



KAPITI ISLAND VEGETATION

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Department of Lands and Survey



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REPORT ON A VEGETATION SURVEY OF KAPITI ISLAND
1984/85

by
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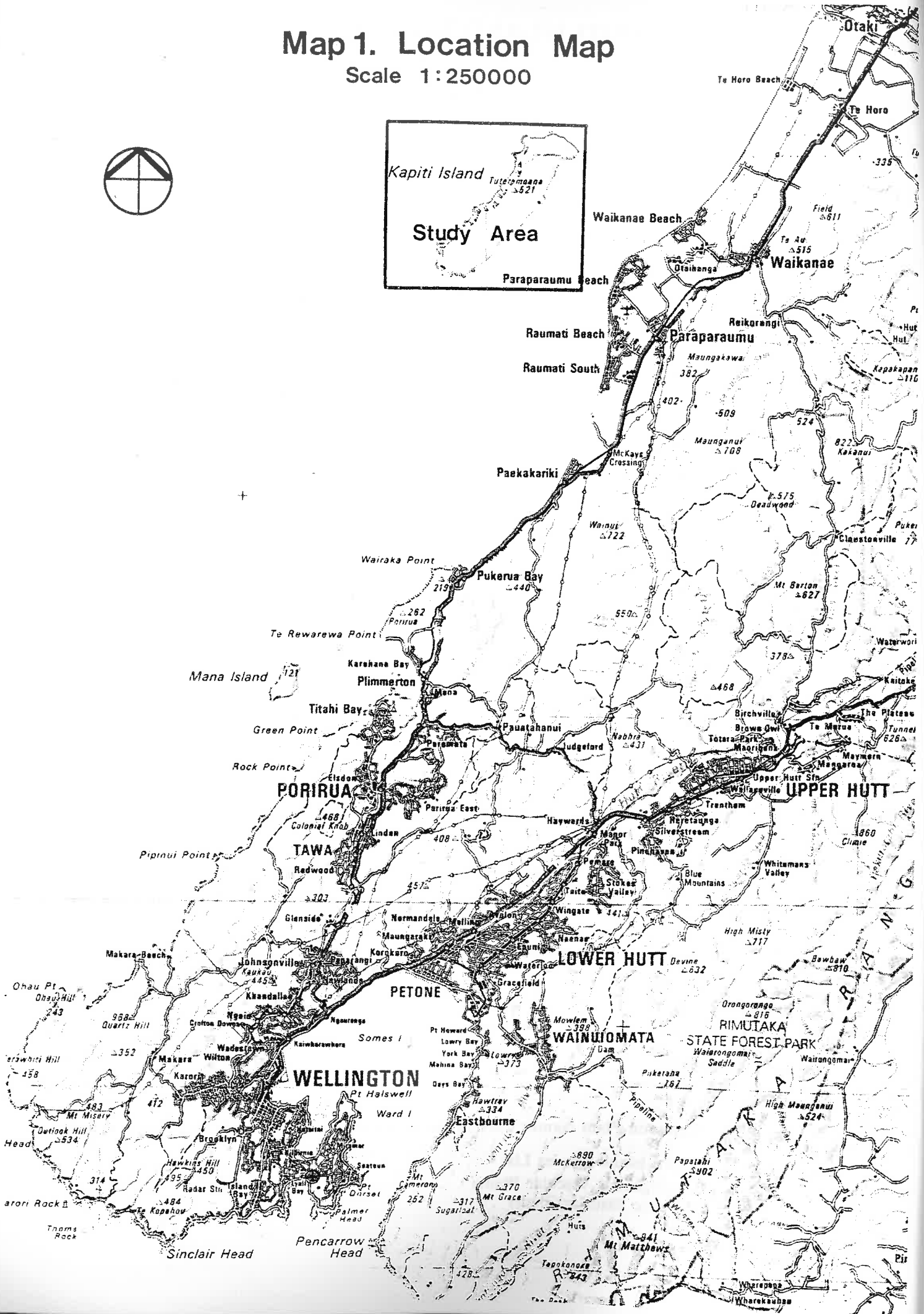
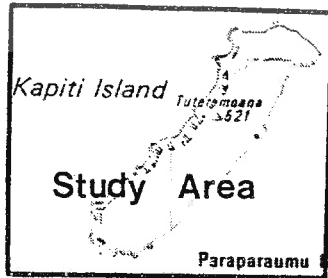
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Map 1. Location Map

Scale 1:250000



SUMMARY

This report contains some of the results of the vegetation survey of Kapiti Island Nature Reserve which was carried out in the summer of 1984/85. The principal objective of the survey was to produce a detailed vegetation map at a scale of 1:10 000. This map will be published separately by the Department of Lands and Survey at the reduced scale of 1:15 000.

Twenty vegetation types were mapped (Table 1) and described. These vegetation types can be grouped into 4 broad structural types: grassland and shrub-grassland 16%, flax-tussockland 3%, shrubland, scrub and low forest 53%, and forest 28%. Fivefinger scrub and low forest was the dominant vegetation type making up 25% of the island's total, followed by kanuka scrub and low forest 22%. The only other vegetation type contributing more than 10% to the total was kohekohe forest, 15%.

In the 20 years since Esler's 1964/65 survey, considerable changes have occurred in the vegetation, including: the almost complete replacement of manuka by kanuka, a reduction of grasslands and shrub-grasslands to less than half, and the succession of much of the high altitude seral forests to tawa forest. These and other changes will probably have widespread effects on the wildlife of the island. There will need to be some consideration of these changes in the future management of the island.

Some changes related to the intensive possum trapping programme initiated in 1980 are also noticeable. They include: the improved health of some forest canopies, an increased vigour of the flowering and fruiting of many species, and the reappearance of seedlings and saplings of those species worst affected by past possum browsing.

The western cliffs were mapped for the first time. The vegetation consisted almost entirely of various shrub-grasslands, shrublands and scrub.

Overall the vegetation of Kapiti is healthy, regeneration is good, and succession is progressing rapidly. To ensure that this trend continues, total eradication of possums is essential.

INTRODUCTION

Over the past year a number of factors have combined to make desirable the compilation of a large scale vegetation map of Kapiti Island.

Since the end of the trapping moratorium on possums in 1980, a vast network of tracks has been cut on the island to facilitate an intense trapping programme. The opportunity provided by these tracks for quick and easy access to all parts of the island, including the western cliffs, could not be ignored. They have allowed the draughting of an accurate vegetation map to a scale not previously possible.

With the subsequent removal of several tens of thousands of possums, the recovery of the vegetation is proceeding rapidly and regeneration is now continuing unhindered. Given the possibility of the eventual eradication of possums and the subsequent revival of a vegetation completely free from browsing animals, this survey will provide a baseline against which future workers can measure succession and forest development along a wide variety of pathways.

The western cliffs have not previously been surveyed or even described and there is some evidence that they were once vegetated in tall forest. With the removal of possums, the extent of regeneration on these coastal slopes is of considerable interest. Little time could be spent on the cliffs due to time constraints, but the main body of the cliffs has been mapped and some inferences about regeneration made.

Kapiti was last surveyed by A.E. Esler in the summer of 1964/65, exactly 20 years prior to this survey. This alone was an important factor in its initiation and one would hope that the survey will be repeated 20 years hence.

No space has been given to descriptions of Kapiti's climate, geology or history as these are covered in detail in the Kapiti Island Management Plan and in Esler's report (1967). The bulk of this report concentrates on individual catchment descriptions, as it was thought that this information would be most useful to future workers on the island, and to the Department of Lands and Survey who are responsible for managing Kapiti.

In addition to these descriptions, the vegetation types which have been mapped are briefly discussed. More work is needed on the data obtained from the survey before a comprehensive report on the vegetation types and successional developments can be written.

METHODS AND TERMINOLOGY

The vegetation map of Kapiti was drawn to a scale of 1:10 000 from stereophotographs (flight 3586, flown 20.10.72). Apparent vegetation types were drawn directly onto these photos and later transferred to a scale map, once they had been investigated and the boundaries confirmed in the field.

Quantitative information on the vegetation types was obtained by the use of transects. The form of transect used was a paced line where, at regularly spaced intervals, sample points of the canopy species were recorded together with other relevant details such as understorey, ground cover, canopy height, aspect, slope, exposure, regeneration and substrate. Transects were positioned with the aim of sampling as wide a variety of sites within each vegetation type as possible, and if variation occurred, further transects were made. The naming of vegetation types and the nomenclature used are based on Atkinson (1962).

The term *seral* is occasionally used in this report and was often used by Esler. Seral can be defined as a series of stages that follow one another in an ecological succession. In the case of Kapiti, they are the stages of regeneration of the island's forests from grassland. Early seral applies here to the fivefinger scrub and young forests which succeed pioneer communities, such as tauhinu shrublands and flax-tussocklands, which first invade the grassland. Late seral forest is more varied and contains an increasing number of species such as tawa, kohekohe, hinau and kamahi which will eventually form the canopies of the terminal forests.

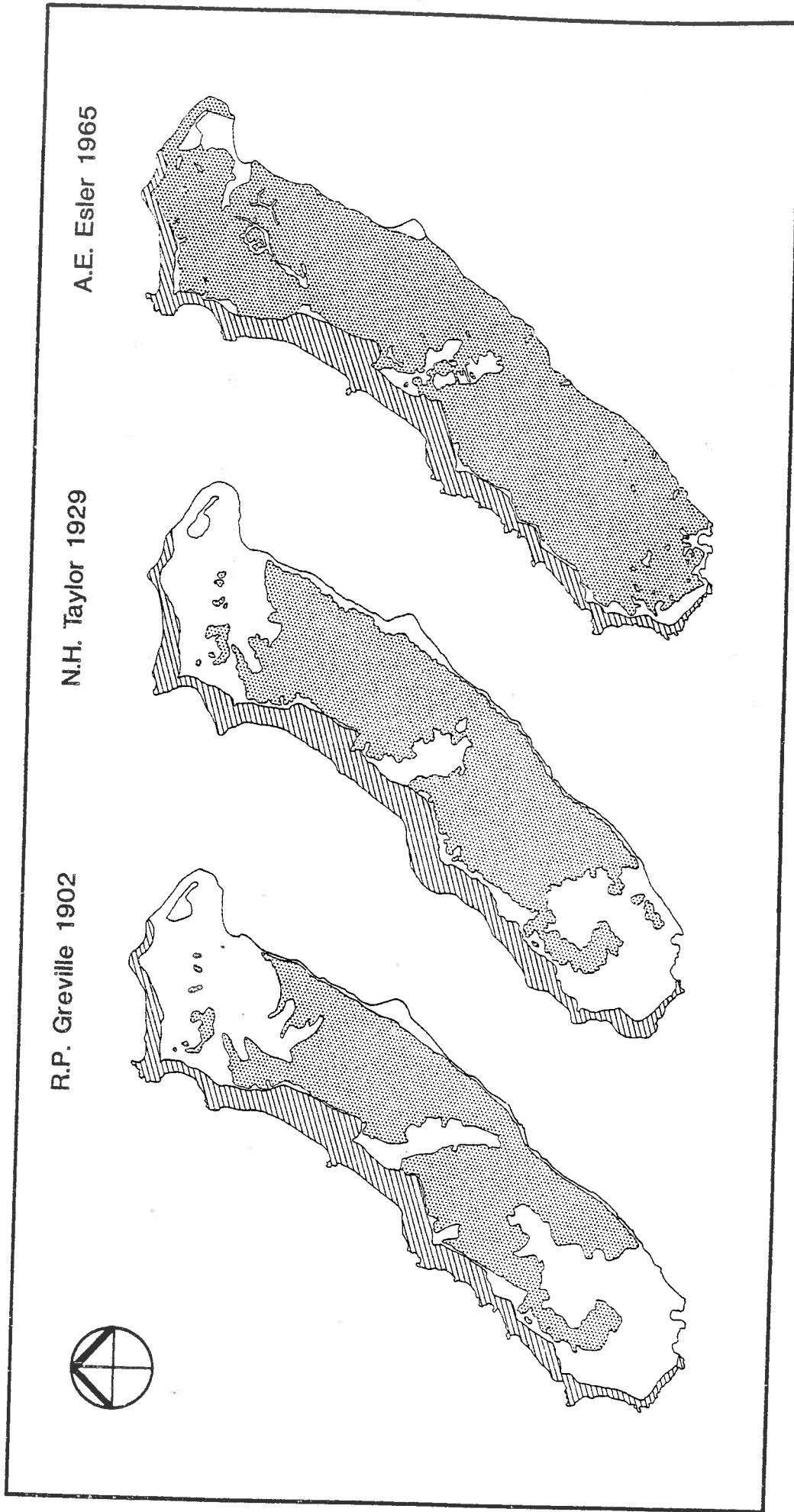
Time for the survey was limited. No ring counts were made, nor were permanent quadrats or transects established. Little time was given to the identification of plants other than those unknown plants recorded on transects, however, an unpublished list compiled by C.C. Ogle from all previously known species lists is given (Appendix I). It includes: planted species; species found on older lists which have probably been lost to fires or browsing; and exotic species. Common names have been used throughout this report where possible and they and their scientific equivalents are listed (Appendix 2).

For convenience and to avoid confusion, some abbreviations of place names and designations for geographical features have been made. Te Kahu-o-te-Rangi and Te Mimi-o-Rakopa have been abbreviated to Te Kahu and Te Mimi respectively. Kurukohatu refers to the whole of the flat surrounding the Okupe Lagoon. Trig-McKenzie refers to the area of unnamed streams immediately above Rangatira and between the Te Rere and Kahikatea catchments. The northern cliffs are those from Tokaiti Point to Arapawaiti Point ('Hole in the Rock'), and the western cliffs are those from Arapawaiti Point to Tareremango Point.

The southern cliffs carry vegetation continuous with that of the Wharekohu catchment and are included in the descriptions of the Wharekohu. Grasslands are named after the catchment they lie in. The grassland on the ridge between the Taepiro and Te Mimi carries a Seismometer Station and is therefore known as the Seismometer grass. The ridges which divide catchments are named after the catchment to their south.

It should be noted that some of the differences between the vegetation described here and that described by Esler, are due to the increased scale of mapping and not to actual changes in the vegetation. For example, it has been possible to separate Esler's broad category of shrublands into a wide variety of shrub-grasslands, shrublands and scrub. This does not mean that these vegetation types did not exist at the time of Esler's survey, but that they could not be separated at the scale used.

Map 2. Changes in the extent of grassland and shrub-grassland in the period from 1902 to 1965



VEGETATION

Table 1 (page 12) summarises the presence and area of the vegetation types found in each catchment, the total area of each vegetation type and its percentage of the island's total area. Twenty vegetation types have been separated and mapped. These range from pure grasslands, through a wide variety of shrublands and scrub, to several seral and terminal forest types.

1. Grasslands and Shrub-Grasslands (Map 2)

In 1902 when mapped by Greville, grassland and tauhinu dominated shrub-grasslands covered 50% of the island not including the cliffs. In 1929 when mapped by Taylor, these had decreased to 40% despite continued farming in most areas. When mapped by Esler in 1965 they had further diminished to 11% with the scaling down of farming on the island. Today only 5.5% of the island, not including the cliffs, remains in grassland or shrub-grassland. Shrub-grassland is the dominant vegetation type on the western cliffs and this makes up a further 10% of the island's vegetation.

1.1 GRASSLAND

Today less than 4% of the island's vegetation is pure grassland. Much of what remains is in the first stages of succession with the gradual encroachment of bracken and ring fern. Most grasslands are dominated by a variety of exotic pasture grasses, the most common being cocksfoot, sweet vernal, yorkshire fog, perennial rye grass, prairie grass and ripgut brome. However, some native grasses are locally dominant: meadow rice grass in coastal situations and on parts of the western cliffs; *Poa anceps* in the higher altitude grasslands; and silver tussock, on parts of the western cliffs, particularly at the exposed south end of the island. The largest areas of grassland are on Kurukohatu Peninsula, at Waiorua Bay, and in the Taepiro, where dense swards appear to be restricting regeneration of shrub species.

1.2 SHRUB-GRASSLANDS

In the shrub-grasslands described, grasses are the dominant growth form but shrubs are beginning to establish and make up 20-50% of the total cover. Five different shrub-grasslands have been mapped, the largest being the lupin-dominated shrub-grasslands found over much of the western cliffs. This type contains a variety of other shrubs, of which tauhinu, *Coprosma propinqua* and kowhai are all locally dominant. Relative canopy dominance in the shrub tier fluctuates seasonally with summer drought and insect damage, which both cause much foliage death. The grasses are a mixture of drought tolerant exotics and hardy natives.

The other shrub-grasslands are all small and localised. Tauhinu is a dominant shrub in areas of grassland on Kurukohatu Peninsula and in parts of the Wharekohu; the grasses are mainly pasture grasses; and other shrubs include *Coprosma propinqua*, fivefinger, karamu and manuka.

Coprosma propinqua is prominent in grasslands on the coastal boulder banks of Kurukohatu Peninsula and Rangatira Peninsula, and is invading the grasslands of the upper Taepiro. Meadow rice grass is dominant on the boulder banks and pasture grasses form dense swards in the Taepiro.

Finally, two shrub-grasslands, which perhaps may more correctly be called vinelands, are dominated by *Muehlenbeckia complexa* and *Muehlenbeckia australis*. *M. complexa* is common in all shrub-grasslands on Kurukohatu and Rangatira Peninsulas and the northern and western cliffs, but comes to dominate on the most exposed boulder banks and coastal scree in these sites. *M. australis* is found in one area of grassland in the centre of the western cliffs.

These five different associations are related to site differences such as exposure to wind and salt spray, moisture, substrate, and soil depth.

2. Wetlands

Kapiti probably once had reasonably large wetlands, although the exact extent is not known. These were drained and cleared during early settlement and now only tiny remnants remain. Today the best area of wetland is on Rangatira Flat, however, this has been artificially enlarged and maintained. Of the other areas, none have open water and all are dry during the summer. The usual vegetation of the wetlands is sedgeland dominated by *Cyperus ustulatus* and *Carex geminata* with bracken, toetoe, *Carex secta*, flax

and a variety of shrubs such as tree nettle, manuka, karamu and cabbage tree. Most of the island's present wetland vegetation has arisen in stream beds since clearing and farming and these areas will disappear as surrounding forests increase in height and cover.

There are less than 10 hectares of wetland on Kapiti.

3. Flax-Tussocklands

3.1 FLAX-TUSSOCKLANDS

Mountain flax is one of the hardiest native plants and on Kapiti is found in the coldest, wettest, windiest and most exposed sites. The largest area is on the southern cliffs of the Wharekohu where pure flax-tussocklands take the brunt of the southerlies. Other smaller areas are found on the south facing slopes at the heads of several catchments, and on rock outcrops and exposed slopes on the western cliffs. There are 32 hectares of pure flax, 1.6% of the total vegetation.

3.2 FLAX-DOMINATED SHRUB-TUSSOCKLANDS

Although mountain flax dominates in these areas, hardy shrubs such as tauhinu, *Pseudopanax anomalus*, akiraho, coastal tree daisy, fivefinger, mahoe, karamu, puka and mapou are slowly establishing. There is also much toetoe, bracken, vine rata, and a variety of grasses. This type of vegetation makes up 1.5% of the total vegetation.

4. Shrublands, Scrub and Low Forest

Fifty three percent of Kapiti's vegetation comprises the forms of shrubland, scrub and low forest described below. Of this proportion 90% is either kanuka scrub and low forest, or fivefinger-dominated scrub and low forest. The remaining 10% of this group is made up of a considerable variety of shrublands and scrub which have been combined into four broad types, 4.1 to 4.4.

4.1 COPROSMA PROPINQUA — MIXED BROADLEAVED SHRUBLANDS AND SCRUB

This is found on the western cliffs on dry unconsolidated slopes. Other shrubs include lupin, mahoe, kawakawa, fivefinger, tauhinu, coastal tree daisy and akiraho. There are abundant bare slips and scree areas of grassland, mainly exotic pasture grasses such as cocksfoot and sweet vernal. Seasonal drought and the unstable nature of the substrate are probably inhibiting regeneration on these slopes and it may be many years before more mature vegetation types appear.

4.2 MIXED SHRUBLANDS

These are young shrublands dominated by small woody shrubs and trees such as *Pseudopanax anomalus*, tauhinu, coastal tree daisy, kaikomako, *Hebe parviflora* and putaputaweta with much fivefinger and mahoe. There is also much grass often dominated by natives such as *Poa anceps*, *Scirpus nodosus*, hook grass, flax, and toetoe. Bracken, vine rata, bush lawyer and hard ferns form entanglements throughout. This is a short lived transitional vegetation type between grassland and fivefinger-dominated communities.

4.3 PSEUDOPANAX ANOMALUS — COPROSMA PROPINQUA SCRUB

This is a dense scrub type found only in the exposed upper Taepiro. Its density is probably due to both the wind and the hedging effect of constant possum browsing. This has meant that few other shrubs have been able to establish with the result that this type has remained virtually unchanged in composition and extent since Esler's survey of 1965. With the reduction in possum numbers, the canopy is beginning to open up and shrubs such as mahoe, fivefinger and mapou are appearing.

4.4 MANUKA SCRUB

When mapped by Esler in 1965, the northern quarter of the island was vegetated in manuka-dominated shrublands and scrub with kanuka co-dominant; approximately 15% of the island's vegetation. As manuka is both shorter lived and smaller than kanuka, kanuka has rapidly replaced it and today manuka only remains in those sites too dry or exposed for kanuka; the north western corner of the Waiorua and steep clay banks along the crest of the western cliffs. Manuka makes up only 1% of today's vegetation.

4.5 KANUKA SCRUB AND FOREST

Kanuka is present in a variety of forms from dense windswept scrub less than 2 m tall to magnificent forests in sheltered gullies up to 20 m tall. The majority of the kanuka on Kapiti is found within the Okupe, Waiorua, Te Kahu, Mangawharariki and Maraetakaroro catchments. Patches are found in most other catchments on dry ridge crests and on sheltered slopes. The trend of the kanuka forests is one of degeneration, either by natural mortality or as a result of storm damage. This trend will continue and may possibly accelerate as many of the young kanuka forests will mature together.

Kapiti contains the largest areas of kanuka forest and scrub reserved in the Wellington Region, except for areas reserved in Tongariro National Park. It is unfortunate that kanuka is so often thought of, and treated as a weed, as it forms tall attractive forests of considerable value as a wildlife habitat for birds, insects and lizards.

Twenty two percent of Kapiti's vegetation is presently composed of kanuka scrub and forest.

4.6 FIVEFINGER-DOMINATED SCRUB AND LOW FOREST

Almost all early paths of succession on Kapiti lead eventually to a fivefinger-dominated community. Undoubtedly the most ubiquitous species on the island, fivefinger is now the dominant vegetation type, with fivefinger scrub and low forest making up exactly 25% of the total vegetation. This percentage will increase as young shrublands and shrub-grasslands mature and as the kanuka forests continue to degenerate. Fivefinger communities are quite variable but two broad types have been separated: coastal scrub, which is distinguished by high proportions of hardy, salt tolerant species such as akiraho, broadleaf and lancewood; and the low forests and scrub of the majority of the island where fivefinger is more prevalent and has the associated species heketara, mahoe, lancewood, and kanuka in transition zones with kanuka forest. As these fivefinger forests mature they become more mixed, and forest species such as hinau, rewarewa, toro, tawa and kohekohe become more dominant. Gradually they will evolve into a climax forest, the exact type determined by site differences such as exposure, moisture, substrate and soil.

5. The Forests

All the forests on Kapiti are young, certainly no more than a century old in most cases. When described by Greville in 1902, the species which today are dominant had not yet begun to exert an influence. From these early forests, five main forest types have arisen: mahoe forest, kohekohe forest, tawa-hinau forest, kamahi-tawa forest and coastal karaka forest. These forests total 28% of the island's vegetation.

5.1 MAHOE FOREST

Mahoe forests are mostly confined to high altitude gullies within the cloud zone of the Te Rere, Kahikatea, Trig-McKenzie and Taepiro catchments. They have a number of associated species, in particular pigeonwood and the tree ferns mamaku and gully fern. Supplejack, bush lawyer and some kiekie form many entanglements. These forests appear to be restricted to areas outside the range of pukatea and kohekohe. This forest type makes up 2.8% of the island's vegetation.

5.2 TAWA-HINAU FOREST

This forest type is found mainly in the Te Rere, Trig-McKenzie and Kahikatea catchments. Esler mapped these catchments as mainly 'late seral species and some tawa'. Since then tawa has come to dominate and hinau, one of the first canopy trees to appear in young scrub and seral forest, has become co-dominant in many areas. Other common canopy species are toro, rewarewa and pukatea (in most large gullies), with matai, miro and rata locally common. Aside from the above catchments, small mixed stands dominated by tawa are present in most catchments on the island. Tawa-hinau forests account for a little over 9% of the island's vegetation. Some increase of this forest type can be expected.

5.3 KAMAHI-TAWA FOREST

This forest type is predominantly found within the cloud forest of the upper Te Rere and Kahikatea catchments where conditions are suitable for epiphytic growth. Occasionally saplings and small trees are found on dry ridge crests below open scrub canopies in the lower Te Rere and Trig-McKenzie, but very little kamahi occurs outside these three catchments. This is not a dominant forest type, representing only 1% of Kapiti's vegetation, but many tree ferns within the cloud forest carry seedlings and saplings of kamahi, and some increase within this zone is likely.

5.4 KOHEKOHE FOREST

Kohekohe forest is the most important vegetation type on Kapiti. On the mainland extensive tracts of this forest type were once present in coastal and lowland situations from North Cape to Nelson, but these forests were to a large extent cleared for farming. Many remaining stands are deteriorating due to possums. Today only isolated fragments of these past forests remain. The kohekohe forests on Kapiti are the largest remaining stands in the lower North Island and, with the reduction in possum numbers of the last five years, they have become some of the healthiest of all the remaining forests. As such Kapiti has become an important refuge for this forest type. The kohekohe forests of Kapiti total nearly 300 ha, the largest single stand being that in the Te Mimi and Kaiwharawhara catchments at approximately 170 ha. These forests are healthy and regenerating well. Kohekohe saplings and seedlings are now common beneath much of the scrub of the Maraetakaroro, Mangawharariki and Wharekohu, and this would suggest a considerable increase in the size of Kapiti's future kohekohe forests.

5.5 KARAKA FOREST

This is the smallest forest type, consisting of a number of tiny stands scattered along the eastern coast and totalling less than 7 ha. Seedlings and saplings of karaka are common along the coast and along some stream beds, and, as this is the most salt tolerant of the canopy trees, it can be expected to increase in these coastal areas as the existing scrub and seral forests mature.

6. Notes on Particular Species

6.1 NORTHERN RATA

Northern rata is perhaps the most conspicuous tree on Kapiti, but it is never present in sufficient quantity to map as a forest type. Almost every catchment contains a few rata, with the greatest concentration in the Te Rere, Trig-McKenzie and Kahikatea. Rata is usually emergent over the surrounding vegetation and is found in a wide variety of associations from kanuka to tawa, kamahi and kohekohe. Some rata regeneration is occurring within the cloud forest of the upper Kahikatea, and an increase of rata in this zone can be expected.

6.2 PODOCARPS

The only podocarps occurring naturally on Kapiti are miro and matai, matai perhaps being the more common of the two. Neither occur frequently, and stands of three or more trees are the exception rather than the rule. Seedlings and saplings are common in many areas, particularly beneath young scrub, and it seems likely that emergent podocarps will increase.

6.3 PUKATEA

Pukatea is common within most large gullies in the areas of older forest, particularly in the Te Rere, Kahikatea, Kaiwharawhara and Te Mimi. Because it is restricted to thin alluvial strips running up the gully floors, it could not be mapped at the scale used.

Pukatea will increase as young seral forests mature and may eventually form a virtual network along most suitable gullies on the island.



THE KAIWHARAWHARA. Looking south from the Te Mimi-Kaiwharawhara grass. (Map 3; spot height 364 m.) The slopes of the Kaiwharawhara centre, carry tall mature kohekohe forest. Over the periods that the possum population went unchecked large areas of this forest's canopy were completely defoliated. Today little sign remains of this.

The shrub-grassland, foreground, is dominated by exotic pasture grasses with abundant small leaved shrubs, mainly Coprosma propinqua and tauhinu. Toetoe and flax are also common.

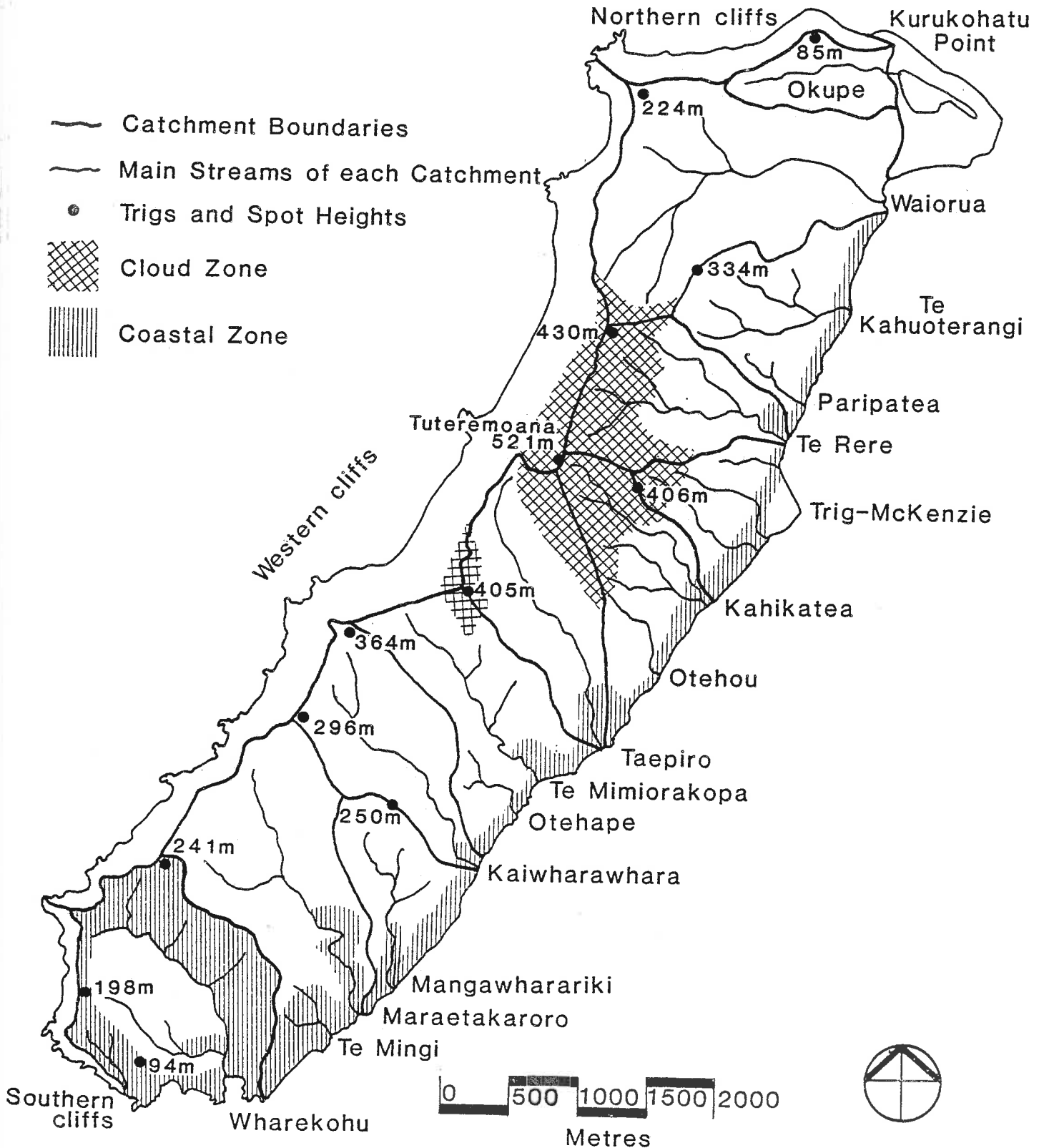
Table 1 — Area of each vegetation type in each catchment.
(Areas in hectares.)

	Grasslands, shrub-grasslands wetlands						
	grassland	wetland	Tauhinu shrub-grassland	Coprosma propinqua shrub-grassland	Lupin dominated shrub-grassland	Muehlenbeckia complexa shrub-grassland	Muehlenbeckia australis shrub-grassland
Kurukohatu Peninsula	18.9	0.2	8.9	9.2		6.7	
Okupe	0.6	0.8					
Waiorua	16	0.1	0.6				
Te Kahu — Paripatea	2.0						
Te Rere	0.5						
Trig — McKenzie	3.9	0.4		4.2			
Kahikatea — Otehou	0.6						
Taepiro	11			4.2			
Te Mimi — Otehape	4.5						
Kaiwharawhara	1.4	1.4		1.1			
Mangawharariki							
Maraetakaroro — Te Mingi	0.9	2.3					
Wharekohu	2.8	4.5	6.5				
Western Cliffs					192	6.7	1.4
TOTAL Area of each vegetation type	63	9.6	16	18.7	192	13.4	1.4
% of total area	3.2	0.5	0.8	1.0	9.9	0.7	0.1
TOTAL area of each structural type	314 ha						
% of total area	16%						
Structural types	Grasslands, shrub-grasslands, wetlands						

Areas over 20 ha have been rounded off.
The total area of Kapiti Island is 1965 hectares.
Okupe Lagoon is approximately 13 hectares

Flax Tussock		Shrublands, scrub, low forest						Forest					Total area of each catchment
flax tussockland	flax and shrubs shrub tussockland	Coprosma propinqua scrub	mixed shrubland	Pseudopanax anomalus scrub	Fivefinger scrub and forest	Kanuka scrub and forest	Manuka scrub	Mahoe forest	Tawa-hinaiu forest	Kamahitawa forest	Kohekohe forest	Karaka forest	
													44
					8.2	48							58
			2.2		77	106	15		15		21		253
	0.8				35	52			15		4.5	0.8	112
			0.8		11.5	12.6		26	68	4.4			124
					15	15.2		6.7	21	0.4	12.7		79
					20	10.7		9.0	32	11.8	32	2.2	118
1.2			12.3	11	45	12.4		8.2	6.2	0.8	20		132
	1.7		0.6		28	16.3			8.8		83	1.1	143
2.5			4.5		22	27			6.2		58		124
	0.8				26	43		4	5.6			1.7	81
0.9	7.9		1.4		78	72			2		37	0.6	203
19	9.4		9.2		125	9.3					16.6		203
8.7	9.5	47	0.8		3.4		5.1				1.1		275
32	30	47	32	11	494	425	20.1	54	180	17.4	286	6.4	1950 ha
1.6	1.5	2.4	1.6	0.6	25	22	1.0	2.8	9.2	0.9	15	0.3	100%
62 ha	1029 ha						544 ha					1950 ha	
3%	53%						28%					100%	
Flax	Shrublands, scrub, low forest						Forest						

Map 3. Catchment Map.



CATCHMENT DESCRIPTIONS

This section describes the general topography, vegetation, regeneration, and important plant associations found within each major stream system on Kapiti. The boundaries of each described catchment or group of catchments, are shown on Map 3.

There are two climatic factors which have considerable influence on the vegetation of Kapiti, and because they affect each catchment differently, they must be discussed before some of the vegetation patterns can be understood. They are the effect of cloud on high altitude forest and the effect of salt laden southerly gales on coastal and south facing vegetation.

The western cliffs rise to 521 m at their highest and are the first land barrier in the path of the prevailing north-westerly winds. These moist winds are forced to rise, and as a result, cloud often forms, generally at an altitude of about 400 m, enveloping the central part of the island (see Map 3). The forests in this zone are known as cloud or mist forests. In these forests there is an increase in precipitation due to condensation, even though there may be no increase in total rainfall. In addition, these forests receive fewer sunshine hours and are consistently colder than the forests below the zone. The catchments most affected by cloud factors are the Kahikatea, Te Rere, upper Taepiro and the Trig-McKenzie.

Southerly storms can and have caused considerable damage to the vegetation of Kapiti, firstly through direct wind damage, but perhaps more importantly, by the effect of wind-borne salt which burns foliage and can continue defoliating vegetation several months after a storm has passed. Coastal vegetation is consequently distinguished by a prevalence of hardy salt tolerant species. Such vegetation is present along the entire east coast of Kapiti up to an altitude of about 100 m, and sometimes extends half a kilometre or more up lower stream beds. The entire northern side of the Wharekohu catchment is essentially coastal in character, reflecting the impact of the southerlies.

The effect of southerlies, however, is not restricted to salt damage in coastal situations. South facing slopes of all catchments south of the Kahikatea have exposed areas where southerly gales affect the vegetation. In these sites wind suppresses regeneration — except of certain hardy species — thereby determining the paths of succession and influencing the development of future forests. The vegetation on the high northern slopes (south aspect) of the Taepiro shows this influence the most markedly, and in this area the effect has been compounded as the upper slopes lie within the cloud zone.

1. KURUKOHATU PENINSULA

General Description of the Area

- This is the largest area of flat ground on the island, totalling 44 ha.
- The peninsula has been built up over the centuries by longshore drift which has continuously deposited shingle and boulders at the northern extremity of the island.
- The most distinctive feature of the peninsula is a large shallow lagoon which was cut off from the sea as the peninsula grew. The lagoon is brackish and has little associated wetland vegetation, but it provides a habitat for a large number of waterfowl and waders.
- The southern half of the peninsula is criss-crossed by many boulder banks which are the remains of Maori kumara beds.
- The peninsula is very exposed, particularly to the north.

General Description of the Vegetation

- About half of the vegetation is grassland. Most of the grassland is dominated by exotic pasture grasses: cocksfoot, *Poa annua*, rye grass, prairie grass and others. Near the coast and on boulder banks, the native meadow rice grass, and occasionally *Poa anceps*, dominate.
- On the coastal boulder banks, particularly along the north of the peninsula, two shrub-grasslands dominate, *Muehlenbeckia complexa* in the most exposed sites and *Coprosma propinqua* further from the coast. These shrub-grasslands make up 36% of the peninsula's vegetation.

- Tauhinu is beginning to invade the main grasslands and tauhinu shrub-grassland has increased noticeably since Esler's map of 1965. It makes up the remaining 20% of the vegetation.

Succession

- Succession is proceeding slowly. Because of the peninsula's exposure only the hardiest shrubs are establishing.
- No clear cut predictions can be made about future vegetation. A number of species such as kowhai, karaka, kohekohe and ngaio could establish.

Interesting Plants or Vegetation Types

- Tauhinu is one of the first native shrubs to establish in grassland and it does so with vigour. It is, however, small and short lived, briefly providing a nursery for larger species, and then disappearing. On his map of 1902, Greville noted that shrubs of tauhinu were common and often dominant in virtually all the pasture on the island, i.e., up to 50% of Kapiti's vegetation used to be tauhinu dominated shrub-grassland (see Map 2). Today, the largest remaining area of tauhinu is 8.9 ha on Kurukohatu Peninsula and the total amount of tauhinu shrub-grassland on Kapiti is only 16 ha or 0.8% of the island's vegetation.

2. OKUPE

General Description of the Catchment

- This is the northernmost catchment on Kapiti.
- It is sheltered from southerlies but exposed to the north.
- The valley floor descends evenly from the headwaters to Okupe Lagoon into which the stream feeds.
- The soils of this catchment have been considerably added to by windblown sand, the only catchment where this has occurred to any extent. The resulting dry acid soils (pH 5.0 — 6.3) appear to have had an affect on the vegetation.

General Description of the Vegetation

- 83% of the vegetation is kanuka. On exposed ridges the kanuka forms dense scrub, often containing some manuka. In sheltered gullies the kanuka forms 10 m tall forests. The canopy is usually dense and the understorey is correspondingly sparse, mainly the small-leaved divaricating shrub *Coprosma rhamnoides* and shrubs of akiraho and fivefinger. The ground cover is also sparse and dominated by *Carex testacea* with some hook grass and ferns.
- Fivefinger scrub runs up the floor of several side gullies. Aside from this there is little variation.
- Where the stream meets Okupe Lagoon, there is a strip of wetland which extends 200 m up the valley floor. It consists mainly of *Cyperus ustulatus* and *Carex geminata* with bracken, toetoe and scattered shrubs. It is dry for most of the summer months.

Succession

- The kanuka scrub in this valley is young and, as the valley is quite sheltered, it can be expected to persist for some time.
- No prediction can be made at present as to the potential forest, as few seedlings or saplings of canopy trees are present.

Interesting Plants or Vegetation Types

- Although the wetland at the mouth of the stream is small and floristically poor, the scarcity of wetland on Kapiti makes all remaining areas of value.



KURUKOHATU PENINSULA. Looking north-east. (Map 3; north of spot height 334 m.) Kurukohatu Peninsula is the largest area of flat land on Kapiti and also carries the largest remaining area of grassland. Tauhinu is spreading onto the peninsula from the hill slopes, centre, and Coprosma propinqua forms a dense shrubland with tauhinu and Muehlenbeckia complexa on the boulder banks along the exposed northern edge of the peninsula. Okupe Lagoon can be seen as a thin strip top centre. The slopes of the lower Waiorua, foreground, are vegetated in dense kanuka scrub and forest.

- The sandy nature of the soil is probably responsible for the prevalence of *Coprosma rhamnoides* in the understorey and *Carex testacea* on the floor of the forests. This is the only catchment where these two species are common.

3. WAIORUA

General Description of the Catchment

- The Waiorua is the largest catchment on the island totalling 253 ha.
- There are no gorges or waterfalls except in some of the small side streams. The main stream descends evenly from the western cliffs to the shore, and the lower half of the catchment has a wide valley floor which makes a pleasant walk.
- There is a large area of rank grassland at the stream mouth. This is the site of past settlements, Maori pa, whaling stations, and more recently, a privately owned farm.
- The remains of Maori house sites are common on spurs and ridges throughout the catchment, but have been considerably disturbed by many decades of clearing and grazing.
- This is a dry sheltered catchment.

General Description of the Vegetation

- When mapped by Esler in 1965, over two-thirds of the Waiorua was vegetated in 'manuka and kanuka'. Today the manuka has all but disappeared, except in the exposed north-western corner of the catchment, and kanuka has generally replaced it.
- Overall, the extent of leptospermum scrub has been reduced. Today a little less than half of the catchment is vegetated in kanuka or manuka. There has been a corresponding increase of fivefinger scrub and low forest.
- Forests make up about 14% of the vegetation in the Waiorua. The southern branches of the catchment contain quite old stands of kohekohe forest in areas described by Greville in 1902 as 'mixed scrub of kohekohe, mahoe, fuchsia and manuka'. No fuchsia or manuka remain.
- There are also a number of small stands of mixed tawa-hinau forest which are young with abundant seral species such as heketara, lancewood, fivefinger and mahoe. There are some big, old trees also present, mainly pukatea, hinau and kohekohe.
- There are perhaps half a dozen young rata in the catchment.

Succession

- Succession from kanuka to fivefinger is progressing rapidly in some areas possibly enhanced by the effect of storms. In other areas, mainly sheltered north-facing slopes, kanuka is still dense and will persist.
- Saplings of kohekohe are present in many gullies, particularly around the area of kohekohe forest in the southern branch of the Waiorua. Similarly, hinau and tawa saplings along with rewarewa, maire, toro and matai, are present around the small tawa stands. Which of the species will dominate cannot be predicted.

Interesting Plants or Vegetation Types

- The most dramatic vegetation change which has occurred on Kapiti since Esler's 1965 survey is the almost complete replacement of manuka-dominated shrublands by kanuka, in the Waiorua and Okupe.
- The kanuka forests on Kapiti, and particularly those in the Waiorua which are now by far the largest, are tall and attractive, usually with dense healthy understoreys. They provide habitats for a wide variety of bird species.

4. TE KAHU — PARIPATEA

General Description of Catchment

- These are two small catchments which are surrounded to the north and west by the Waiorua and to the south by the Te Rere.
- Both fall fairly steeply from their headwaters to the sea and the Paripatea in particular becomes quite gorgy near its mouth. The Te Kahu has a number of small waterfalls along its length.
- They are relatively sheltered except for the highest ridge crests.

General Description of Vegetation

- Over 50% of the vegetation is kanuka-dominated, often forming quite tall forests, but shorter on exposed ridges.
- 30% is fivefinger scrub which is found mainly on the upper slopes of the Te Kahu and on exposed south facing slopes.
- The remainder of the forest is a very mixed tawa-hinau forest which forms narrow strips up the main stream beds. These forests contain pukatea, kohekohe, toro, karaka, rata, kamahi, lancewood and mahoe, in varying proportions.
- There are a large number of rata scattered up the Te Kahu, particularly in the south branch. The rata are present in both the tawa-hinau forest of the valley floors and in the kanuka forests of the slopes immediately above. Most rata are young, but some very large older trees are present.

Succession

- Eventually, the kanuka forests will give way to fivefinger-dominated forests. Succession beyond that is unclear.
- The mixed tawa-dominated forests within the main gullies will act as the main seed source, however, a considerable variety of tree species are present, and saplings of most of them can already be found beneath the kanuka and fivefinger forests nearby.

5. TE RERE

General Description of the Catchment

- This is a steep, highly dissected catchment. The main stream branches many times and the headwaters of the catchment extend for a kilometre along the highest part of the island.
- The upper third of the catchment lies within the cloud zone, though most of the catchment is probably affected by the increased cloud cover.
- The streams, although steep, descend evenly from their headwaters to the sea, with few waterfalls or gorges. There is a short section of gorge just above the stream mouth.
- The Te Rere is sheltered to the south by the high ridges of the Kahikatea and Trig-McKenzie. The only areas which are directly exposed to southerlies are on the northern slopes of the lower gorge.

General Description of the Vegetation

- 55% of the vegetation is tawa-dominated forest, ranging from stands of pure pole tawa to mixed and more mature forests with much hinau, toro and rewarewa. Most of these forests are young and there is still much heketara, lancewood, pigeonwood, and mahoe remaining from the earlier seral forests. Older stands are present on some high ridges in the decaying remains of past rata forests. Occasionally in these sites kamahi occurs, forming a kamahi-tawa forest. These stands are small, making up less than 4% of the total vegetation.

- Mahoe gully forest makes up a further 20% of the vegetation, and is the largest area of this forest type on the island.
- The remaining vegetation is made up of small scattered stands of fivefinger and kanuka forests and scrub; each making up another 10% of the total.
- Pukatea forms many pure stands beside the main stream beds and scattered trees are found along most other streams and gullies.
- Northern rata is a common emergent in many parts of the catchment, particularly in the upper cloud forest, but it is rarely found in stands of more than half a dozen.

Succession

- As the tawa forests mature, some trees which are now common in the canopy will be overtaken, and will either die or become part of the sub-canopy. Seral species such as heketara, lancewood, and fivefinger will diminish. Pigeonwood, toro, and mahoe will probably remain in the sub-canopy. Hinau may or may not remain co-dominant in the canopy.
- It is possible that there will be a gradual increase of miro and matai in some areas. Scattered trees are already present and seedlings are common in some areas.
- Rata may also increase in the cloud zone.

Interesting Plants or Vegetation Types

- The Te Rere contains the largest area of tawa forest on the island.
- It also contains a large amount of northern rata.

6. TRIG-McKENZIE

General Description of the Catchment

- This catchment consists of three unnamed streams. It lies between the Te Rere and Kahikatea catchments and is bounded by the trig and the McKenzie tracks.
- The streams are steep and rocky and have many waterfalls, particularly at their lower ends.
- The lower slopes and ridges of this area are exposed to the south. The upper catchment is quite sheltered.
- The upper quarter of the catchment lies within the cloud zone and the vegetation is appropriately affected.
- This area also includes Rangatira Peninsula, the second largest area of flat ground on the island and the site of the ranger's residence.

General Description of the Vegetation

- The largest vegetation type is tawa-hinau forest which makes up about 27% of the vegetation. Some of these forests are mature, but mostly they are young with many late seral species present, as in the Te Rere.
- Mahoe forests are present in most of the gullies in the upper end of the catchment, and amount to about 9% of the vegetation.
- The rest of the vegetation is made up of roughly equal proportions of: kanuka — mostly on lower ridges; fivefinger — on the coastal slopes and around Rangatira; and kohekohe — in the rocky gullies and coastal screes at the lower end of the catchment. Each makes up 16-18% of the vegetation.
- Rangatira Peninsula is vegetated mainly in grassland and *Coprosma propinqua*-dominated shrub-grasslands. It also contains a small area of wetland.

- This catchment contains a high proportion of rata, ranging from large isolated trees to small stands of younger trees.

Succession

- The upper quarter of the catchment is affected by the higher effective precipitation of the cloud zone and tawa will continue to dominate with perhaps an increase of kamahi and rata. Seedlings of both species were seen on tree ferns in the area.
- The lower portion is steep and exposed with many scree and kohekohe will probably increase here.

Interesting Plants or Vegetation Types

- Perhaps the best stand of northern rata on the island is found in this catchment. About 40 young healthy trees occupy a small basin at the exact centre of the area.
- The small area of wetland on Rangatira Peninsula is the best on the island. It is, however, artificially enlarged and maintained.

7. KAHIKATEA — OTEHOU

General Description of the Catchment

- The Kahikatea has its headwaters at Tuteremoana trig, the highest point on the island, and descends from this altitude of 521 m to the sea in a little less than 1.5 km — an average fall of 1 in 3.
- It is a steep highly dissected catchment with deep gullies and long steep sided spurs which separate the many branches of the stream.
- The streams of the lower half of the catchment descend in many waterfalls and gorges. Those of the upper half are somewhat more gentle.
- The upper half of the Kahikatea catchment lies within the cloud zone and this has influenced the vegetation considerably, perhaps more than any other catchment.
- The Otehou is a small catchment to the south of the Kahikatea and is steep and rocky. It lies below the cloud zone.

General Description of the Vegetation

- Tawa is the main forest tree in the Kahikatea, but is found in two different associations: tawa-hinau forest and kamahi-tawa forest. They are relatively young forests.
- The tawa-hinau forest is similar to that of the Te Rere with similar associated species. It comprises 27% of the vegetation of the Kahikatea.
- The kamahi-tawa forest is forest of the cloud zone. The kamahi appears to have seeded epiphytically on dead rata stumps and logs subsequent to fire. The higher moisture levels of the cloud zone are necessary for kamahi to establish epiphytically. This forest type makes up about 11% of the vegetation.
- Like the Te Rere there are also large areas of mahoe gully forest which make up a further 7% of the vegetation.
- Kanuka and fivefinger make up another 25% of the vegetation mainly on the lower slopes of the area. The fivefinger is mostly in the form of coastal scrub. Kanuka is present as both dense scrub on exposed ridges and tall forest on sheltered slopes and spurs within the Kahikatea.
- The forests of the Otehou are predominantly kohekohe, the final 27% of the vegetation.
- The Kahikatea contains the highest proportions of northern rata on the island with a number of stands of young trees and many large old trees.

Succession

- As the tawa-hinau and kamahi-tawa forests mature there will be a continued reduction in the seral species such as heketara, mahoe, lancewood, which are still present from the early seral forests.
- At the lower end of the catchment where fivefinger and kanuka are present, kohekohe will probably come to dominate, as these slopes are dry, often with rock and scree, and are exposed to the south.
- It is possible that northern rata will increase within the cloud forest zone as epiphytic saplings are present in many areas.

Interesting Plants or Vegetation Types

- Over the past couple of years or so, there has been a notable increase of seedlings and saplings of species such as wineberry, fuchsia, toro, and *Pseudopanax edgerleyi*. This is almost certainly due to a reduction in possum numbers.
- Large numbers of tree fern within gullies of the cloud zone carry young epiphytic rata. This is the only catchment where there is significant regeneration of northern rata.

8. TAEPIRO

General Description of the Catchment

- This valley lies exactly halfway down the island and it visually and topographically divides the island in two. To the north are the high steep ridges and deep gullies of the Kahikatea and Te Rere, to the south are the broad valleys and basins of the Te Mimi and Kaiwharawhara.
- The northern slopes of the Taepiro are correspondingly high and steep, standing up to 100 m above the gentler slopes on the south side of the valley.
- The northern slopes extend well into the cloud zone, are directly exposed to the south, and receive little sun over the winter months due to their orientation. These factors have had a major affect on the vegetation.
- The lower quarter of the stream descends in a series of small waterfalls and gorges to the sea.

General Description of the Vegetation

- In 1902, the upper two-thirds of the valley was in grassland, described by Greville as the best pasture on the island. Farming ceased by 1930 and from then till 1965, grassland diminished to approximately 30% (see Map 2). This has been reduced further and today about 10% of the catchment remains in grassland and shrub-grassland.
- Fivefinger is now the dominant vegetation type, making up 35% of the total.
- Another 27% of the vegetation is made up of a number of small stands of forest. The most extensive is young kohekohe forest in rocky gullies at the lower end of the catchment and extending over the ridge from the Te Mimi. There is also some mahoe forest in the gullies within the cloud zone, and a number of small tawa stands scattered through the valley.
- The remaining 27% of the vegetation is made up of kanuka scrub, on sheltered north-facing slopes, and shrublands and scrub which are dominated by two hardy divaricating shrubs, *Pseudopanax anomalus* and *Coprosma propinqua*. These two species combine to form dense scrub on the most exposed slopes at the head of the valley and are both common in the mixed shrublands of less exposed areas.
- Flax is also beginning to spread into the remaining grasslands at the head of the valley.

Succession

- Succession in the grasslands is proceeding steadily. Most of the grassland remaining is on exposed ridges, and at the head of the valley, where the adverse climate and dense grass sward are inhibiting regeneration of other species. Flax, *Coprosma propinqua* and *Pseudopanax anomalus* are the first species appearing.

- Small stands of kohekohe, tawa, and kamahi are present in this catchment, and it is likely that each will come to dominate in some part of the valley. Kohekohe will increase at the lower end of the catchment where it is already abundant.

Interesting Plants or Vegetation Types

- Within the cloud forest zone on the high south facing slope, there is considerable regeneration of fuchsia and wineberry.
- The dense *Pseudopanax anomalus* — *Coprosma propinqua* scrub at the head of the valley is present only in this valley. Its density has hindered further succession and it has remained relatively unchanged since Esler's survey of 1965. Similar vegetation was also described at the head of the Taepiro by Cockayne in 1907. It seems this vegetation type has been a feature of the Taepiro for some time.

9. TE MIMI AND OTEHAPE

General Description of the Catchment

- The upper two-thirds of the Te Mimi forms a long, steep-sided basin. The floor of the basin is at an altitude of about 200 m.
- The lower one-third drops in a series of deep gorges and small waterfalls to the sea.
- The Te Mimi is sheltered except for the lower gorge and the upper north-western corner of the catchment.
- The Otehape is a small stream which drops steeply to the sea. It is completely sheltered from the south.

General Description of the Vegetation

- 80% of the vegetation is kohekohe forest. The remainder is fivefinger scrub, kanuka scrub and forest, and tawa forest.
- The kohekohe forests are mainly young but with some older trees in gullies. Pukatea is common along the main stream and up the larger side creeks.
- There are a number of small stands of pure tawa on ridge crests at the head of the Te Mimi. The tawa is growing on the deep organic remains of past forests, very similar to the areas in the Kahikatea and Te Rere where kamahi is common. There is also a stand of pole tawa on sheltered slopes in the Otehape.
- Stumps and logs of rata and podocarps are abundant throughout the area. However, there are probably less than a dozen living rata, mostly young trees growing in the seral forest at the lower end of the catchment.
- The kohekohe forests are very healthy and have dense understoreys, good floor cover, and are flowering prolifically.

Succession

- Kohekohe will eventually spread to cover the whole catchment.
- Some increase of tawa in the kohekohe canopy is likely, as well as other species such as miro, matai, and pukatea. Seedlings and saplings of these species are present throughout.
- Flowering and fruiting of the kohekohe is prolific and regeneration is good.

Interesting Plants or Vegetation Types

- The kohekohe forest of the Te Mimi, in combination with smaller areas continuous with it in the Kaiwharawhara and Maraetakaroro, forms one of the largest remaining pure kohekohe forests in New Zealand. (Refer to Vegetation 5.4.)

10. KAIWHARAWHARA

General Description of the Catchment

- The upper two-thirds of this catchment forms a large basin which curves to the north in a sickle shape. The floor of the basin is at an altitude of approximately 180 m.
- The lower one-third drops in an impassable gorge to the sea. The gorge is called Te-Ano-o-Kahukura.
- The valley is relatively sheltered except for the lower gorge and the slopes of the north-western corner.
- There is a small area of swamp at the lower end of the basin.

General Description of the Vegetation

- Kohekohe forests are the main vegetation type making up about 50% of the total. These forests, particularly stands within the gullies of the northern slopes, are perhaps the oldest forests on the island. Pukatea is common in these gullies and tawa also occurs locally.
- The rest of the vegetation is predominantly kanuka scrub or fivefinger scrub, each contributing about 20% to the total vegetation. The kanuka is found mainly on the sheltered north facing slopes of the lower half of the valley. Fivefinger is present throughout, forming coastal associations in the lower gorge.
- The exposed north-western corner of the catchment is vegetated in small areas of dense flax and open shrublands. At the very head of the valley is 6 ha of grassland.
- The small area of wetland in the valley floor is dominated by sedges but has many shrubs and saplings.
- There are two stands of young rata within the kanuka forests at the lower end of the valley.

Succession

- Kohekohe will probably increase to cover the whole catchment.
- There may be an increase of species such as tawa, matai, and miro within the kohekohe forests.
- The wetland area has many seedlings and saplings of pukatea and this species may eventually form a small pukatea-dominated swamp forest.
- There are a number of kahikatea and rimu saplings planted near the area of wetland. It will be of interest to follow any spread of the species as they are not found naturally on the island (see native flora).
- Flowering and fruiting of kohekohe is prolific and the understorey dense and healthy.

Interesting Plants or Vegetation Types

- This catchment contains what I believe to be the oldest forests on the island. The fact that they are kohekohe forests adds to their importance (see vegetation descriptions).
- If the wetland regenerates to a swamp forest it will be the only area of swamp forest on the island.

11. MANAGAWHARARIKI

General Description of the Catchment

- This catchment is very similar to the Te Kahu both in its size and topography, and in the pattern of vegetation.
- It is bounded to the north by the Kaiwharawhara and to the south by the Maraetakaroro.
- The stream descends evenly from the headwaters to the sea with only a small area of gorge in the lower section.

- The catchment contains the best preserved and most abundant remains of Maori house sites on the island.
- The stream runs north to south and so is quite exposed to southerlies, particularly in the lower third.

General Description of the Vegetation

- The vegetation is predominantly kanuka, 53%, with fivefinger scrub making up a further 32%. The remainder is made up of young mixed tawa forests and mahoe gully forests which run up many stream beds.
- The fivefinger scrub in the lower third of the catchment has a large amount of akiraho, lancewood and puka. The kanuka scrub in this area is dense and windswept, and in places contains small proportions of manuka.
- There are about half a dozen young rata scattered through the upper part of this catchment, the southernmost rata on the island.

Succession

- The main canopy tree which is appearing within the kanuka forest and scrub of the upper catchment is hinau. There are already small stands of pole hinau on some ridge crests.
- Saplings of both tawa and kohekohe are also present in some areas. It is unclear which of these species will come to dominate.

Interesting Plants or Vegetation Types

- The native broom, *Carmichaelia arborea* var., is curiously prevalent in the understorey of kanuka forests on several of the ridges in this catchment. It was only seen in a few other areas on the island — a small population beneath kanuka scrub in a side stream of the Waiorua and occasional shrubs in the shrublands of the Taepiro. The reason for the prevalence of broom in the Mangawharariki is unclear.

12. MARAETAKARORO — TE MINGI

General Description of the Catchment

- The Maraetakaroro is the second largest catchment on the island, and is very similar to the Waiorua in both vegetation and topography.
- The stream descends evenly from the western cliffs to the sea with no gorges or waterfalls. There are small gorges, however, in several side streams.
- The valley floor is flat, and in places, reasonably broad.
- A thin strip of wetland runs almost continuously along the valley floor of the central third of the stream.
- The lower third of the catchment and the south facing slopes of the northern branch of the catchment are quite exposed.
- The Te Mingi is a small stream to the immediate south of the Maraetakaroro. It is steep and rocky with many gorges and waterfalls. It is directly exposed to the south.

General Description of the Vegetation

- Kanuka and fivefinger each make up 40% of the vegetation.
- The fivefinger forms a dense, mixed coastal scrub in the Te Mingi and the lower third of the Maraetakaroro. In the sheltered south branch of the catchment it forms almost pure scrub and forest.
- Most of the kanuka is dense and windswept except in sheltered gullies on the north facing slopes.

- Kohekohe makes up about 18% of the vegetation. The streams and slopes of the northern corner of the catchment are steep and rocky and some good stands of kohekohe are present here. A large stand of kohekohe is also present in the south branch of the Maraetakaroro and a number of small stands occur in the Te Mingi.
- The wetland in the valley floor is dominated by sedges similar to most wetlands on the island.
- The remainder of the vegetation consists of flax-dominated shrub-tussocklands at the head of the valley's northern branch.

Succession

- Seedlings of kohekohe are common in many areas of both catchments, and it seems likely that kohekohe will eventually dominate most of the area.
- As the forests on either side of the valley floor mature, they will shade out the wetland vegetation. There are few areas where the stream bed is wide enough to ensure that some wetland survives.
- The kanuka scrub is still young and will persist for a time, particularly on the sheltered north-facing slopes.

13. WHAREKOHU

General Description of the Catchment

- This is the southernmost catchment on Kapiti and the most exposed.
- The high northern slopes stand virtually unprotected from the south.
- The main stream descends evenly from the cliffs to the sea, however, side streams, particularly on the steep northern slopes, are often gorgy.
- There is a small alluvial terrace at Wharekohu Bay at the mouth of the stream. This terrace has a large area of wetland which continues up the north branch of the stream for half its length.
- The Wharekohu includes a number of small truncated streams which end at the southern cliffs. The southern cliffs are sheer, weather worn bluffs and rock outcrops directly exposed to the south.

General Description of the Vegetation

- Fivefinger scrub and forest is the dominant vegetation making up 61% of the total. There are about equal amounts of five finger forest, on sheltered slopes in the centre of the catchment, and coastal fivefinger scrub which extends the full length of the northern slopes.
- Flax and flax-dominated shrub-tussocklands are the next largest vegetation types, totalling about 14%. They are found on the southern cliffs and the slopes directly above the cliffs.
- Kohekohe is the last important vegetation type. It is found in the steep rocky gullies of the northern slopes, and makes up another 8%.
- The remainder of the vegetation is mixed shrublands and shrub-grasslands, and there are a number of small pockets of kanuka scattered throughout the catchment on sheltered north-facing slopes. The main grasses along the crest of the cliffs are natives such as silver tussock, plus the sedge *Scirpus nodosus*.
- The wetland in Wharekohu Bay is similar to most of the other wetlands on the island, dominated by sedges and with many shrubs.

Succession

- In many areas of the catchment, kohekohe seedlings are common, and this species should spread over most of the catchment. There are no areas of tawa and very few trees or saplings of other species such as hinau, toro, pukatea, matai, and miro.

- Karaka occurs regularly within the kohekohe forest of the northern slopes, and this tree should also increase.
- The fivefinger scrub is in most places dense, and will probably persist for some time.
- The wetland in the main stream bed will diminish as surrounding forest matures. The wetland in Wharekohu Bay should remain at least in part.

Interesting Plants or Vegetation Types

- The wetland at Wharekohu Bay is large and should remain while other wetlands on the island diminish.
- Spotless crane, a rare waterfowl, has been heard at least once in the wetland of the bay.
- The flax-tussocklands, which dominate on the southern cliffs, seem to be an important nectar source for many bird species, and tuis and bellbirds in particular flock to this area in large numbers over summer.



*WHAREKOHU BAY. The photo is taken from the northern slopes looking west across the wetland at the mouth of Wharekohu stream. This wetland is the largest on the island. It is composed of a dense sedgeland of *Cyperus ustulatus* with toetoe, flax and abundant shrubs. The slopes above are vegetated in dense, pure fivefinger scrub. The bay lies to the left, just outside the frame of the photo. The hut, left centre, is the base of possum trapping at the south end. The high point, top right, is Tareremango, map 3 height 198 m.*

14. THE NORTHERN AND WESTERN CLIFFS

General Topography

- The cliffs are steep unconsolidated slopes which extend for most of the length of the northern and western coastlines. The soils are thin and stony and broken by many outcrops of rock. Screes and slips are abundant. The slope varies between 35 and 45 degrees with some bluffs and outcrops of rock approaching vertical.
- The highest area of cliffs is that between the Te Rere grass and the Taepiro grass. The slope of this area is the most gentle, generally around 35 degrees, and it carries the main area of scrub and bush on the cliffs. The upper 50-100 m of this section lies within the cloud zone.
- The cliffs are steepest south of the Taepiro grass with more exposed rock and less vegetation.
- The beaches at the base of the cliffs are made up of gravel and boulders and are interrupted regularly by rock outcrops which extend into the sea.
- The cliffs are remarkably sheltered in all but the strongest winds. They are very dry throughout summer and can become dangerously unstable after heavy rain.

General Description of the Vegetation

- The main vegetation of the cliffs is a mixed shrub-grassland, generally dominated by lupin, making up 70% of the total. Other shrubs are locally common and include *Coprosma propinqua*, tauhinu, kowhai, coastal tree daisy, and manuka. *Muehlenbeckia complexa* is also common particularly on the lower slopes where it sometimes forms its own shrub-grassland association. Another common plant is the creeping herb native spinach. Like *M. complexa* it forms large entanglements, spreading through grasslands and sprawling over low shrubs. The grasses are mainly exotic pasture grasses, however, meadow rice grass is common in places, particularly at the northern end. Silver tussock dominates at the exposed south end.
- The second most extensive vegetation type is *Coprosma propinqua*-dominated scrub, a mixed type with many other species such as akiraho, tauhinu, mahoe, kawakawa, mapou and fivefinger. It makes up 17%.
- Flax occurs on rock outcrops throughout, but is most common on the bluffs below the trig which lie within the cloud zone.
- A small area of mixed seral forest and scrub extends onto the cliffs below the Te Rere. It runs along the base of some bluffs and contains kohekohe, tawa and a number of healthy fuchsia.
- The cliffs are highly susceptible to drought and both species composition and relative canopy dominance appear to fluctuate seasonally, particularly in the shrub-grasslands. Also, kowhai and lupin are both severely browsed by the caterpillar of the kowhai moth.

Succession

- There has been very little mention of the western cliffs in past reports. The first record was a brief note on Greville's 1902 map where he wrote:
"Barren slopes, loose rock, tussocks of native grass in places."
A photograph by L. Cockayne of a slope on the northern cliffs shows bare rock and screes with a generally sparse cover of toetoe and tauhinu.
- There have been a number of changes since then, the most important being the introduction of lupin, probably unintentionally, which has come to dominate over most of the cliffs and will probably have some effect on succession.
- The area described by Greville as barren slopes now has large areas of scrub, flax-tussocklands and small areas of young seral forest.

- Small stands of kohekohe are found on scree slopes along the crest of the cliffs and this species may be one of the first trees to colonise the cliffs. Other tree species which are suited to the cliffs and may increase are karaka, kowhai, mahoe and akiraho.

Interesting Plants or Vegetation Type

- The vegetation found on Kapiti's cliffs is distinctive of the coastal escarpments and headlands of much of the Cook Strait Region. Like similar vegetation on the mainland it has been subject to fires, constant browsing by stock and feral animals, and invasions by exotic plants. These have combined to prevent, impede, or influence regeneration to the extent that it is no longer clear what the original vegetation was like. On the mainland, fires and browsing continue, but on Kapiti there is control and the possibility of eradicating the last of the browsing mammals, the possum. The cliffs have not been burnt for over a century, and they represent the only significant area of regenerating coastal vegetation in the Wellington Region.
- The area of fuchsia below the Te Rere is the only area of fuchsia which survived unprotected during the height of the possum problem. No explanation for this can be given.



THE WESTERN CLIFFS. Looking north from the Te Mimi grass. (Map 3; spot height 364 m.) The highest part of the western cliffs is shown; Tuteremoana Trig lies just outside the frame of the photo, top right. Most of the vegetation on these slopes is a mixed shrub-grassland dominated by lupin and Coprosma propinqua. The area of grassland, top right, is at the head of the Taepiro valley.

NATIVE FLORA

Although no time was given to compiling a species list on this survey, a species list compiled from all previous lists is given (Appendix II). This list records 391 native vascular plants. It is likely that most trees, shrubs, lianes and ferns have been identified. Many herbs and grasses may be unrecorded, particularly species confined to the cliff areas where few workers have ventured.

The only plant on Kapiti which can be considered rare is a small coastal hebe, *Hebe elliptica* var. *crassifolia*. This hebe is only found on Kapiti and on coastal cliffs near Titahi Bay, some of which are protected within Whitireia Park Recreation Reserve. It is relatively common along the eastern coast of Kapiti growing in small rock fissures and cracks above high tide.

There is a large number of planted native species which are not natural to Kapiti. The most conspicuous of these are a number of pohutukawa which are scattered along the east coast. In addition, a wide variety of natives ranging from parataniwha and king fern to black beech, kauri and native cedar can be found. Most are planted close to Rangatira.

Rimu and kahikatea are puzzling absentees from the island's native flora. Dieffenbach made special mention of them in his brief description of Kapiti in 1843, but today the only examples found on the island have been planted. Unless Dieffenbach misidentified these trees, which is unlikely, there must have been catastrophic fires on Kapiti in the years after his visit.

Karo is another planted species not natural to Kapiti. Unlike the others, it was introduced specifically as a food source for endangered birds. It is an extremely hardy tree able to tolerate wind and salt better than most other species on the island. If it is allowed to spread it will undoubtedly come to form an important component of the coastal vegetation.

EXOTIC FLORA

Approximately 140 exotic species have been recorded on Kapiti over the years (Appendix II). Like the native flora this list cannot be considered complete.

The vast majority of exotic plant species found on Kapiti are grasses and herbs. Very few of these species are able to establish beneath a healthy native canopy, and the forests and scrub on the island are notably free of exotic plants.

The only exotic plant, aside from grasses, which is present in abundance is lupin. Since its introduction it has become a dominant species over much of the western and northern cliffs. Its presence will probably be of more benefit than harm as it may enhance regeneration and succession on the cliffs by stabilising slopes and fixing nitrogen in the thin rocky soils. When the native plants begin to take advantage of this, lupin will diminish.

There are few exotic trees on the island except for those planted at the ranger's residence on Rangatira and those within the private land of the Waiorua. There appears to be no spread of these trees. If the private land is ever purchased, the removal of these trees may be considered appropriate.

There is a small patch of *Selaginella kraussiana* growing near the stone seat at Rangatira. This plant is of concern as it is one of the few weeds able to establish beneath a complete native canopy, and it must be eradicated. Its presence in this area raises the possibility of seeds being brought to the island on the shoes of day visitors. *Clematis vitalba*, or Old Man's Beard, is believed to be spread in this manner and regular surveillance of the Trig-McKenzie tracks for the seedlings of exotics such as this should be considered.

RECOVERY OF THE VEGETATION FOLLOWING POSSUM REDUCTIONS

A number of species have been considerably affected by past possum browsing, through both the browsing of foliage, which in many cases resulted in the death of trees, and by the reduction of regeneration due to the eating of flowers and fruit and the browsing of seedlings and saplings. Today all canopies appear healthy: some kohekohe which were completely defoliated, now show little sign of it. The flowering and fruiting of all species is good, in some cases prolific. However, the most encouraging sign of the recovery of Kapiti's forests is the reappearance in quantity of seedlings and saplings of the species worst affected by possum browsing.

Fuchsia was the species most severely affected by browsing. Regeneration ceased and all but a few trees were killed. A small stand in the Taepiro was only saved by concerted trapping. Two trees near the trig were protected by banding and a number of trees in an area of bush on the western cliffs mysteriously survived with little damage. Seedlings are now reappearing beneath canopy gaps and within open stream beds throughout the forests of the cloud zone. The seedlings and saplings of two other highly palatable species, wineberry and pate, are also reappearing in these sites.

The regeneration of many other palatable species was reduced at the height of the possum problem. Today the seedlings and saplings of these species are notably more abundant in many areas. They include toro, titoki, raukawa, karaka, kohekohe and tawa.

The effect possums have on maire is unclear. Possums are known to feed on black maire, and there is a distinct age gap between the numerous seedlings of black and white maire found throughout the island and the scattered adult trees mostly of white maire.

A small stand of swamp maire is present in the Kaiwharawhara basin, adjacent to the small area of wetland. A number of these trees have died, apparently due to possum browsing. This species is becoming increasingly uncommon on the mainland due both to loss of wetland habitat and to browsing, and an increase of this species on Kapiti as a result of the reduction of possums, would be of importance.

A number of plants of the native mistletoe *Ileostylus micranthus* were only last year found on Kapiti, and two other mistletoes *Tupeia antarctica* and *Korthalsella salicornioides* have been recorded in the past, though not seen for many years. The native mistletoes are becoming uncommon in many parts of New Zealand due to their palatability, and several species are now rare including *Tupeia antarctica*. The reappearance of *I. micranthus* on Kapiti following the reduction of possum numbers is therefore significant, particularly in the light of suggestions to introduce several of the rare mistletoes to the island.

Overall the degree of recovery of Kapiti's vegetation in only five years, has been remarkable and already serves to highlight the nature and extent of the damage possums can cause to native forests.

DISCUSSION

1. THE FUTURE

All of Kapiti's vegetation, including those forests described as terminal, are continually changing. This can easily be overlooked because of the time scales involved. It is within the young vegetation types, however, that succession progresses the most rapidly.

In 1929, over 40% of Kapiti (not including the cliffs) was in pasture. Today less than 6% of the island remains in grassland or shrub-grassland. Over two-thirds of the island's vegetation is now shrubland, scrub or young seral forest. In all these types, succession is still occurring, often at a considerable rate, and this rate can be expected to increase further with the considerable reduction of possums. In fifty years time, there will be little or no exotic grassland remaining. Few of the mixed shrubland and scrub types, except those on the western cliffs where harsh conditions are impeding regeneration, will remain, and kanuka forest and scrub which presently make up 23% of the island's vegetation will be considerably reduced. Much of the wetland, which has developed in stream beds subsequent to clearing of the forests, will also diminish as surrounding vegetation matures.

These changes have important implications in terms of the future management of the island and its vegetation.

2. THE QUESTION OF DEVELOPMENT

Provision has been made in Kapiti's management plan (Policies 4.04 and 4.07) for the controlled modification or manipulation of the island's vegetation, where a case can be made. Minor use has already been made of these provisions with the planting of karo, a plant not found naturally on Kapiti, as a winter food source for stitchbirds. To date, however, no proposal has arisen which would require a major modification to the island's vegetation.

It is possible that in the light of the continuing changes to Kapiti's vegetation, debate may arise on the desirability and need to modify or control areas of vegetation on the island. For example:

- The maintenance of scrub communities and grasslands.
- The development or restoration of habitats not present or poorly represented, e.g. wetland.
- Further plantings.

2.1 Maintenance of scrub communities and grassland

A.E. Esler concluded his 1967 report with the observation that:

"There is little to suggest that the forests which are developing will make a better habitat for the present species of birds than the current heterogeneity of vegetation types."

D. Dawson went further in the conclusion to his bird census of 1968. His results indicated that both the total numbers of birds and the numbers of bird species were highest in seral forests and he went on to suggest that:

"If this habitat preference is general for most of the year then Kapiti would serve its function as a bird sanctuary best by having a large area of late seral forest. Land could be cleared so that vegetation succession could occur again and ensure a continuing diversity of habitats."

If the importance of these seral forests is accepted and it is also accepted that part of Kapiti's value as a bird sanctuary lies in the fact that it contains such a wide variety and diversity of habitat types, then the possibility of maintaining a number of representative vegetation types will need to be discussed.

On the other hand it may be decided that future forests would provide more relevant or necessary habitats than the present vegetation types or that the modification of the island's vegetation cannot be justified scientifically or ethically. Certainly from a botanical viewpoint it is desirable that succession of as much of the island's vegetation as possible, be allowed to continue without interference. Quite apart from the island's importance as a bird sanctuary, in years to come Kapiti will be of considerable value as an outstanding example of natural forest succession, following a wide variety of paths, in one of the few places in New Zealand free from browsing animals.

2.2 The development or restoration of habitats not present or poorly represented

Wetlands existed on Kapiti in the past in several areas and it is probably only the presence of old drainage ditches which is preventing the reappearance of relatively large wetlands in the Waiorua and Wharekohu.

Although approximately 9.5 ha of wetland was mapped, this total is made up of many small scattered areas of which few are more than moist stream beds with a dense cover of *Cyperus ustulatus*. Unfortunately it is likely that much wetland, no matter how poor, will disappear as surrounding forests grow. It may be considered that because of this and because wetlands were once more extensive, some development or restoration of wetlands is appropriate, at least to the extent of closing drainage ditches.

A factor in the consideration of the development of wetlands or any other habitat type, is that nearby Mana Island is to be specifically managed for the development of special habitats. With this potential resource available nearby it may be difficult to justify overt manipulation of Kapiti's vegetation. Restoration of vegetation types existing on Kapiti before European settlement would, however, seem appropriate.

2.3 Future plantings

There have been several suggestions to introduce rare or potentially endangered plants to Kapiti. Some of the species mentioned are the rare mistletoes *Peraxilla colensoi*, *Trilepidea adamsii* (if not already extinct), and *Tupeia antarctica* which has been recorded on the island but not seen for many years. Other species are the prostrate fuchsia *Fuchsia procumbens*, the kaka beak *Clianthus puniceus*, and the fern *Marattia salicina*. A number of each of these three species have already been planted on Kapiti but have not yet shown any appreciable spread.

When considering the introduction of a species not native to Kapiti Island, the effect of its spread on the natural vegetation must be clearly ascertained. As has already been noted (see native flora), karo which was introduced as a winter food source for stitchbirds, has shown itself to be hardier than most of the coastal trees native to the island, and the spread of this species may have a major influence on the future coastal forests.

The effect of introducing the rare species so far mentioned would probably be minor.

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**COMMON PLANT NAMES USED IN THE TEXT
AND THEIR LATIN EQUIVALENTS**

akiraho	<i>Olearia paniculata</i>	prairie grass*	<i>Bromus catharticus</i>
black beech	<i>Nothofagus solandri</i> var. <i>solandri</i>	pohutukawa	<i>Metrosideros excelsa</i>
black maire	<i>Nestegis cunninghamii</i>	puka	<i>Griselinia lucida</i>
bracken	<i>Pteridium esculentum</i>	pukatea	<i>Laurelia</i> <i>novae-zealandiae</i>
broadleaf	<i>Griselinia littoralis</i>	putaputaweta	<i>Carpodetus serratus</i>
broom	<i>Carmichaelia arborea</i> var.	rata	<i>Metrosideros robusta</i>
bush lawyer	<i>Rubus cissoides</i>	raukawa	<i>Pseudopanax edgerleyi</i>
cabbage tree	<i>Cordyline australis</i>	rewarewa	<i>Knightsia excelsa</i>
coastal tree daisy	<i>Olearia solandri</i>	rimu	<i>Dacrydium cupressinum</i>
cocksfoot*	<i>Dactylis glomeratus</i>	ring fern	<i>Paesia scaberula</i>
fivefinger	<i>Pseudopanax arboreus</i>	riggut brome*	<i>Bromus diandrus</i>
fuchsia	<i>Fuchsia excorticata</i>	ryegrass*	<i>Lolium perenne</i>
gully fern	<i>Cyathea cunninghamii</i>	silver treefern	<i>Cyathea dealbata</i>
hangehange	<i>Geniostoma rupestre</i>	silver tussock	<i>Poa laevis</i>
hard fern	<i>Blechnum</i> spp.	smiths treefern	<i>Cyathea smithii</i>
heketara	<i>Olearia rani</i>	supplejack	<i>Ripogonum scandens</i>
hen and chicken fern	<i>Asplenium bulbiferum</i>	swamp maire	<i>Syzygium maire</i>
hinau	<i>Elaeocarpus dentatus</i>	sweet vernal*	<i>Anthroxanthum</i> <i>odoratum</i>
hook grass	<i>Uncinia uncinata</i>	tauhinu	<i>Cassinia leptophylla</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>	tawa	<i>Beilschmiedia tawa</i>
kaikomako	<i>Pennantia corymbosa</i>	titoki	<i>Alectryon excelsus</i>
kamahi	<i>Weinmannia racemosa</i>	toetoe	<i>Cortaderia toetoe</i>
kanono	<i>Coprosma grandifolia</i>	toro	<i>Myrsine salicina</i>
kanuka	<i>Leptospermum ericoides</i>	tree fern	<i>Cyathea</i> spp.
karaka	<i>Corynocarpus laevigatus</i>	tree nettle	<i>Urtica ferox</i>
karamu	<i>Coprosma robusta</i> and <i>C. lucida</i>	vine rata	<i>Metrosideros fulgens</i> , <i>M. diffusa</i> , <i>M. perforata</i>
karo	<i>Pittosporum crassifolium</i>	white maire	<i>Nestegis lanceolata</i>
kauri	<i>Agathis australis</i>	wineberry	<i>Aristolelia serrata</i>
kawakawa	<i>Macropiper excelsum</i>	yorkshire fog*	<i>Holcus lanatus</i>
kiekie	<i>Freycinetia baueriana</i> ssp. <i>banksii</i>		
king fern	<i>Marattia salicina</i>		
kohekohe	<i>Dysoxylum spectabile</i>		
kohuhu	<i>Pittosporum tenuifolium</i>		
kowhai	<i>Sophora microphylla</i>		
lancewood	<i>Pseudopanax crassifolius</i>		
lupin*	<i>Lupinus arboreus</i>		
mahoe	<i>Meliccytus ramiflorus</i>		
mamaku	<i>Cyathea medullaris</i>		
manuka	<i>Leptospermum scoparium</i>		
mapou	<i>Myrsine australis</i>		
matai	<i>Prumnopitys taxifolia</i>		
meadow rice grass	<i>Microlaena stipoides</i>		
miro	<i>Prumnopitys ferrugineus</i>		
mountain flax	<i>Phormium cookianum</i>		
native cedar	<i>Libocedrus plumosa</i>		
native spinach	<i>Tetragonia trigyna</i>		
nikau	<i>Rhopalostylis sapida</i>		
ngaio	<i>Myoporum laetum</i>		
parataniwha	<i>Elatostema rugosum</i>		
pate	<i>Schefflera digitata</i>		
pigeonwood	<i>Hedycarya arborea</i>		

* Exotic species

KAPITI ISLAND SPECIES LIST

This species list has been compiled from lists by L. Cockayne 1907; A.S. and A. Wilkinson 1952; A.E. Esler 1967; C.C. Ogle 1962, 71, 79; Garrick 1980; Fauna Survey Unit, New Zealand Wildlife Service 1982; L. Rodda plantings from 1926-1970; S. Fuller 1985.

INDIGENOUS VASCULAR PLANTS OF KAPITI ISLAND

Gymnosperm Trees

*Agathis australis**
*Dacrydium cupressinum***
*Dacrycarpus dacrydioides***
*Libocedrus plumosa**
*Podocarpus hallii**
*P. totara**
*Phyllocladus trichomanoides**
Prumnopitys ferruginea
P. taxifolia

Dicot Trees and Shrubs

Alectryon excelsus
Aristotelia serrata
Beilschmiedia tawa
Brachyglottis repanda
Carmichaelia arborea var.
Carpodetus serratus
Cassinia leptophylla
*Clianthus puniceus**
Coprosma areolata
C. colensoi
C. foetidissima
C. grandifolia
C. lucida
C. propinqua
C. repens
C. rhamnoides
C. robusta
C. rotundifolia
C. tenuicaulis
C. propinqua x *C. robusta*
Coriara arborea
Corokia buddleioides x *C. cotoneaster**
Corynocarpus laevigatus
Cyathodes juniperina var.
Discaria toumatou
*Dodonaea viscosa**
Dysoxylum spectabile
Elaeocarpus dentatus
*Entelea arborescens**
Fuchsia excorticata
Gaultheria antipoda
Geniostoma rupestre var.
Griselinia littoralis
G. lucida
Hebe elliptica var. *crassifolia*
*H. speciosa**
H. stricta var. *atkinsonii*
H. stricta var. *macroura*
H. parviflora var. *arborea*
Hedycarya arborea
Hoheria populnea var. *populnea*
H. populnea var. (*H. sixtylosa*)*
Hymenanthera crassifolia
H. obovata
Ileostylis micranthus
Knightia excelsa
Korthalsella salicornioides

Laurelia novae-zelandiae
Leptospermum ericoides
L. scoparium
Leucopogon fasciculatus
L. fraseri
*Litsea calicaris**
Lophomyrtus bullata
Macropiper excelsum
Melicope simplex
M. ternata
M. simplex x *M. ternata*
Melicytus ramiflorus
Metrosideros diffusa
*M. excelsa**
M. fulgens
*M. kermadecensis**
M. perforata
M. robusta
*Meryta sinclairii**
Mida salicifolia
Myoporum laetum
Myrsine australis
M. salicina
Nestegis cunninghamii
N. lanceolata
N. montana
*Nothofagus fusca**
*N. menziesii**
N. solandri var. *solandri**
*Olearia arborescens**
O. paniculata
*O. pachyphylla**
O. rani
O. solandri
Paratrophis banksii
Pennantia corymbosa
Pimelea prostrata
P. urvilleana
Pittosporum cornifolium
P. crassifolium
P. eugenioides
P. tenuifolium
*Pomaderris apetala**
Pseudopanax anomalus
P. arboreus var. *arboreus*
P. crassifolius
P. edgerleyi
P. arboreus x *P. crassifolius*
Pseudowintera axillaris
P. colorata
Schefflera digitata
Solanum aviculare
S. laciniatum
Sophora microphyllum var. (shrub)
S. microphyllum var. (tree)*
Syzygium maire
Tupeia antarctica
Urtica ferox
*Vitex lucens**
Weinmannia racemosa sp.

Climbers, Lianes and Related Trailing Plants

Calystegia soldanella
C. tuguriorum
Clematis forsteri
C. paniculata
*Fuchsia procumbens**
Muehlenbeckia australis
M. complexa
M. australis x *M. complexa*
Parsonsia heterophylla
Passiflora tetrandra (*Tetrapathaea*)
Ripogonum scandens
Rubus cissoides
R. sp. (*R. australis*)

Grasses, Sedges, Rushes and Like Plants

Agropyron sp. (*A. scabrum* agg.)
Astelia frgrans
A. solandri
Carex comans
C. dissita
C. flagellifera
C. forsteri
C. lessoniana
C. pumila
C. secta var. *secta*
C. spirostris (as *C. vacilans*)
C. testacea
C. virgata
C. sp. (aff. *C. raoulii* and *C. testacea*)
Collosperrum hastatum
Cortaderia toetoe
Cyperus ustulatus
Deyeuxia billardieri
Dichelachne crinita
Echinopogon ovatus
Eleocharis acuta
E. gracilis (as *E. cunninghamii*)
Gahnia pauciflora
G. setifolia
Hierochloe redolens
Juncus australis
J. caespiticius
J. gregiflorus
J. maritimus var. *australiensis*
J. pallidus
J. planifolius
J. sarophorus
Lepidosperma australe
Leptocarpus similis
Libertia grandiflora
L. ixioides
Luzula banksii var.
Microlaena avenacea
M. stipoides
Lachnagrostis filiformis (as *Deyeuxia filiformis*)
Phormium cookianum
P. tenax
Poa anceps
P. imbecilla
P. laevis

Puccinellia stricta
Rytidosperma caespitosa
R. clavatum
R. gracilis
R. petrosum
R. unarede
Scirpus cernuus
S. inundatus
S. nodosus
S. pungens
S. sp. (*S. caldwellii*)
Spinifex hirsutus
Triglochin striatum
Trisetum antarcticum
Uncinia scabra
U. uncinata
U. banksii

Monocot Herbs

Acianthus fornicatus
Arthropodium candidum
A. cirratum
Bulbophyllum pygmaeum
Caladenia catenata
Chiloglottis cornuta
Cordyline australis
*C. terminalis**
Corybas trilobus
C. sp.
Dendrobium cunninghamii
Dianella nigra
Drymoanthus adversus
Earina autumnalis
E. mucronata
Freycinetia baueriana ssp. *banksii*
Gastrodia cunninghamii
Microtis unifolia
Prasophyllum colensoi
Pterostylis alobula
P. australis
P. banksii
P. graminea
Rhopalostylis sapida
Ruppia megacarpa
Thelymitra uniflora
T. longifolia
Typha orientalis

Dicot Herbs

Acaena anserinifolia
Apium australe
Atriplex sp.
Cardamine sp. (*C. debilis* agg.)
Centella uniflora
Centipeda orbicularis
Chenopodium allanii
C. ambiguum
Colobanthus muelleri
Cotula membranacea
C. dioica
Crassula sieberiana

Dicot Herbs (cont.)

Daucus glochidiatus
Dichondra repens
D. sp. (D. brevifolia agg.)
Disphyma australe
*Elatostema rugosum**
Epilobium billardierianum
E. chionanthum
E. cinereum (as junceum)
E. linnaeoides
E. pallidiflorum
E. pubens
E. rotundifolium
E. komarovianum (as nerteroides)
E. nummularifolium
E. pedunculare
E. alsinoides
Euphrasia cuneata
Galium aparine
Galium propinquum
G. trilobum
Geranium microphyllum
G. sessiliflorum
Gnaphalium audax
G. gymnocephalum
G. involucratum
G. sp. (G. luteo-album agg.)
Haloragis erecta
Helichrysum filicaule
Hydrocotyle heteromeria
H. moschata
Hydrocotyle sp. (H. novae-zelandiae agg.)
Lagenifera pumila
Lepidium tenuicaule
L. oleraceum
Lilaeopsis sp. (L. orbicularis?)
Limosella lineata
Linum monogynum
Lobelia anceps
Myosotis sp. (M. pygmaea var. minutiflora)
Myriophyllum propinquum
Nertera depressa
Oxalis exilis
Parietaria debilis
Pelargonium inodorum
Peperomia urvilleana
Plantago raoulii
Polygonum sp. (P. decipiens auct N.Z.)
Potentilla anserinoides
Pratia perpusilla
Ranunculus acaulis
R. hirtus
R. macropus
R. rivularis
Rhagodia triandra
Rumex flexuosus
Samolus repens
Sarcocornia quinqueflora
Scandia geniculata
Scleranthus biflorus
Selliera radicans
Senecio glomeratus

S. hispidus
S. kirkii
S. lautus
S. minimus
S. quadridentatus
S. rufiglandulosus
Solanum nodiflorum
Sonchus kirkii
Spergularia media
Stellaria parviflora
Taraxacum magellanicum
Tetragonia tetragonoides
T. trigyna
Urtica incisa
Viola cunninghamii
Vittadinia australis
Wahlenbergia gracilis
W. marginata

Ferns and Fern Allies

Adiantum cunninghamii
A. sp. (cf. A. fulvum/A. viridescens)
Anarthropteris lanceolata
Arthropteris tenella
Asplenium bulbiferum
A. flabellifolium
A. flaccidum ssp. flaccidum
A. gracillimum
A. hookerianum
A. oblongifolium
A. obtusatum
A. polyodon
A. terrestre ssp. maritimum
Azolla rubra
Blechnum chambersii
B. colensoi
B. discolor
B. filiform
B. fluviatile
B. minus (B. capense agg. swamp sp.)
B. nigrum
B. penna-marina
B. sp. (B. capense agg. large lowland sp.)
Botrychium australe
B. biforme
Cardiomanes reniforme
Cheilanthes distans
C. sieberi ssp. sieberi
Ctenopteris heterophylla
Cyathea cunninghamii
C. dealbata
C. medullaris
C. smithii
Dicksonia fibrosa
D. squarrosa
*Doodia media ssp. australis**
Grammitis billardieri
Histiopteris incisa
Hymenophyllum atrovirens
H. bivalve
H. demissum
H. dilatatum

Existing trees all considered to have been planted.

EXOTIC VASCULAR PLANTS ON KAPITI

<i>Achillea millefolium</i>	yarrow	(h)
<i>Agrostis gigantea</i>	redtop	(g)
<i>A. stolonifera</i>	creeping bent	(g)
<i>A. tenuis</i>	browntop	(g)
<i>Aira caryophyllea</i>	silvery hair grass	(g)
<i>Anagallis arvensis</i>	scarlet pimpernel	(h)
<i>Anthoxanthum odoratum</i>	sweet vernal	(g)
<i>Arrhenatherum elatius</i>	tall oat grass	(g)
<i>Bellis perennis</i>	daisy	(h)
<i>Briza major</i>	quaking grass	(g)
<i>B. minor</i>	shivery grass	(g)
<i>Bromus diandrus</i>	rippgut brome	(g)
<i>B. mollis</i>	soft brome	(g)
<i>B. unioloides</i>	prairie grass	(g)
<i>Callitriche stagnalis</i>	starwort	(h)
<i>Capsella bursa-pastoris</i>	shepherd's purse	(h)
<i>Carduus pycnocephalus</i>	slender winged thistle	(h)
<i>C. tenuiflorus</i>	winged thistle	(h)
<i>Carpobrotus edulis</i>	ice plant	(h)
<i>Centaureum erythraea</i>	centaury	(h)
<i>Cerastium fontanum</i> ssp. <i>triviale</i>	chickweed	(h)
<i>C. glomeratum</i>	mouse-eared chickweed	(h)
<i>Chamaecytisus palmensis</i>	tree lucerne	(t)
<i>Chenopodium album</i>	fathen	(h)
<i>C. pumila</i>		(h)
<i>Cirsium arvense</i>	Californian thistle	(h)
<i>C. vulgare</i>	Scotch thistle	(h)
<i>Conium maculatum</i>	hemlock	(h)
<i>Conyza floribunda</i>	fleabane	(h)
<i>Coronopus didymus</i>	twin cress	(h)
<i>C. squamatus</i>	wart cress	(h)
<i>Cotula australis</i>		(h)
<i>C. coronopifolia</i>	bachelor's button	(h)
<i>Crepis capillaris</i>	hawksbeard	(h)
<i>Crococsmia x crocosmifolia</i>	montbretia	(g)
<i>Cynosurus cristatus</i>	crested dogstail	(g)
<i>Dactylis glomerata</i>	cocksfoot	(g)
<i>Erigeron floribundus</i>		(h)
<i>Erodium cicutarium</i>	storksbill	(h)
<i>Euphorbia peplus</i>	milkweed	(h)
<i>Festuca arundinaceae</i>	tall fescue	(g)
<i>F. rubra</i> ssp. <i>commutata</i>	chewings fescue	(g)
<i>Fumaria muralis</i>	fumitory	(g)
<i>F. officinalis</i>		(h)
<i>Galium aparine</i>	cleavers	(h)
<i>Geranium molle</i>	dove's foot	(h)
<i>G. robertianum</i>	herb robert	(h)
<i>Glaucium flavum</i>	horned poppy	(h)
<i>Hedychium</i> sp.		(h)
<i>Holcus lanatus</i>	Yorkshire fog	(g)
<i>Hordeum murinum</i>	barley grass	(g)
<i>Hydrocotyle moschata</i>	pennywort	(h)
<i>Hypochaeris radicata</i>	cat's ear	(h)
<i>Juncus articulatus</i>	jointed-leaved rush	(g)
<i>Lagurus ovatus</i>	haretail	(g)
<i>Lamium purpureum</i>	red dead-nettle	(h)
<i>Lapsana communis</i>	nipplewort	(h)
<i>Leontodon taraxacoides</i>	hawkbit	(h)
<i>Lepidium</i> sp.	cress	(h)

<i>Lobelia anceps</i>		(h)
<i>Lolium perenne</i>	perennial rye-grass	(g)
<i>Lotus peduncularis</i>	lotus major	(h)
<i>Lupinus arboreus</i>	shrub lupin	(s)
<i>Lycium ferocissimum</i>	boxthorn	(s)
<i>Malva</i> sp. (<i>M. neglecta</i> ?)	mallow	(h)
<i>Marrubium vulgare</i>	horehound	(h)
<i>Medicago arabica</i>	spotted bur medick	(h)
<i>M. hispida</i>		(h)
<i>M. lupulina</i>	hairy medick	(h)
<i>Mentha spicata</i>	spearmint	(h)
<i>M. viridis</i>		(h)
<i>Narcissus biflorus</i>		(h)
<i>Nasturtium officinale</i>	water cress	(h)
<i>Oxalis</i> sp. (<i>O. incarnata</i> ?)		(h)
<i>Paspalum dilatatum</i>	paspalum	(g)
<i>Passiflora mollissima</i>	banana passion-fruit	(c)
<i>Physalis peruviana</i>	cape gooseberry	(s)
<i>Phytolacca octandra</i>	inkweed	(s)
<i>Picris echioides</i>	ox tongue	(h)
<i>Plantago coronopus</i>	buck's-horn plantain	(h)
<i>P. lanceolata</i>	narrow-leaved plantain	(h)
<i>P. major</i>	broad-leaved plantain	(h)
<i>Poa annua</i>	annual poa	(g)
<i>P. pratensis</i>	Kentucky bluegrass	(g)
<i>Polycarpon tetraphyllum</i>	allseed	(h)
<i>Polygonum aviculare</i>	wireweed	(h)
<i>Portulacca oleracea</i>	pigweed	(h)
<i>Prunella vulgaris</i>	selfheal	(h)
<i>Prunus</i> sp.	peach?	(t)
<i>Ranunculus parviflorus</i>	small-flowered buttercup	(h)
<i>R. repens</i>	creeping buttercup	(h)
<i>R. sardous</i>	hairy buttercup	(h)
<i>R. sceleratus</i>	celery-leaved buttercup	(h)
<i>Rosa rubiginosa</i>	sweet briar	(s)
<i>Rubus fruticosus</i> agg.	blackberry	(s)
<i>Rumex acetosella</i>	sorrel	(h)
<i>R. conglomeratus</i>	clustered dock	(h)
<i>R. crispus</i>	curled dock	(h)
<i>R. obtusifolius</i>	broad-leaved dock	(h)
<i>R. pulcher</i>	fiddle dock	(h)
<i>Rytidosperma pennicillatum</i>		(g)
<i>R. racemosum</i>		(g)
<i>Sagina procumbens</i>	pearlwort	(h)
<i>Senecio elegans</i>		(h)
<i>S. jacobaea</i>	ragwort	(h)
<i>S. mikanioides</i>	German ivy	(c)
<i>S. sylvaticus</i>	wood groundsel	(h)
<i>S. vulgaris</i>	groundsel	(h)
<i>Sherardia arvensis</i>	field madder	(h)
<i>Silene gallica</i>	catchfly	(h)
<i>Silybum marianum</i>	variegated thistle	(h)
<i>Solanum nigrum</i>	black nightshade	(h)
<i>S. pseudocapsicum</i>	Jerusalem cherry	(s)
<i>Soliva</i> sp.	Onehunga weed	(h)
<i>Sonchus asper</i>	prickly sowthistle	(h)
<i>S. oleraceus</i>	sow thistle	(h)
<i>Spergularia rubra</i>	sand spurrey	(h)
<i>Sporobolus africanus</i>	rat's tail	(g)
<i>Stellaria media</i>	chickweed	(h)
<i>Stipa setacea</i>		(h)
<i>Taraxacum officinale</i>	dandelion	(h)

<i>Teline</i> sp. (<i>T. monspessulana</i> ?)	Montpellier broom	(s)
<i>Trifolium dubium</i>	suckling clover	(h)
<i>T. glomeratum</i>	clustered clover	(h)
<i>T. micranthum</i>	lesser suckling clover	(H)
<i>T. ornithopodioides</i>	trigonel	(h)
<i>T. repens</i>	white clover	(h)
<i>T. striatum</i>	striated clover	(h)
<i>Ulex europaeus</i>	gorse	(s)
<i>Urtica urens</i>	stinging nettle	(s)
<i>Verbascum thapsus</i>	woolly mullein	(h)
<i>Veronica agrestis</i> ?		(h)
<i>V. arvensis</i>	field speedwell	(h)
<i>V. serpyllifolia</i>	turf speedwell	(h)
<i>Vicia angustifolia</i>	narrow-leaved vetch	(h)
<i>V. hirsuta</i>	hairy vetch	(h)
<i>V. sativa</i>	vetch	(h)
<i>Vinca major</i>	periwinkle	(h)
<i>Viola</i> sp. (<i>V. odorata</i> ?)	violet	(h)
<i>Vulpia bromoides</i>	squirrel-tail fescue	(g)
<i>Wahlenbergia marginata</i>	harebell	(h)

- (c) = climber
(g) = grass
(h) = herb
(s) = shrub
(t) = tree