

# LAND OF MEMORIES

A CONTEMPORARY VIEW OF PLACES  
OF HISTORICAL SIGNIFICANCE IN  
THE SOUTH ISLAND OF NEW ZEALAND



## 21. 22 The Kaiapohia Monument

This stark monument, completed in 1899, stands by the remains of the southern battlements of the great Kaiapoi pa, 'sold' by Ngai Toa to Governor Grey in 1847 under the Wairau Purchase. The pa was founded about the year AD1700 by Tuahuriri's son Turakauahi, who predicted that the natural local food supply of eels and waterfowl could be successfully augmented by food 'swung in' from the surrounding countryside. Hence the pa was called Kai-a-poi. The control of the West Coast pounamu by Ngai Tuahuriri's close relatives the Pouiti Ngai Tahu soon made Kaiapoi the greatest pounamu-trading centre in the land. The pa was surrounded on three sides by deep swamp, giving canoe access to a hapua (lagoon) on the Rakahuri (Ashley) River. Only the southern defences of the pa faced dry land.

The Kaiapoi pa was destroyed by Te Rauparaha's forces after a long siege in 1832, to avenge the killing of some of his relatives there after two years before. The siege ended when the southern battlements were breached or by fire, fanned by a strong southerly wind. The defenders perished or were taken into captivity, except for those who escaped through the swamp. Among those who escaped were the tohunga (learned man) Karaki and his young son Tiramorehu, later to become one of the most prominent chiefs of Ngai Tuahuriri and the most distinguished Ngai Tahu tohunga of his generation.

Whenua i maharatia, haehae ngā tākata

Land of memories, scarred by people

### 23. Waimakariri River mouth

Here the Waimakariri (cold water), Ngai Tuahuriri's river, approaches the open sea. In the distance beyond the lagoon to the south are the sprawling ridges and steep crags of Horomaka (Banks Peninsula), with the 920-m dome of Ahu Patiki (Mt Herbert) rising above all. To Ngai Tuahuriri fishermen off the coast the peaks of Maungatere, Ahu Patiki, and other prominent mountains served as marks to locate the customary fishing grounds, for the food supplies of the ocean were regarded as a continuation of the mahinga kai on land. The Waimakariri rises in the snows of the Southern Alps and its waters never fail. Like other snow-fed rivers its flow tends to be greater in warm weather when the snows are melting — as in the 'fresh' shown in this picture. Thus the natural tendency of the river is a periodic flushing out of its channels, which wind among braided shingle beds a kilometre wide when the level is low. Before European settlement began in the 1850s, the lower reaches of the Waimakariri and Rakahuri (Ashley) connected with a maze of waterways and wetlands fed by underground springs of the purest artesian water, which nourished a wealth of mahinga kai rich in bird life, eels, fish and natural vegetation. For this reason, when Crown Commissioner Kemp arrived in 1848 to purchase Canterbury, the Ngai Tuahuriri negotiators proposed to retain the 100,000 ha between the Waimakariri and Rakahuri, leaving the territory south of the Waimakariri for the Europeans. This arrangement was denied them. Instead, their four hundred people were confined to a 1,000-ha reserve at Tuahiwi, with a promise that they would retain their mahinga kai, while the rest of the 100,000 ha they had asked for was allocated to (at first) a dozen or so settlers.

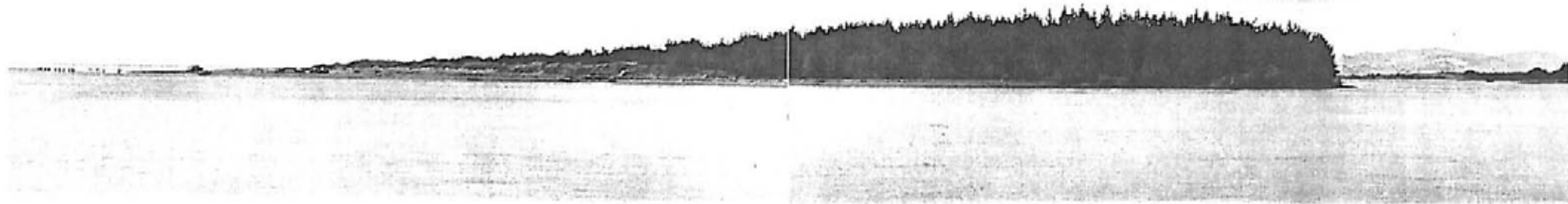
The onset of European settlement brought the destruction of Maori mahinga kai and put an end to the traditional Ngai Tahu way of living off the countryside. In the interests of agriculture, industry and town settlement, swamps were drained, streams were diverted, and natural vegetation was burned. The lower Waimakariri channel was straightened and stopbanks were built to prevent flooding, thus cutting off the water from the former wetlands. Worse still in its effects was the European habit of regarding natural, life-giving waters as a receptacle for excrement and all kinds of other filth — a practice unthinkable to the 'savage' Maori. Today the discharge of town sewage, agricultural effluent, and industrial waste from meat works and woollen mills has made the lower Waimakariri and its associated creeks virtually unusable to the Maori as a source of food.

PHOTOGRAPHS

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TEXT

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## Hydrology

Wetlands similar to those on the West Coast would have covered the coastal strip of the Waimakariri - Rakahuri (Ashley) 200 years ago instead of the willows and grasslands you see today. The interdune area was once a continuous wetland which over the years has been drained and modified. This area is also in a flood path (see Coastal Lands - land / water patterns map pp 4-5).

Water drives the existence of wetlands. There are two basic reasons. The first is the balance between the inflow and outflow of water, which changes with the season. In winter, for example, it is usually a lot wetter than in summer, because vegetation is transpiring less moisture.

The other main reason a wetland may occur is because of the topography and low gradient, so water is ponded and saturates the soil. Near sea level the gradient may be too gentle for water to get away easily. Wetlands are often situated in bowl-shaped depressions which is the situation in this coastal strip. It is possible to identify a former wetland by the type of soil or remnant vegetation.

### Inflows

Water comes into the area through rainfall and through the Waimakariri and Rakahuri (Ashley) rivers which cut through the Ashley fan. Water also comes from underground springs fed from the Rakahuri (Ashley) river which give rise to the streams which run across this area.

An increase in the need for irrigation by land managers further up the plains may mean less water coming out of the springs at the foot of the fan.

### Outflows

Water moves off the area through overland drainage and streams flowing into the Waimakariri and Rakahuri (Ashley) rivers. Seepage back into the groundwater aquifer is not very significant because of the high water table as it is so close to sea level. Two significant processes are: evaporation from the soil and ponds, and transpiration

by vegetation. These processes are important because it is possible to modify them. Trees intercept and transpire about 650 mm of water per year, which is twice the amount transpired by grassland and close to the annual rainfall in the area.

### Changing Regime

A wetland can be modified by changing different aspects of the inflow and outflow. It can be made wetter or drier depending on what the objectives are for the area and how it is managed. As early as 1865 Waioara stream (originally mapped as Kawari) was diverted from its natural course eastward to Tutaepatu Lagoon and redirected northward into Waikuku stream. The original course of the stream is now dry pasture, although it can still be seen on aerial photographs (Evison, H.C, Te Wai Pounamu).

Our ability to modify the environment is also determined by external factors such as climate. Over recent years, the weather patterns have been changing and Canterbury appears to have become more prone to drought. We do not yet know whether such changes are permanent or simply part of a cycle but they will affect how much we can modify our environment and undertake ecological restoration.



Effects of a drought -  
Photo by Florence McNeill

Through natural processes sea level is rising by about 1.5 mm per year. The shoreline along this part of the coast is moving outwards by about 2 metres per year on average. Together, these trends will cause the gradient towards the sea to drop so that these coastal lands could get wetter in years to come.

Opportunities exist for the community to decide on their vision for their environment and to assess the practicalities, strategies and management for achieving the visions.

## Wildlife

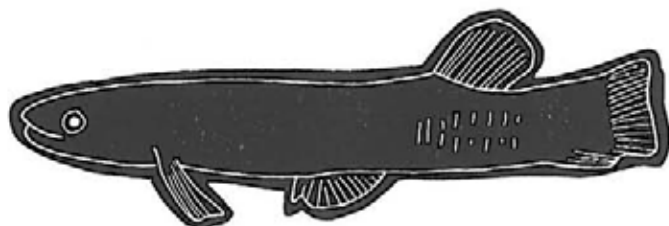
### Fishlife

In the estuaries, wetlands and streams of the Waimakariri - Rakahuri Coastal Lands, there is a great range and abundance of fishlife including tuna (eel), patiki (black flounder), and inanga (whitebait). With the wetland and stream restoration sought, fishlife is expected to be enhanced considerably.

Native fish known to be found in the coastal strip include:

#### Rakahuri (Ashley) River and Te Akaaka (Ashley) Estuary

Banded Kokopu	<i>Galaxias fasciatus</i>
Bluegill Bully	<i>Gobiomorphus hubbsi</i>
Canterbury Galaxias	<i>Galaxias vulgaris</i>
Canterbury Mudfish	<i>Neochanna burrowsius</i>
Common Bully	<i>Gobiomorphus cotidianus</i>
Common Smelt	<i>Retropinna retropinna</i>
Inanga, Whitebait	<i>Galaxias maculatus</i>
Koaro (Whitebait)	<i>Galaxias brevipinnis</i>
Longfinned Eel	<i>Anguilla dieffenbachii</i>
Patiki, Black Flounder	<i>Rhombosolea retiaria</i>
Shortfinned Eel	<i>Anguilla australis</i>
Torrent Fish	<i>Cheimarrichthys fosteri</i>
Upland Bully	<i>Gobiomorphus breviceps</i>



#### Rakahuri / Ashley River Wetlands

Canterbury Mudfish	<i>Neochanna burrowsius</i>
Inanga, Whitebait	<i>Galaxias maculatus</i>
Shortfinned Eel	<i>Anguilla australis</i>

#### Taranaki Stream

From Te Akaaka (Ashley) estuary to Tutaepatu lagoon

Common Bully	<i>Gobiomorphus cotidianus</i>
Common Smelt	<i>Retropinna retropinna</i>
Giant Bully	<i>Gobiomorphus gobioides</i>
Longfinned Eel	<i>Anguilla dieffenbachii</i>
Patiki, Black Flounder	<i>Rhombosolea retiaria</i>

#### Little Ashley Stream

Common Bully	<i>Gobiomorphus cotidianus</i>
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#### Waikuku Stream

Longfinned Eel	<i>Anguilla dieffenbachii</i>
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#### Waimakariri River Mouth

Black Flounder	<i>Rhombosolea retiaria</i>
Common Smelt	<i>Retropinna retropinna</i>
Inanga, Whitebait	<i>Galaxias maculatus</i>
Kanakana, Lamprey	<i>Geotria vulgaris</i>
Stargazer	<i>Leptoscopus macropygus</i>
Stokells Smelt	<i>Stokellia anisodon</i>



## Waimakariri River Estuary

Common Bully	<i>Gobiomorphus cotidianus</i>
Common Smelt	<i>Retropinna retropinna</i>
Giant Bully	<i>Gobiomorphus gobioides</i>
Inanga, Whitebait	<i>Galaxias maculatus</i>
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Shortfinned Eel	<i>Anguilla australis</i>
Stokells Smelt	<i>Stokellia anisodon</i>
Torrent Fish	<i>Cheimarrichthys fosteri</i>
Yellow Eye Mullet	<i>Aldrichetta forsteri</i>

## Beach

Elephant Fish	<i>Callorhynchus milii</i>
Gurnard	<i>Chelidonichthys kumu</i>
Kahawai	<i>Aripis trutta</i>
Paddle Crabs	<i>Ovalipes catharus</i>
Pipis	<i>Paphles australis</i>
Red Cod	<i>Pseudophycis bacchus</i>
Rig	<i>Mustelus lenticulus</i>
Trough Shells	<i>Mactra</i> spp.
Tuatua	<i>Amphidesma sutriangulatum</i>



## Birdlife

The Waimakariri - Rakahuri (Ashley) coastal strip provides habitat for a wide range of native, migratory and introduced birds. A total of 105 bird species have been recorded from this area, including 76 species that utilise estuarine, freshwater wetland and beach habitats. Although many of these 105 species have been recorded at the Rakahuri (Ashley) or Brooklands Lagoon only, at least 70 species (including 40 wetland/coastal species) occur in the coastal lands that lie between.

Waterfowl (swans, geese, ducks, coot and pukeko) and wading birds (waders, herons and bittern) are the two major groups utilising wetlands in the coastal strip. Sites such as Tutaepatu, Kairaki Lagoon and Taranaki Creek are important nesting, moulting and wintering sites, complementing the estuarine habitats at the mouths of the Waimakariri and Rakahuri (Ashley). Tremendous potential exists to enhance and restore habitats within the coastal strip. Any such enhancement could be expected to draw in birds from the neighbouring estuaries, and to attract passing migratory birds moving along the North Canterbury coastal flyway.

### Native bird species recorded Tutaepatu lagoon

Australasian Coot	<i>Fulica atra australis</i>
Korimako, Bellbird*	<i>Anthornis melanura</i>
Black Swan	<i>Cygnus atratus</i>
Karoro, Black-backed Gull	<i>Larus dominicanus</i>
Black-billed Gull	<i>Larus bulleri</i>
Black-fronted Tern*	<i>Sterna albobrostris</i>
Pipipi, Brown Creeper*	<i>Finschia novaeseelandiae</i>
Caspian Tern	<i>Sterna caspia</i>
Piwakawaka, Fantail*	<i>Rhipidura fuliginosa</i>
Riroriro, Grey Warbler*	<i>Gerygone igata</i>
Kahu, Australasian Harrier	<i>Circus approximans</i>
Kawau, Black Cormorant	<i>Phalacrocorax carbo</i>



Kotuku, White Heron	<i>Egretta alba</i>
Little Cormorant	<i>Phalacrocorax melanoleucos brevirostris</i>
Marsh Crane*	<i>Porzana pusilla affinis</i>
Matuku, Australasian Bittern	<i>Botaurus stellaris poiciloptilus</i>
Mute Swan	<i>Cygnus olor</i>
Kotare, NZ Kingfisher	<i>Halcyon sancta vagans</i>
New Zealand Shoveler*	<i>Anas rhynchotis variegata</i>
Papango, NZ Scaup*	<i>Aythya novaeseelandiae</i>
Parera, Grey Duck	<i>Anas superciliosa</i>
Pied Cormorant	<i>Phalacrocorax varius varius</i>
Poaka, Pied Stilt	<i>Himantopus himantopus</i>
Pukeko	<i>Porphyrio porphyrio</i>
Putangitangi, Paradise Shelduck*	<i>Tadorna variegata</i>
Tarapunga, Red-billed Gull*	<i>Larus novaehollandiae sopulinus</i>
Pipiharauroa, Shining Cuckoo*	<i>Chrysococcyx lucidus lucidus</i>
Tauhou, Silvereye	<i>Zosterops lateralis lateralis</i>
South Island Pied Oystercatcher*	<i>Haematopus ostralegus finschi</i>
Spur-winged Plover	<i>Vanellus miles</i>
Tete, Grey Teal	<i>Anas gracilis</i>
Tuturiwhatu, Banded Dotterel*	<i>Charadrius bicinctus</i>
Welcome Swallow	<i>Hirundo tahitica neoxena</i>
White-faced Heron	<i>Ardea novaehollandiae</i>
White-fronted Tern*	<i>Sterna striata</i>



### Native bird species recorded from Ashley - Saltwater Creek or Brooklands - Waimakariri estuarine areas only

Black Stilt*	<i>Himantopus novaeseelandiae</i>
Black-fronted Dotterel	<i>Charadrius melanops</i>
Gull-billed Tern	<i>Gelochelidon nilotica macrotarsa</i>
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>
Reef Heron	<i>Egretta sacra sacra</i>
Royal Spoonbill	<i>Platalea leucorodia regia</i>
Southern Crested Grebe	<i>Podiceps cristatus australis</i>
Wrybill*	<i>Anarhynchus frontalis</i>

### Other native bird species recorded

Australasian Gannet	<i>Sula bassana serrator</i>
Australasian Little Grebe	<i>Tachybaptus novaehollandiae</i>
Kereru, New Zealand Pigeon*	<i>Hemiphaga novaeseelandiae</i>
Spotted Shag*	<i>Stictocarbo punctatus</i>
Variable Oystercatcher*	<i>Haematopus unicolor</i>
White-flipped Penguin*	<i>Eudyptula minor albosignata</i>

\*Endemic

### Other wildlife

No surveys and specific data were available on native reptiles and invertebrates for the area. The importance of invertebrates, particularly for fishlife, is well known.



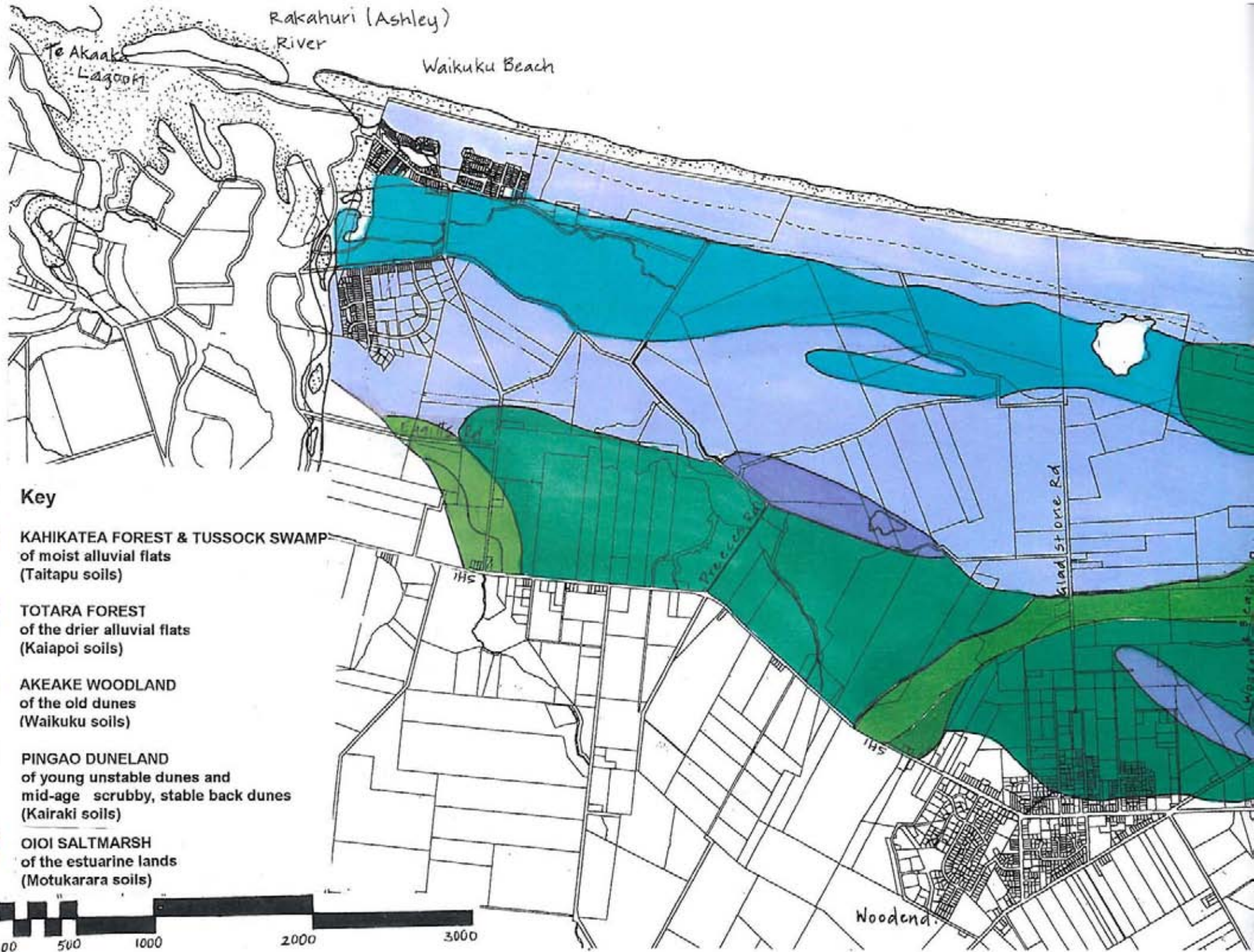




# Existing Vegetation Overview







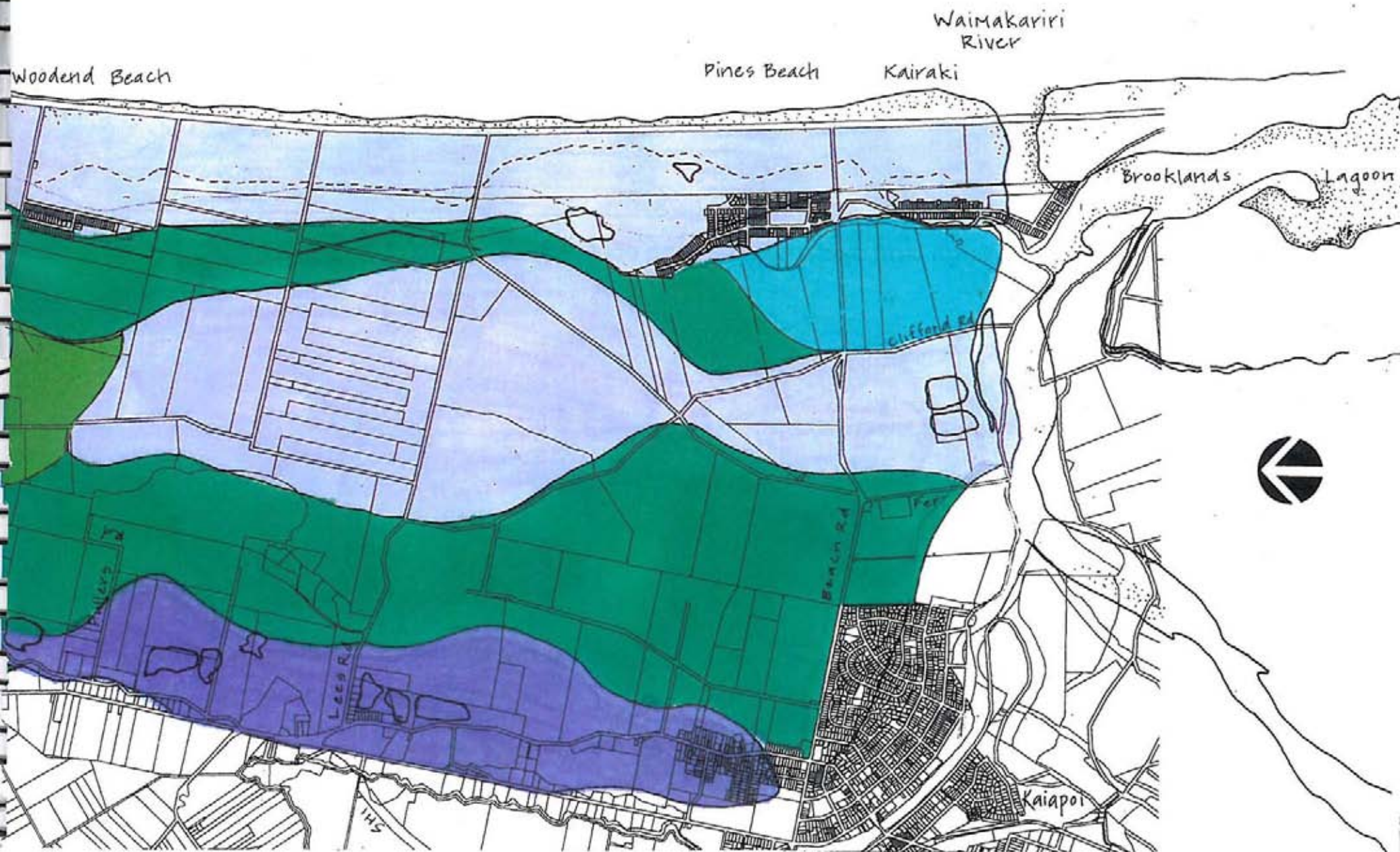
### Key

- KAHIKATEA FOREST & TUSOCK SWAMP  
of moist alluvial flats  
(Taitapu soils)
- TOTARA FOREST  
of the drier alluvial flats  
(Kaiapoi soils)
- AKEAKE WOODLAND  
of the old dunes  
(Waikuku soils)
- PINGAO DUNELAND  
of young unstable dunes and  
mid-age scrubby, stable back dunes  
(Kairaki soils)
- OIOI SALTMARSH  
of the estuarine lands  
(Motukarara soils)

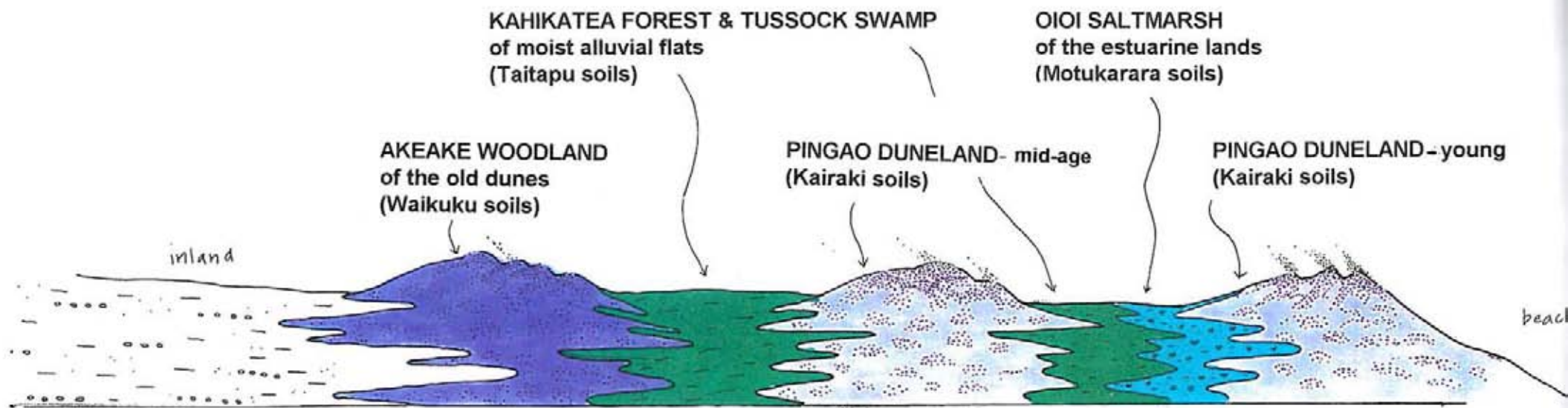




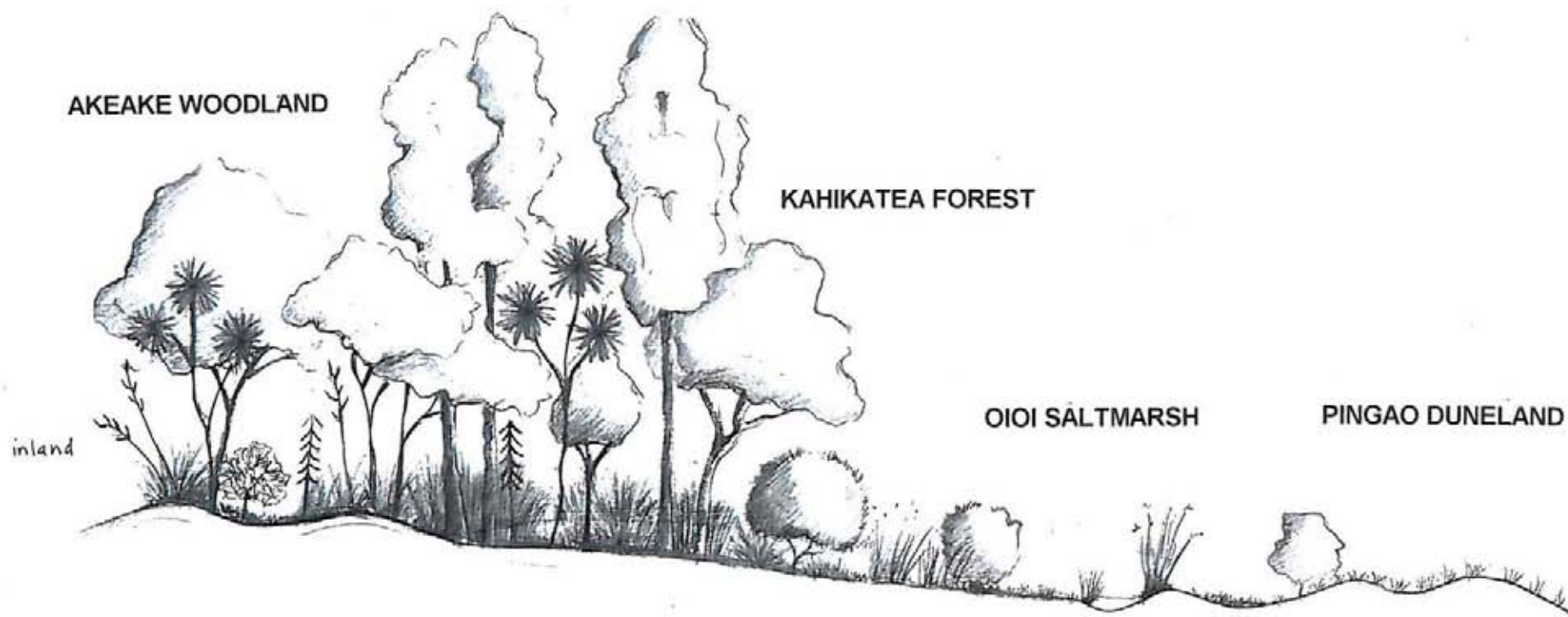
# Underlying Ecosystems "what nature intended"



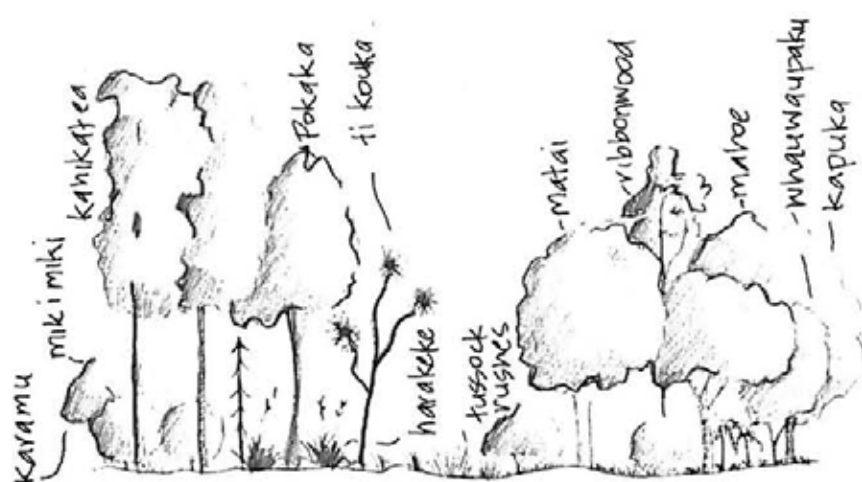




**Diagrammatic cross-section through land system underlying ecosystems**



**Diagrammatic cross-section through " natural " vegetation of these coastal ecosystems**

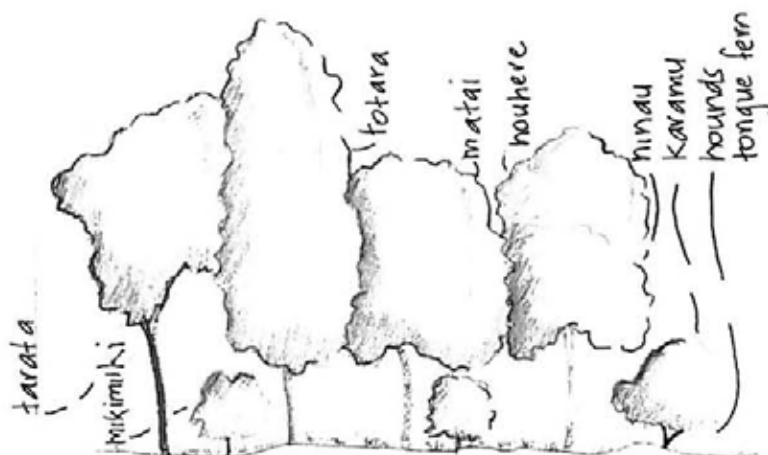


### KAHIKATEA FOREST & TUSSOCK SWAMP of moist alluvial flats

#### Taitapu soils (silt loams to sandy loams)

Taitapu soils are formed on flat to gently undulating low lying former swampland from deep, fine textured, poorly drained greywacke alluvium.

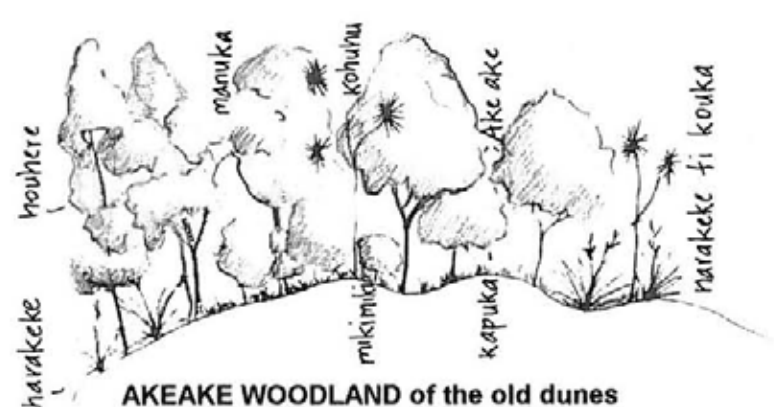
A mosaic of excessively drained sand dunes soils (Waikuku and Kairaki) and slowly draining Motukarara and Taitapu soils in the interdune hollows and depressions forms the coastal belt.



### TOTARA FOREST of the drier alluvial flats

#### Kaiapoi soils (silt loams to sandy loams)

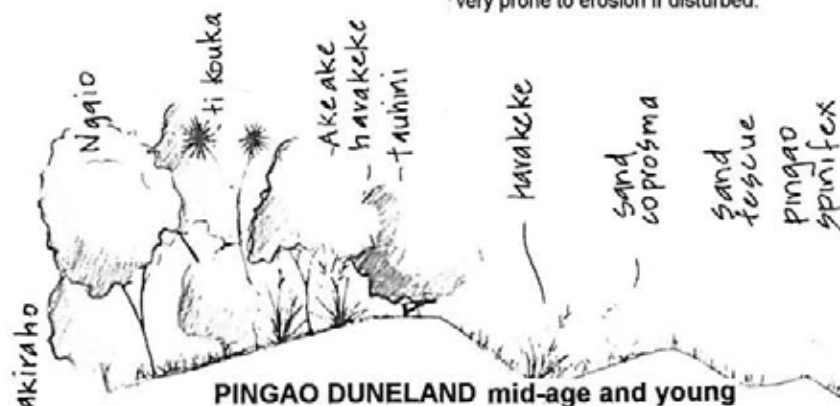
Kaiapoi soils are formed on flat to gently undulating deep fine textured greywacke alluvium. In their natural state they are imperfectly to moderately well drained with distinct sub soil mottling. Kaiapoi soils are moist in summer, but have high water tables in winter. The more freely draining shallower soils are subject to seasonal drought.



### AKEAKE WOODLAND of the old dunes

#### Waikuku loamy sand

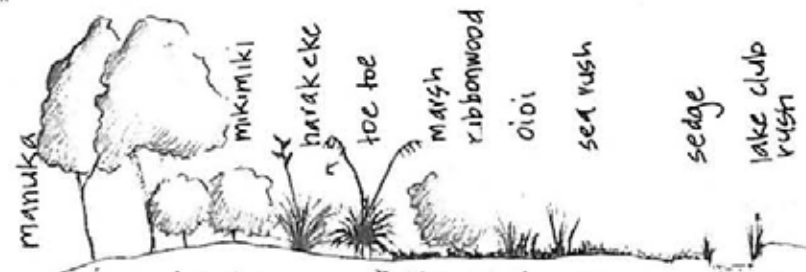
Waikuku loamy sand soils are formed on older, more stable fixed sand dunes with weakly developed topsoils and topsoil structures. They are excessively drained and very prone to erosion if disturbed.



### PINGAO DUNELAND mid-age and young

#### Kairaki sand

Kairaki sand is formed on excessively drained, young raw dune sands held together primarily by plant roots, which doesn't possess a distinct topsoil, and is very prone to wind erosion.



### OIOI SALTMARSH of the estuarine lands

#### Motukarara soils (sandy loams to clay loams)

Motukarara silts are formed on low-lying poorly drained flat to undulating lake margins and estuaries on fine to coarse saline estuarine sediments. Motukarara soils are young and show little profile development, and a wide range of salinity levels is reflected in the native vegetation.



## Restoration Guide

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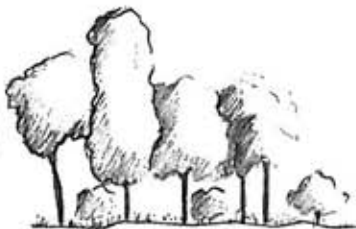
With the considerable community interest in restoration of the native ecosystems of these Waimakariri-Rakahuri coastal lands, some preliminary guidance is provided. This is a general guide to the sort of potential there is in the area, to assist landowners and those wishing to explore options. Whilst the data may be interpreted for a site in one of the general ecosystems identified, a detailed restoration plan for a particular site is recommended before undertaking a project.

### Ecosystems Framework

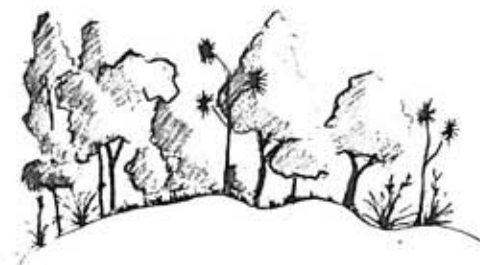
From the landform, soils and hydrological data, broad ecosystems have been identified, mapped and described. These indicate what nature intended for that general area, particularly the type of vegetation, e.g. whether it is inherently a:



- **KAHIKATEA FOREST & TUSSOCK SWAMP** of moist alluvial flats;



- **TOTARA FOREST** of the drier alluvial flats;



- **AKEAKE WOODLAND** of the old dunes;



- **PINGAO DUNELAND** of young unstable dunes and mid-age scrubby, stable back dunes;



- **OIOI SALTMARSH** of the estuarine lands.

***Scarcely anything of the vegetation of such native ecosystems remains.***

## Be Realistic

It will be difficult if not impossible to re-establish what once may have existed - conditions have changed, nature has been fragmented, and some species are now locally extinct! However, opportunity to re-establish some semblance of a functional ecosystem often remains.



Even a small gesture, such as creating a small grove of local bush in your backyard, will contribute to increasing habitat for wildlife and for enhancing the natural character of your area.

It is important to investigate the viability of any effort at re-establishment. For some areas, drainage and weed threats may make restoration difficult. Therefore it is important to thoroughly investigate a site, its potential and its limitations. Attempting something that is realistic and achievable is important, or a lot of effort can be wasted. Just creating a haven for weeds may be more harmful than helpful!

## First Protect

Before considering investing effort in starting a restoration project, see if there are already natural values that you can nurture. It is important to understand what exists already, or all your good intentions at restoration could unintentionally destroy some natural values. There may be native plant communities present that you hadn't noticed - even small herbfields or turfs. There may be areas that are currently used by wildlife - seasonally wet areas or grasses that wading birds feed on, willow trees that shags nest in, and, logs for lizards.

Make a map of your area, note any existing natural features and the patterns of the land and soils - such as wet areas, dry or sandy areas. Note also how these link across boundaries to adjoining natural patterns and features. Make a plan of the natural patterns of your area and its environs. The overall maps included in this

preliminary report of the hydrological, landform and soil patterns of the Waimakariri - Rakahuri (Ashley) coastal lands may help you get started. As well as checking on the ground, aerial photos can help in understanding the land patterns.



For any existing natural values, an understanding of the existing management that allows them to occur is important. For example, for open grass or herb communities, stock grazing may be helping by preventing weeds invading. In other areas, stock may be slowly destroying shrubs or dunes and stopping natural regeneration. Elsewhere, exotic plants may be invading, such as pine seedlings, gorse and marram.

You may notice whether existing natural values have been improving or deteriorating, and work out why.

## Restoration Site Selection

The first priority is to protect and assist natural values that already exist, whether on the area you are interested in, or on neighbours. Complement what is around - expand on, link and buffer existing habitats. Look for the greatest opportunities - these will mostly be on waterways, the estuaries, and, the kahikatea forest ecosystem of the alluvial flats, where rich forested wetlands supporting a myriad of fish and birdlife would naturally occur.



## Weed Risk Assessment

Address problems before you start. First work out how you will deal with potential weeds. There is little point in planting near seeding invasive plants. Some seed will come in by wind, some with birds, others with water, stock, vehicles and people. Some of the plants need wet areas,



some dry; some need full sun, others love shade. Some tolerate grazing; others race away when grazing is absent - such as grey willow seedlings which, if both male and female plants are present, will rapidly take over wetland areas. It is important you do a weed risk assessment to ensure your restoration efforts will be successful.

Developing a weed management strategy for the Waimakariri-Rakahuri (Ashley) coastal lands should be straight-forward with the strong community support, interest and local knowledge. It will make a significant contribution to restoration opportunity.

For restoration it is not just the traditional agricultural or horticultural weeds that you need to worry about, it is mostly garden plants that have the potential to invade. For example, the berries of cotoneaster, ivy, privet and holly are widely spread by birds and these plants are major threats to existing and potential native forest. Other plants threaten other ecosystems.

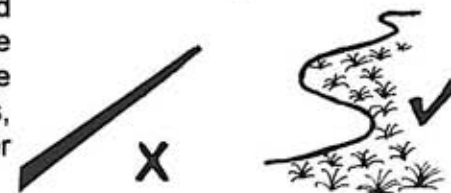
A community weed programme could identify the existing and potential problem plants, and encourage people to remove these from their properties. A community awareness programme could also discourage people from dumping garden waste over the fence, over the bank, etc. This waste along with dumped pot plants and aquarium water are major sources of weed invasions.

### **Trial a Patch**

Plan for the overall, but start small to make sure you have the materials and the skills to establish and to manage the area adequately. A small successful restoration area is much more effective and encouraging than a large half-pie area over-run with weeds. So, develop a realistic staging plan. For planting, begin with a trial area to test different species and planting techniques, and to see how you get on with management.

### **Restore Natural Patterns of Landforms and Waterways**

In some areas, restoration will involve changing the vegetation by mass planting. In other areas it may be necessary to first restore landforms or water levels. If an area has been flattened or drained, or a waterway straightened, rather than rushing in and planting this modified state, first consider the potential to re-construct something of the original landform and wetness. Re-creating the gentle slopes, the curved alignment, the pools, islands and marshy areas, provides opportunities for a richer native diversity.



You may have the opportunity to fill in drains, re-open springs and remove other barriers to re-create wetlands of the kahikatea forest ecosystem. For areas in the oioi estuarine ecosystem, once you allow the tides to again wash in, the salt marshes and meadows will probably re-establish naturally - you may not need to plant them.

### **Site Preparation**

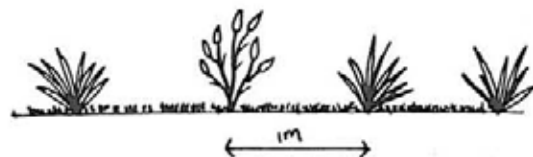
Even a trial planting has to be protected from grazing stock and permanently protected. So take care to make sure secure fences surround your restoration site before you start any plantings or your efforts may be all in vain. A permanent fence with a style and no gate is often the best protection for restoration sites adjoining farmland.

Particularly in dry sites, removing existing vegetation from planting sites is important to give new plants a start as the existing vegetation will take out all available moisture. But the need to clear existing vegetation will depend on what exists, what is intended, and the management effort available. It is pointless completely clearing a site of weed trees and shrubs if you are not able to manage the mass of new weeds that will immediately emerge. Also, in exposed sites, it may be wise to leave some protective shrubby cover to shelter new plantings.

### Restoring Native Ecosystems in Existing Pasture

In general, it is necessary to remove grass competition when planting. Clearing 1 metre diameter planting "spots" is a standard laying technique, perhaps using bio-degradable chemical or screefing and dense mulch (that won't wash or blow away).

For much restoration planting, to provide quick cover and canopy closure for weed control and forest development, many species need to be planted just 1m apart. Usually this means grass control over the entire planting area.



### Restoring Native Wetland Ecosystems in Willow Groves

As willow are light demanding and will thus not seed in and establish under dense shade, and because they can provide a useful micro-climate for new plantings, carefully assess the advantages and disadvantages of clearing the site. Also, before any clearing, check to ensure you don't remove natural native regeneration that may already be occurring under the willows.

As they are often not particularly invasive, rather than immediately clearing crack willows, consider phasing options. You may only need to thin the trees, or remove big unstable limbs. You may be able to use the willow canopy to shade and shelter the young plants to reduce the vigour of weeds such as blackberry, and to continue providing habitat for birdlife. The native forest species can just be planted under the crack willow canopy, and the willows gradually phased out, naturally or assisted. However, for the extremely invasive grey willow, complete removal of at least the female trees will be essential before any restoration planting begins. A lot of effort can be wasted if proper grey willow control is not undertaken.

Re-establish the streamside and wetland sedges and rushes that love to be at least partly immersed - you may need to plant these in summer when water levels are low. Lots of over-hanging vegetation is important for fish habitat.

willow  
wetland



willows  
underplanted



Kahikatea Forest &  
Tussock Swamp  
established



### Restoring Ecosystems in Gorse Scrub

Gorse may provide a micro-climate, good soil litter, and nitrogen, and can be a useful nurse plant for re-establishment of taller forest and woodland. Although the seed has a long viability in the soil, it is a light-demanding plant and new, dense, evergreen tree and shrub cover should prevent a new gorse crop establishing. Therefore, if possible, plant in amongst the gorse, perhaps in lines to provide access.

Re-establishment of low grassland and dune cover in gorse-covered areas provides a greater challenge. The gorse may need to be cleared first and conditions may enable gorse seedlings to continue to appear for a long time. The practicalities need to be carefully weighed.

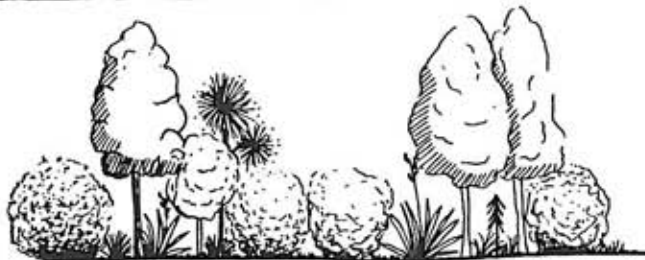
### Restoring Ecosystems in Pinelands

Planted and wilding pine forests both occupy these coastal lands. They can provide a microclimate for re-establishment of native forest and woodland, but removal to at least provide sheltered clearings or coupes to plant behind or within is probably necessary. However, retention of pines may provide an ongoing seed source to invade other vulnerable areas, and whilst retained, the pines will visually dominate the area.

gorse



gorse  
interplanted



gorse  
overtaken



pines



pines  
clearings  
planted



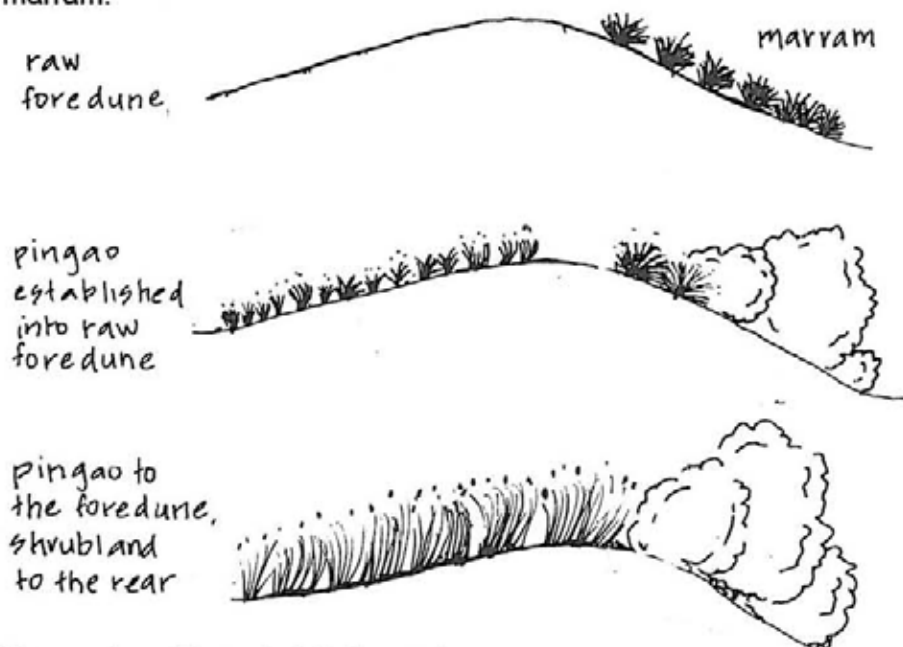
new  
native  
forest





## Dune Vegetation Restoration

A dense dune cover of marram grass provides a very competitive environment for re-establishment of fore-dune plants such as pingao and spinifex. However, for the older back dunes with greater stability and soil development, spot clearance and dense planting of first stage native shrubs and trees can compete to dominate and shade out the marram.



## Ecosystem Re-establishment

Consider existing and potential wildlife, and how you might plan to improve their ecosystems. The lizards of the dry grasslands may be of particular interest - or the wetland and bush birds, or the aquatic fishlife.

The data on each main ecosystem suggests a general vision of what was and could perhaps be again in each area if land owners and land managers are interested.

## Which Plants to Use

A plant list is provided for each ecosystem which includes a considerable range of trees, shrubs, grasses, ferns, groundcovers, etc. that are thought to belong naturally in each area. You might consider selecting species from the list for the ecosystem most like your site. The plants listed are all local native species.

Although species may be tolerant once well-established, be wary of planting in the inter-dune flats as these are very prone to damaging frosts.

More detailed guidance needs to be developed for each type of ecosystem, and interpreted in the planning for each restoration site to suit people's aspirations and the inputs they have available.

## Plant Supply

To maximise restoration potential, use plants propagated from natural local vegetation ("eco-sourced" plants), so they are genetically adapted and belong here. Local forms express the identity of this place. Preferably order the plants 2 years in advance of the proposed planting.

For plantings, allow about 1 plant per metre for shrubs; low cover plants (sedges, rushes, pingao, ferns, etc.) at half metre spacings (4 per square metre); small-growing trees (kanuka, akeake, ngaio, etc.) at 2 to 5 metre spacings; and, large growing trees (kahikatea, totara, etc.) at some 6 to 10 m spacings with shrubs and low cover massed between. Full species lists follow, listing what occurs naturally in each ecosystem - the trees, shrubs, groundcovers and vines

### **On-Going Management**

The task is not complete just because the planting has been done! The planting is the easy part. Maintenance is essential to allow those plants to flourish. Keeping them clear of grass and weeds for at least three years is a crucial task. This allows the plants to join together and form a canopy. Many of the potential weeds are light-demanding, and will not invade once the canopy shades out the ground.

After several years when you have canopy closure, you can inter-plant with the more tender and long term species. For the forest ecosystems, plant the long-term tall canopy species under this first low canopy, for example the kahikatea. Also, plant in the understorey species that need the shade of the canopy, such as the ferns.

### **Further Guidance**

This is a preliminary report. Preliminary restoration guidance is provided for those who may be interested. Restoration planning for specific sites, and more detailed guidance for the various ecosystems, is intended to be developed later.



## KAHIKATEA FOREST & TUSsock SWAMP

plants of moist alluvial flats (Taitapu soils)

### TALL TREES

<i>Dacrycarpus dacrydioides</i>	kahikatea, white pine
<i>Elaeocarpus dentatus</i>	hinau
<i>Elaeocarpus hookerianus</i>	pokaka
<i>Prumnopitys taxifolia</i>	matai, black pine

### TREES & TALL SHRUBS

* <i>Carpodetus serratus</i>	putaputaweta, marbleleaf
<i>Coprosma lucida</i>	shining karamu
<i>C. robusta</i>	karamu
<i>Cordyline australis</i>	ti kouka, cabbage tree
<i>Griselinia littoralis</i>	kapuka, broadleaf
<i>Hoheria angustifolia</i>	houhere, narrow-leaved lacebark
<i>Hoheria populnea</i> <sup>1</sup>	houhere, lacebark
<i>Leptospermum scoparium</i>	manuka, tea tree
<i>Lophomyrtus obcordata</i>	rohutu, NZ myrtle
* <i>Melicope simplex</i>	poataniwha
* <i>Pennantia corymbosa</i>	kaikomako
<i>Pittosporum eugenioides</i>	tarata, lemonwood
<i>Pittosporum tenuifolium</i>	kohuhu, black matipo
<i>Plagianthus regius</i>	manatu, lowland ribbonwood
<i>Pseudopanax crassifolius</i>	horoeka, lancewood
* <i>Streblus heterophyllus</i>	turepo, small-leaved milk tree

1. This is not the common, broad-leaved *Hoheria sextylosa* introduced from the North Island.

**Bold**=main species for relatively fast growing first stage planting into open sites, but \* are vulnerable, \*\* are particularly vulnerable in frost pockets

### SHRUBS, SCRAMBLERS

<i>Coprosma propinqua</i>	mikimiki
<i>Coprosma rubra</i>	red-stemmed coprosma
<i>Hebe salicifolia</i>	koromiko
<i>Myrsine divaricata</i>	weeping mapou
<i>Pseudopanax anomalus</i>	a shrub pseudopanax

### GROUNDCOVERS

<i>Anemathele lessoniana</i>	bamboo grass, windgrass
<i>Carex flaviformis</i>	yellow sedge
<i>Carex lambertiana</i>	a sedge
<i>Carex secta</i>	pukio sedge
<i>Carex solandri</i>	a sedge
<i>Carex virgata</i>	swamp sedge
<i>Cortaderia richardii</i>	toe toe (toi toi)
<i>Deschampsia caespitosa</i>	tufted hair grass
<i>Juncus gregiflorus</i>	wiwi, tussock rush
<i>Juncus pallidus</i>	wiwi, tussock rush
<i>Phormium tenax</i>	harakeke, NZ flax
<i>Pratia angulata</i>	panakeneke, creeping pratia



## ADDITIONAL PLANTS FOR SHELTERED SITES:

### LARGE TREES

<i>Alectryon excelsus</i>	titoki
<i>Hedycarya arborea</i>	porokaiwhiri, pigeonwood

### TREES & TALL SHRUBS

<b><i>Aristotelia serrata</i></b>	<b>makomako, wineberry</b>
<b><i>Coprosma linariifolia</i></b>	<b>narrow-leaf coprosma, yellow-wood</b>
<i>Coprosma rotundifolia</i>	round-leaved coprosma
<i>Fuchsia excorticata</i>	kotukutuku, tree fuchsia
<i>Meliccytus micranthus</i>	manakura, shrubby mahoe
<i>Meliccytus ramiflorus</i>	mahoe, whiteywood
<i>Myrsine australis</i>	mapou, red matipo
<i>Pseudopanax arboreus</i>	whauwhaupaku, five-finger
<i>Pseudowintera colorata</i>	horopito, peppertree

### SHRUBS, SCRAMBLERS

<i>Clematis paniculata</i>	pua waananga, bush clematis
<i>Coprosma areolata</i>	thin-leaved coprosma
<i>Coprosma rhamnoides</i>	red-fruited mikimiki
<i>Parsonsia</i> spp.	NZ jasmine
<i>Passiflora tetrandra</i>	kohia, native passionvine

### GROUNDCOVERS

#### Forest

<i>Astelia fragrans</i>	kakaha, bush flax
<i>Dianella nigra</i>	turutu, blue berry
<i>Microlaena avenacea</i>	bush rice grass
<i>Uncinia uncinata</i>	watau, hook sedge

#### Open swamp

<i>Baumea rubiginosa</i>	
<b><i>Libertia ixioides</i></b>	<b>mikoikoi, NZ iris</b>
<i>Schoenus pauciflorus</i>	bog rush
<i>Urtica linearifolia</i>	ongaonga, narrow-leaved

## FERNS

<i>Asplenium gracillimum</i>	makau, hen & chicken
<i>Asplenium terrestre</i>	spleenwort
<i>Blechnum chambersii</i>	kiokio, a hard fern
<i>Blechnum fluviatile</i>	ray water fern
<i>Blechnum minus</i>	kiokio fern
<i>Blechnum penna-marina</i>	kiokio fern
<i>Cyathea smithii</i>	katote, soft tree fern
<i>Dicksonia fibrosa</i>	kuripaka, wheki ponga, a tree fern
<i>Dicksonia squarrosa</i>	wheki, rough tree fern
<i>Histiopteris incisa</i>	mata, water fern
<i>Hypolepis ambigua</i>	rough pig fern
<i>Pellaea rotundifolia</i>	button fern
<i>Phymatosorus diversifolius</i>	hounds tongue fern
<i>Polystichum richardii</i>	pikopiko, shield fern
<i>Polystichum vestitum</i>	puniu, shield fern

**Bold**=main species for relatively fast growing first stage planting into open sites





## TOTARA FOREST plants of the drier alluvial flats (Kaiapoi soils)

### LARGE TREES

* <i>Elaeocarpus dentatus</i>	hinau
<i>Podocarpus totara</i>	totara
<i>Prumnopitys taxifolia</i>	matai, black pine

### TREES & TALL SHRUBS

<i>Coprosma lucida</i>	shining karamu
<i>Coprosma robusta</i>	karamu
<i>Cordyline australis</i>	ti kouka, cabbage tree
* <i>Fuchsia excorticata</i>	kotukutuku, tree fuchsia
<i>Griselinia littoralis</i>	kapuka, broadleaf
<i>Hoheria angustifolia</i>	narrow-leaved
	houhere, lacebark
<i>Hoheria populnea</i> <sup>1</sup>	houhere, lacebark
<i>Kunzea ericoides</i>	kanuka
<i>Leptospermum scoparium</i>	manuka
<i>Lophomyrtus obcordata</i>	rohutu, NZ myrtle
* <i>Pittosporum eugenioides</i>	tarata, lemonwood
<i>Pittosporum tenuifolium</i>	kohuhu, black matipo
<i>Plagianthus regius</i>	manatu, lowland ribbonwood
<i>Pseudopanax crassifolius</i>	lancewood
<i>Sophora microphylla</i>	South Island kowhai

### SHRUBS

<i>Coprosma propinqua</i>	mikimiki
<i>Coprosma virescens</i>	pale green coprosma
<i>Hebe salicifolia</i>	koromiko

### GROUNDCOVERS, etc.

<i>Acaena novae-zelandiae</i>	bidibidi, pipiriri
<i>Cortaderia richardii</i>	toetoe (toitoe)
<i>Phormium tenax</i>	harakeke, NZ flax
<i>Phymatosorus diversifolius</i>	hounds tongue fern

### ADDITIONAL PLANTS FOR SHELTERED SITES: TREES & TALL SHRUBS

* <i>Alectryon excelsus</i>	titoki
* <i>Aristotelia serrata</i>	makomako, wineberry
<i>Coprosma areolata</i>	thin-leaved coprosma
* <i>Coprosma linariifolia</i>	narrow-leaf coprosma, yellow-wood
<i>Coprosma rhamnoides</i>	red-fruited mikimiki
<i>Coprosma rubra</i>	red-stemmed karamu
<i>Melicope simplex</i>	poataniwha
* <i>Melicope ramiflora</i>	mahoe, whiteywood
* <i>Myoporum laetum</i>	ngaio
<i>Myrsine australis</i>	mapou, red matipo
* <i>Pennantia corymbosa</i>	kaikomako (slow growing)
* <i>Pseudopanax anomalus</i>	shrub pseudopanax
<i>Pseudopanax arboreus</i>	whauwhaupaku, fivefinger
* <i>Streblus heterophyllus</i>	turepo, small-leaved milk tree

### GROUNDCOVERS

<i>Astelia fragrans</i>	kakaha, bush flax
<i>Libertia ixioides</i>	mikoikoi, NZ iris
<i>Microlaena polynoda</i>	a rice grass
<i>Microlaena stipoides</i>	a rice grass
<i>Pteridium esculentum</i>	rahurahu, bracken fern
<i>Uncinia uncinata</i>	

<sup>1</sup> This is not the common, broad-leaved *Hoheria sextylosa* introduced from the North Island.





## **AKEAKE WOODLAND plants of the old dunes (Waikuku soils)**

### **TREES AND TALL SHRUBS**

<i>Coprosma repens</i>	taupata (pre-European introduction)
<i>Coprosma robusta</i>	karamu
<i>Cordyline australis</i>	ti kouka, cabbage tree
<i>Discaria toumatou</i>	matagouri, wild irishman
* <i>Dodonaea viscosa</i>	akeake
<i>Griselinia littoralis</i>	kapuka, broadleaf
<i>Hoheria angustifolia</i>	houhere, narrow-leaved lacebark
<i>Kunzea ericoides</i>	kanuka
<i>Leptospermum scoparium</i>	manuka
* <i>Myoporum laetum</i>	ngaio
<i>Olearia avicennifolia</i>	akiraho, a tree daisy
<i>Olearia paniculata</i>	akiraho, golden akeake
* <i>Pittosporum eugenioides</i>	tarata, lemonwood
<i>Pittosporum tenuifolium</i>	kohuhu, black matipo
<i>Pseudopanax crassifolius</i>	lancewood
* <i>Solanum laciniatum</i>	poroporo
<i>Sophora microphylla</i>	South Island kowhai

### **SHRUBS & SCRAMBLERS**

<i>Ozothamnus leptophyllus</i>	tauhinu, cottonwood
<i>Coprosma crassifolia</i>	thick-leaved mikimiki
<i>Coprosma propinqua</i>	mikimiki
<i>Coprosma rhamnoides</i>	red-fruited karamu
<i>Corokia cotoneaster</i>	korokio
<i>Helichrysum lanceolatum</i>	niniaio
<i>Melicytus alpinus</i>	porcupine shrub
<i>Muehlenbeckia astonii</i>	a rare pohuehue shrub
<i>Muehlenbeckia complexa</i>	shrubby pohuehue
<i>Olearia odorata</i>	a fragrant shrub daisy
<i>Pomaderris phyllicifolia</i>	tauhinu

### **GROUNDCOVERS, NICHE PLANTS**

<i>Carmichaelia australis</i>	NZ broom
<i>Coprosma acerosa</i>	sand coprosma
<i>Dichelachne crinita</i>	long-hair plume grass
<i>Gnaphalium audax</i>	cudweed
<i>Isolepis nodosa</i>	wiwi, knobby clubrush
<i>Libertia ixioides</i>	mikoikoi, NZ iris
<i>Linum monogynum</i>	rauhua
<i>Pelargonium inodorum</i>	namunamu, a cranesbill
<i>Pteridium esculentum</i>	rahurahu, bracken fern
<i>Senecio glomeratus</i>	a NZ groundsel

### **IN ADDITION PLANTS FOR SHELTERED SITES: TREES AND LARGE SHRUBS**

<i>Corynocarpus laevigatus</i>	karaka (pre-European introduction)
<i>Melicytus ramiflorus</i>	mahoe, whiteywood

**Bold**=main species for relatively fast growing first stage planting into open sites,  
but \* are vulnerable, \*\* are particularly vulnerable in frost pockets.





## PINGAO DUNELAND plants of young unstable dunes and mid-age scrubby, stable back dunes (Kairaki soils)



Plants keyed to landform units, as shown in diagram:

(F) = Foredune; (M) = Mid-dune; (B) = Back dune; (S) = Sand flats; (H) = Swampy hollow

(F) = Foredune; (M) = Mid-dune; (B) = Back dune; (S) = Sand flats;  
(H) = Swampy hollow

### TREES & LARGE SHRUBS

<i>Coprosma repens</i>	taupata (M,B) (pre-European introduction)
<i>Cordyline australis</i>	ti kouka, cabbage tree (B,S)
<i>Discaria toumatou</i>	matagouri, wild irishman (M,S)
<i>Dodonaea viscosa</i>	akeake (M,B)
<i>Kunzea ericoides</i>	kanuka (B)
<i>Leptospermum scoparium</i>	manuka, teatree (B,S)
* <i>Myoporum laetum</i>	ngaio (M,B)
<i>Olearia avicenniifolia</i>	akiraho, a tree daisy (M,B)
<i>Olearia paniculata</i>	akiraho, golden akeake
* <i>Solanum laciniatum</i>	poroporo (M,B)

**Bold**=main species for relatively fast growing first stage planting into open sites,  
but \* are vulnerable, \*\* are particularly vulnerable in frost pockets.

### SHRUBS & SCRAMBLERS

<i>Carmichaelia australis</i>	makaka, NZ broom (M,S)
<i>Cassinia leptophylla</i>	tauhinu, cottonwood (M,S)
<i>Clematis afoliata</i>	pohue, leafless clematis (M,S)
<i>Coprosma acerosa</i>	sand coprosma (F,M)
<i>Coprosma crassifolia</i>	a thick-leaved mikimiki (M,S)
<i>Coprosma propinqua</i>	mikimiki (M,B,S)
<i>Corokia cotoneaster</i>	korokio (M)
<i>Discaria toumatou</i>	matagouri
<i>Helichrysum lanceolatum</i>	niniaio (M)
<i>Melicytus alpinus</i>	porcupine shrub (M)
<i>Muehlenbeckia astonii</i>	a rare pohuehue shrub (M,B)
<i>Muehlenbeckia complexa</i>	shrubby pohuehue (M,S)
<i>Olearia odorata</i>	fragrant shrub daisy (M)
<i>Plagianthus divaricatus</i>	houi, saltmarsh ribbonwood (F,S)
<i>Pomaderris phyllicifolia</i>	tauhinu (M)
<i>Sophora prostrata</i>	prostrate kowhai (M)

### GROUNDCOVERS etc.

<i>Austrofestuca littoralis</i>	sand fescue (F,S)
<i>Calystegia soldanella</i>	nihinihi, sand convolvulus (F)
<i>Carex pumila</i>	sand sedge (S)
<i>Cortaderia richardii</i>	toetoe (toitoe) (S)
<i>Desmoschoenus spiralis</i>	pingao, golden sand sedge (F)
<i>Euphorbia glauca</i>	shore spurge (F)
<i>Isolepis nodosa</i>	wiwi, knobby clubrush (F,H,M,B)
<i>Linum monogynum</i>	rauhua (F,M)
<i>Microtis unifolia</i>	onion leaved orchid
<i>Phormium tenax</i>	harakeke, NZ flax (S)
<i>Pimelea arenaria</i>	sand daphne (S)
<i>Pteridium esculentum</i>	rahurahu, bracken fern (M,B)

# NICHE PLANTS FOR DAMP OR WET SITES

<i>Carex flaviformis</i>	yellow sedge
<i>Carex geminata</i>	rautahi, purei, cutty grass (H)
<i>Epilobium billardioreanum</i>	willowherb (H)
<i>Gunnera dentata</i>	sand gunnera (H)
<i>Hierochloa redolens</i>	karetu, holy grass (H)
<i>Isolepis basilaris</i>	a turf club-rush (H)
<b><i>Juncus pallidus</i></b>	<b>wiwi, a giant rush (F,H,S)</b>
<i>Juncus gregiflorus</i>	tussock sedges
<i>Leptinella dioica</i>	cotula (H)
<i>Lepidosperma australe</i>	four square sedge
<i>Mazus pumilio</i>	a carpet musk (H)
<i>Nertera setulosa</i>	nertera
<i>Schoenus concinnus</i>	a turf sedge (H)
<b><i>Schoenoplectus pungens</i></b>	<b>three-square (H)</b>
<i>Schoenus pauciflorus</i>	bog rush

**Bold**=main species for relatively fast growing first stage planting into open sites





## **OIOI SALTMARSH plants** **of the estuarine lands (Motukarara soils)**

### SHRUBS

<i>Coprosma propinqua</i>	mikimiki
<i>Leptospermum scoparium</i>	manuka, tea tree
<i>Muehlenbeckia complexa</i>	shrubby pohuehue
<i>Plagianthus divaricatus</i>	houi, saltmarsh ribbonwood

### TUSsock GRASSES & FLAXES

<i>Bolboschoenus caldwellii</i>	a sedge
<i>Cortaderia richardii</i>	toetoe (toitoe)
<i>Cyperus ustulatus</i>	umbrella sedge
<i>Hierochloa redolens</i>	karetu, holy grass
<i>Isolepis nodosa</i>	wiwi, knobly clubrush
<i>Juncus maritimus</i>	
<i>Juncus pallidus</i>	sea rush
<i>Lepidosperma australe</i>	
<i>Leptocarpus similis</i>	oioi, jointed wire rush
<i>Phormium tenax</i>	harakeke, NZ flax
<i>Schoenoplectus pungens</i>	three-square
<i>Schoenoplectus validus</i>	lake club rush

### GROUNDCOVERS

<i>Apium prostratum</i>	sea celery
<i>Leptinella dioica</i>	cotula
<i>Limosella lineata</i>	NZ mudwort
<i>Samolus repens</i>	moakoako, sea primrose
<i>Selliera radicans</i>	selliera

**Bold**=main species for relatively fast growing first stage planting into open sites

## Weeds & Invasive Plants

The following non-native invasive species are especially relevant to biodiversity and habitat protection, and revegetation projects in these coastal lands. They are already a problem in these coastal lands, or are a problem elsewhere and are potentially invasive weeds for natural areas here. You should also be aware of the 'Control' and 'Surveillance' plant pest lists available from the Canterbury Regional Council. Removal of potentially invasive plants from surrounding lands is desirable if restoration is to be achievable.

Common Name	Scientific Name		
agapanthus	<i>Agapanthus orientalis</i>	gorse	<i>Ulex europaeus</i>
aluminium plant	<i>Galeobdolon luteum</i>	grey willow	<i>Salix cinerea</i>
barberry	<i>Berberis darwinii</i>	hawthorn	<i>Crataegus monogyna</i>
barberry	<i>Berberis glaucocarpa</i>	hemlock	<i>Conium maculatum</i>
beggars tick	<i>Bidens frondosa</i>	ivy	<i>Hedera helix</i>
bittersweet	<i>Solanum dulcamara</i>	marram grass	<i>Ammophila arenaria</i>
blackberry (wild aggregates)	<i>Rubus fruticosus</i> agg.	periwinkle	<i>Vinca major / minor</i>
boneseed	<i>Chrysanthemoides monilifera</i>	silver poplar	<i>Populus alba</i>
boxthorn	<i>Lycium ferocissimum</i>	smilax	<i>Asparagus asparagoides</i>
broom	<i>Cytisus scoparius</i>	spartina, cord grass	<i>Spartina</i> spp.
buddleia	<i>Buddleia davidii</i> (excluding hybrids)	spindle tree	<i>Euonymus europaeus</i>
Californian thistle	<i>Cirsium arvense</i>	spiny broom	<i>Calicotome spinosa</i>
cape ivy	<i>Senecio angulatus</i>	sweet briar	<i>Rosa rubiginosa</i>
cotoneaster	<i>Cotoneaster</i> spp.	tagasaste, tree lucerne	<i>Chamaecytisus palmensis</i>
crack willow	<i>Salix fragilis</i>	tree lupin	<i>Lupinus arboreus</i>
elderberry	<i>Sambucus nigra</i>	wandering willy	<i>Tradescantia fluminensis</i>
German ivy	<i>Senecio mikanioides</i>	willow weed	<i>Polygonum persicaria</i>



## Beach Settlement Guidelines

### Existing Character

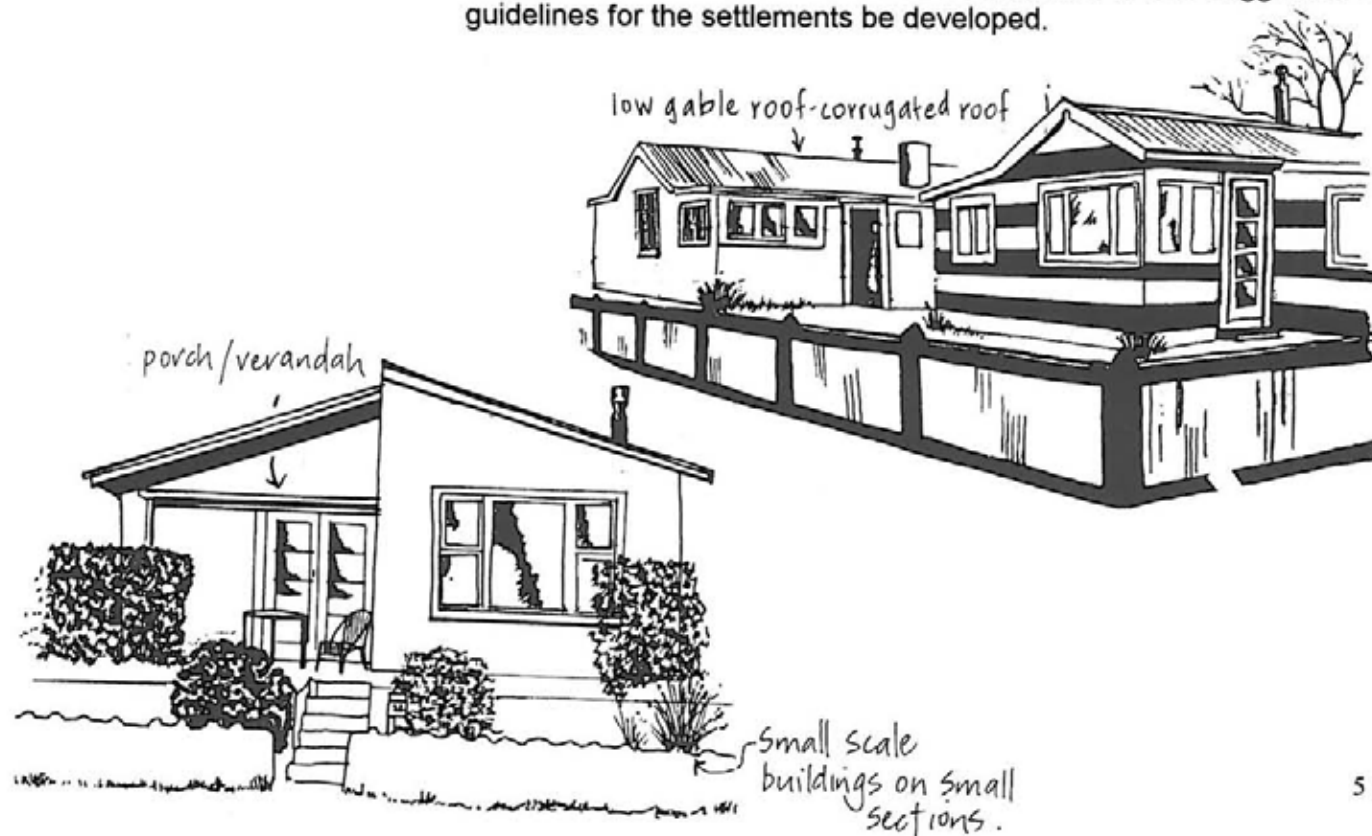
The coastal settlements of Waikuku Beach, Woodend Beach and Pines Beach / Kairaki each has a unique character which is reflected in their setting, history, size and people.

Each settlement hugs the coast line of Pegasus Bay, lying between the braided rivers of the Waimakariri and Rakahuri (Ashley). The small settlements are closely associated with the rural/naturalistic character of the coastal dune system. This is reflected in the daily lives of inhabitants, who value the open spaces and variety of recreational opportunities the coastal rural context offers.

Although there have long been settlements in these coastal lands, Waikuku Beach and Pines Beach / Kairaki sprang up in the early part of this century, with Woodend Beach first subdivided in the 1930's. These three settlements developed as a holiday spots which had ready access to the beach, lagoons and rivers.

The settlements are made up of a variety of housing styles but the most common style is the 'bach'. A style which has developed through the 'grass roots' to become a national architectural icon of waterside holiday spots throughout New Zealand.

From the workshop consultation process it was clear that people want to conserve the character of these settlements. It was suggested that guidelines for the settlements be developed.

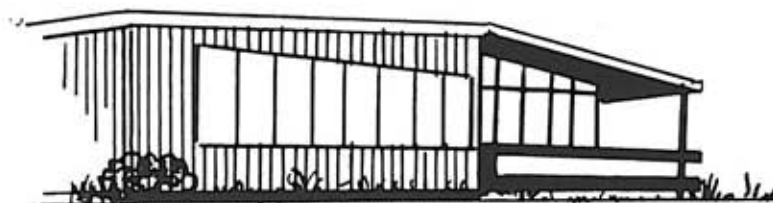


## Design Guidelines

To retain existing character, but allow for traditional spontaneity, some simple guidelines have been developed which avoid suburban or urban character in form, scale, materials and density

### Blending new and old buildings

- a) New buildings and amendments to the exterior of existing buildings should respect the bach character of Waikuku Beach, Woodend Beach and Pines Beach / Kairaki.
- b) The form and size of new buildings should respect the scale and form which has been established by existing buildings.



### Scale

- a) Small dwellings which are relative in size to the section.

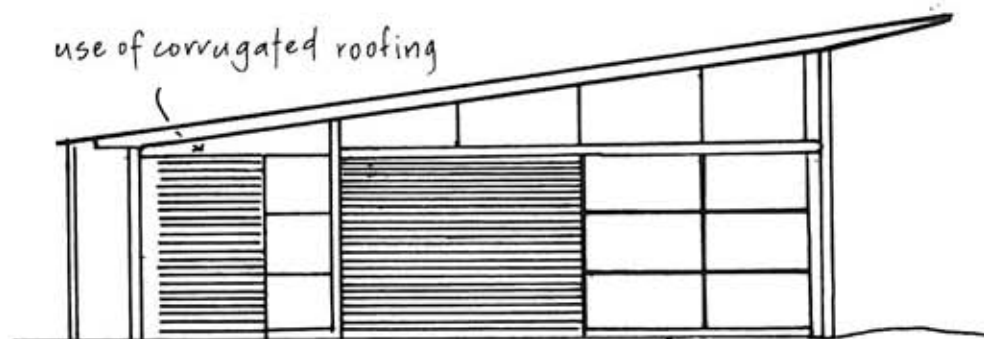
### Form

- b) Single storey dwellings are preferable, a stepped floor level or attic room could be an alternative.

### Roofs

- c) Low pitch roofs, 0 -27 degrees.
- d) Flat roofs, mono-pitch and gables

use of corrugated roofing

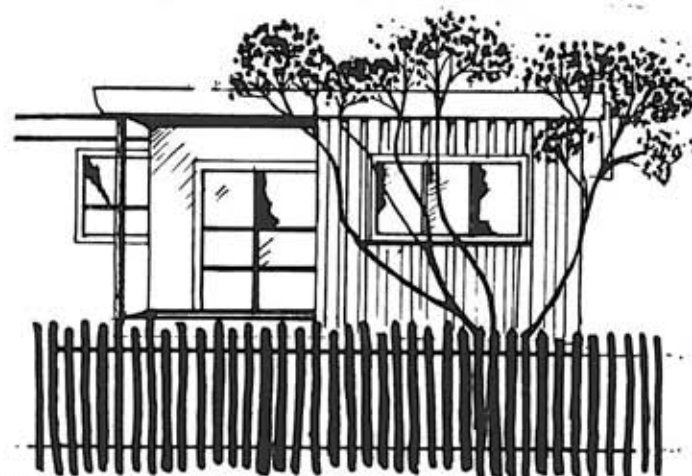


### Height

- e) Eaves to a maximum of 5 metres above ground level

### Materials

- f) Roof - Frequent use of corrugated roofing rather than tiles
- Walls - Timber, sheet claddings, avoiding masonry or brick.



### Fences

- g) Low fences to a maximum height of 1 metre or alternatively vegetation to define front boundaries.

### Verandas

- h) Use of verandas and porches providing a welcoming intermediate space between the street and front door

## Recommendations

Recognising the importance of the area, the community consultation process and professional analysis suggest a vision for the Waimakariri - Rakahuri (Ashley) coastal lands that involves voluntary participation of landholders in:

- Retention of open space character;
- Conservation of local heritage;
- Restoration of natural areas and linkages forming a matrix within which various forms of production occurs; along with,
- Retention and confinement of the low key beach settlements.

For local people, groups and authorities to progress the vision:

### ASSIST LANDOWNER PROTECTION

1. Identify indigenous remnant vegetation for landowners who wish to be informed of any values that may exist on their land and that they can then consider protecting.
2. Develop mechanisms to provide protection guidance and assistance to landowners if wanted.

### WILDLIFE

3. Explore the potential to have wildlife surveys undertaken, particularly in association with local schools and community groups to better identify and understand existing invertebrates, fish, lizards and birds, and what existing habitat may be important to them. The diversity of insect life that eel gorge on, for example, could amaze and fascinate children.
4. Community and landowner interests explore different management regimes to assess the help or hindrance of existing management for conservation and restoration. For example, identify barriers to fish passage, such as culverts and weirs.
5. Develop strategies and guidelines for wildlife enhancement.

### WATER MANAGEMENT

6. Encourage understanding of groundwater levels and the ecological potential of the land-water interface.
7. Have guidelines developed for restoration and management of streams and wetlands, for both the quantity and the quality of their waters, as well as their biota.
8. Encourage and assist landowner/managers to exclude grazing stock from waterways and wetlands to remove the source of many nutrient and sediment pollutants, and to allow for water-cleansing buffer vegetation to establish.
9. Where there is space, encourage restoration of natural stream form and vegetation - rather than straight steep-sided, "shaved" drains.
10. Explore the potential for land-owner support to seek to re-instate stream flows crucial to wetland sustainability, such as the Waioara Stream to Tutaepatu.
11. Explore the potential for expanding the area of wetlands, encouraging their native biodiversity and ensuring minimum water levels.

### RESTORATION PROJECTS

12. Following community and landowner consideration and discussion, learn from existing restoration projects and seek to identify potential restoration trial sites and demonstration plots in each type of ecosystem, whether on private land or land which has a public interest. Trial different establishment and management techniques, e.g. mixed species planting to establish a kahikatea forest, versus planting of a close pure kahikatea stand only.



13. Ensure recognition that wetland ecosystems extend well beyond the actual water or visibly wet area, in all types of season, so that appropriate management is sought for the full area of influence, to minimise drought effects on heritage values.
14. Explore potential support for restoration projects - whether community, commercial, local government or other agencies.
15. Have restoration guideline details developed for each type of ecosystem, to cover both large- and small-scale project activities. These be made available to all landowners/managers, and to others involved in decision-making on these lands.
16. Encourage establishment, support and advice for Coastal Care Groups, to co-ordinate energy and information, and to be notified of problems.
17. Along with trials and demonstrations, further develop the planting guides to enable people to undertake their own restoration activities.
18. Support and encourage neighbourliness, through complementing restoration efforts, proving linkages, extensions and buffers, and through controlling potentially invasive non-native plants.

#### **BIODIVERSITY MONITORING**

19. Seek to establish indigenous biodiversity monitoring programmes in the community (e.g. in schools) to identify and record the change in nature that occurs - e.g. are there more kereru or lizards each year? - or, a greater variety of insects over a stream?

#### **WEEDS & WASTE**

20. Together with the community, develop a database of existing and potential invasive plants (weeds) and develop a weed management strategy for the area to encourage removal of certain threatening species.

21. Encourage good practice in disposal of garden waste to reduce the threat of invasive plant spread.
22. Encourage avoidance and removal of polluting practices, whether of ground water or surface water.
23. Recognise cultural and heritage values in the selection, upgrading and monitoring of sewage treatment techniques.
24. Encourage the upgrade of community and individual sewage management schemes to avoid contamination and the degradation of natural and cultural values.

#### **EMPLOYMENT & TRAINING**

25. Develop a co-ordinated approach to employment on restoration programmes. If owners wish to undertake a series of projects, seek a co-ordinated involvement of the community and tangata whenua to maximise potential employment and training opportunities.

#### **INTERPRETATION**

26. Develop and provide appropriate interpretation of cultural history and of natural history to help in the public understanding and respect for the specialness of these coastal lands.
27. Encourage discussions with tangata whenua prior to any new earth disturbance, to seek to avoid disturbance of cultural values

#### **RECREATION**

28. Seek development of a walkway system and other ecologically, socially and culturally appropriate recreation opportunities.
29. Develop mechanisms for reducing user conflicts e.g. separate areas for quiet and noisy activities, restoration timing to avoid wildlife breeding, etc.

## **BUILDINGS**

30. Have a local landscape guideline brochure for building form, materials, colours, etc, developed in consultation with the community to assist people to consider landscape development and management that complements the vision.
31. Develop a building guideline leaflet to articulate both rural and settlement character and to assist people in considering any renovations, extensions or new development.

## **DISTRICT PLAN**

32. To recognise the local vision identified for heritage management and restoration, support is pursued for the District Plan to support recommendations 1-31 above to enable achievement of a restoration and settlement vision.

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