for then there will be some browsing of seedling podocarps and of tawa.

(4) Good and fairly regular seed years.

In the field it was possible to examine many stages of forest re-colonization, particularly where podocarp regeneration was in evidence. The general descriptions given below have been condensed from field book descriptions. The successions described all form part of the two principal seres in which manuka and kanuka play a large part since these are by far the most extensive. The approximate ages of each stage described have been determined by ring counts.

Burnt 5-10 years ago

Dense low growth of bracken fern, up to 3 ft., associated species being *Erica lusitanica*, *Gaultheria rupestris*, and *Hypochoeris radicata*. There may be a little emergent manuka, particularly on sites that carried manuka at the time of the fire, there being still a store of manuka seed in the soil.

Burnt 10-20 years ago

Patchy growth of manuka, up to 6 ft., coming through dense fern, up to 5 ft. Amongst the fern there are small *Gaultheria*, *Nothopanax arboreum*, *Hebe salicifolia*, kamahi, *Pittosporum tenuifolium*, *Erica*

lusitanica and *Lycopodium scariosum*. No podocarp seedlings.

Burnt 20-30 years ago

Dense manuka, to 10 ft., fern mainly suppressed. Associated with the manuka are seedlings and sapling *Pittosporum tenuifolium*, *Pseudopanax crassifolium*, and *Coprosma* spp.. A few podocarp seedlings are present and in some areas there is quite a good stocking of rimu (*Dacrydium cupressinum*), kahikatea (*Podocarpus dacrydioides*), matai (*P. spicatus*), and totara (*P. totara*.)

Burnt 30-50 years ago

Poles and saplings of *Pittosporum tenuifolium* form a dense tier between 20-30 ft., manuka commonly suppressed. Beneath, there are seedlings of rimu, matai, and totara. The stocking of these young podocarp seedlings is often quite good; there may be 2,000 or more young rimu per acre. Many of the podocarp seedlings, however, show sign of cicada damage. Other lower tier species include *Coprosma* spp., *Carpodetus serratus* and *Melicope simplex*.

Burnt 50-70 years ago

A few poor form rimu and totara poles are present in the upper tier in which *Pittosporum tenuifolium* is still dominant. Other species in this tier are *Pseudopanax crassifolium* and *Cordyline australis*. There may frequently be up to 100 podocarp saplings per acre, and on some sites over 4,000 podocarp seedlings per acre have been counted.

Burnt 70-100 years ago

Occasional small dense pole podocarp stands, up to 1,000 poles per acre, rimu, matai, kahikatea, and totara, height to 60 ft. Scattered large manuka and kanuka. Where the podocarps are dense they are of good form with a mean diameter of approximately 7 inches. Sometimes there is a small admixture of young red beech (*Nothofagus fusca*). Where the pole podocarps form a dense canopy understories are weak. Such areas as these, however, are not common. They occur on local sites surrounded by older forest where bird populations are concentrated. Other burns of this age carry stands of poor form kamahi poles with scattered poor form rimu and miro poles. There are, however, usually abundant seedling rimu and miro present with some seedling totara and kahikatea. On one burn, on a stream terrace of water-sorted gravel, there was found a dense pole stand of matai and kahikatea with two old *Cordyline*.

It has not been possible to distinguish stages in the succession not involving manuka and kanuka. Usually there is development of poor form podocarp poles, mainly kahikatea and totara, which have grown through hardwood scrub of kamahi, tawa, *Fuchsia excorticata*, *Pittosporum tenuifolium*, *Aristotelia serrata*, and *Nothopanax* spp.. In lower tiers there is a scattered patchy stocking of seedling and sapling kahikatea, rimu, totara, and matai. Cicada

damage is pronounced on kahikatea seedlings and saplings with many deaths due to breakage of leaders. This non-manuka sere occurs only on very restricted sites, however, and is of little importance. The rate of forest re-development is not faster than it is where manuka and kanuka enter the succession.

In all cases, it appears that the regeneration period is of the order of fifty years. At the end of this period there will have developed a hardwood association containing scattered podocarps of poor form whether the succession proceeds through manuka and kanuka to scrub hardwoods, or direct from fern to scrub hardwoods. Only in a few special instances will there be development of small dense podocarp pole stands.

With respect to growth rates sketchy evidence indicates a prospective growth rate, once the podocarp poles are emergent from the hardwood canopy, approximating 15 rings to 1 inch. Log lengths will be short. Diameter growth may be slower in the dense podocarp pole stands but with good log lengths.

Finally, it might be noted that kamahi apparently once played a far more significant part in the re-advance of the forest, but the part it plays today is negligible. Deer, present in the The Whaiti area for 35 years, have eliminated it as a species of the advancing forest edge.