Indigenous Ecosystems of the Lyttelton Harbour Basin

with **Stream Guide**

for the Governors Bay Community Association
and the Governors Bay Landcare Group

Project Background & Vision

The whole of the Lyttelton Harbour Basin can be seen from many different places along the walking tracks that wind their away around the summits of the surrounding hills. A first impression is of vast hillsides now given over to farming and forestry. A closer look reveals some remaining bush remnants. These bush pockets give hints of what the Harbour Basin was like many hundreds of years ago.

There has been a growing awareness of this natural bush cover among people living in the area. People settle here because they like the bush and the birds. Some people have been working away quietly at planting more trees and looking after what remains. Others want to know more and don't know where to begin and still others remark that they want more native birds to come back to the area.

Nearly two years ago the Governors Bay Garden Club invited Di Lucas to speak about the plans she had developed for encouraging people in Christchurch to plant more native species. This talk prompted the idea to develop a similar project for the Harbour Basin. It was considered a timely way of tapping into the interest in things native.

Since that first step the Governors Bay Community Association adopted the project at the request of the Garden Club. As the project has developed it has become quite evident that it is a project for the whole Harbour Basin. People from the whole area have welcomed the concept.

We now take pleasure in offering this completed project to the people of the Lyttelton Harbour Basin. Our hope is that it will not only inspire people to value our native plants more, but it will also give practical assistance for people wanting to know more about what to plant, where to plant and how to plant more native species.

Convener of the Project,

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Funders of the Project:
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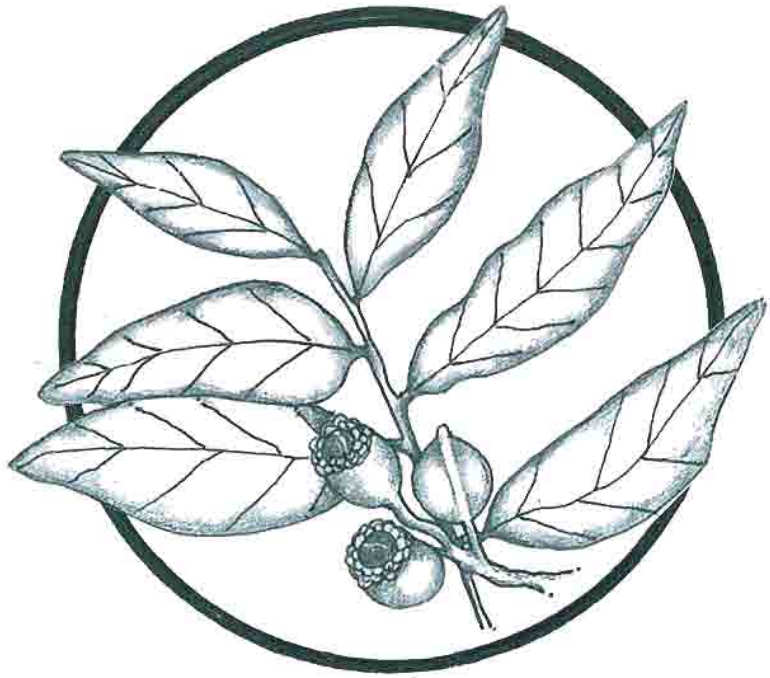
Banks Peninsula District Council
Smugglers Arms Hotel
Governors Bay Community Association
Governors Bay Garden Club
Diamond Harbour & Districts Landscape and Management Group
Lyn Wright
plus
Environment Canterbury, for assistance with re-print

Books available for purchase from Sally Tripp or Letzgo Native Nursery (Main Rd, Governors Bay).

Indigenous Ecosystems of the

Lyttelton Harbour Basin

a guide to native plants, their ecology and planting



Project Symbol

"Windowing in" through a port hole to a titoki leaf and fruit of the rich native forests that belong in the Lyttelton Harbour Basin.

Lucas Associates (Di Lucas, Nikki Gray, Annabel Riley, 1998), (Di Lucas, Jeremy Head and Leona deRidder, 2005) with **Colin Meurk & Ian Lynn**, Manaaki Whenua Landcare Research

Acknowledgement of assistance from Hugh Wilson, Colin O'Donnell & Jorge Santos

for the Governors Bay Community Association and the Governors Bay Landcare Group

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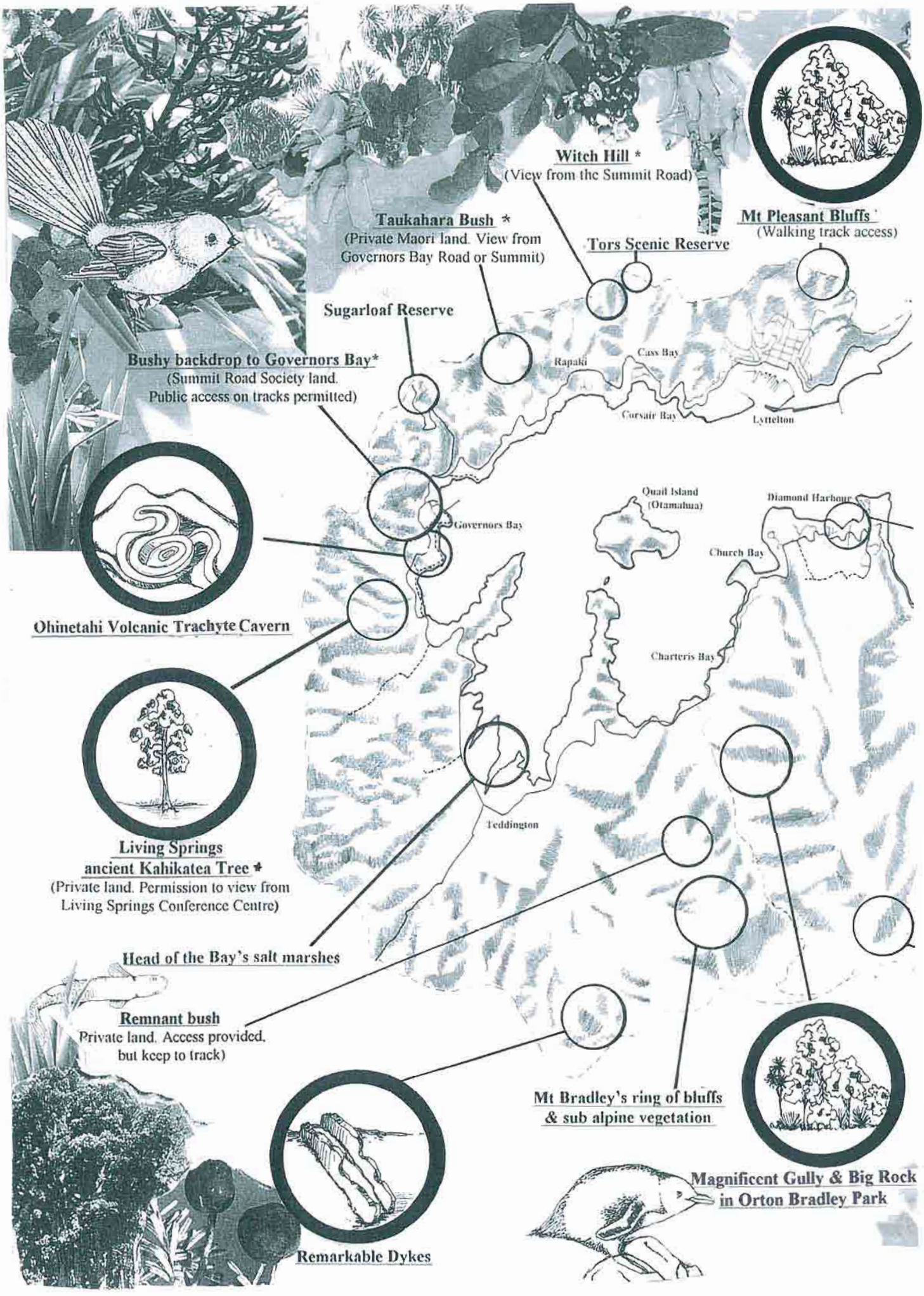
Contents

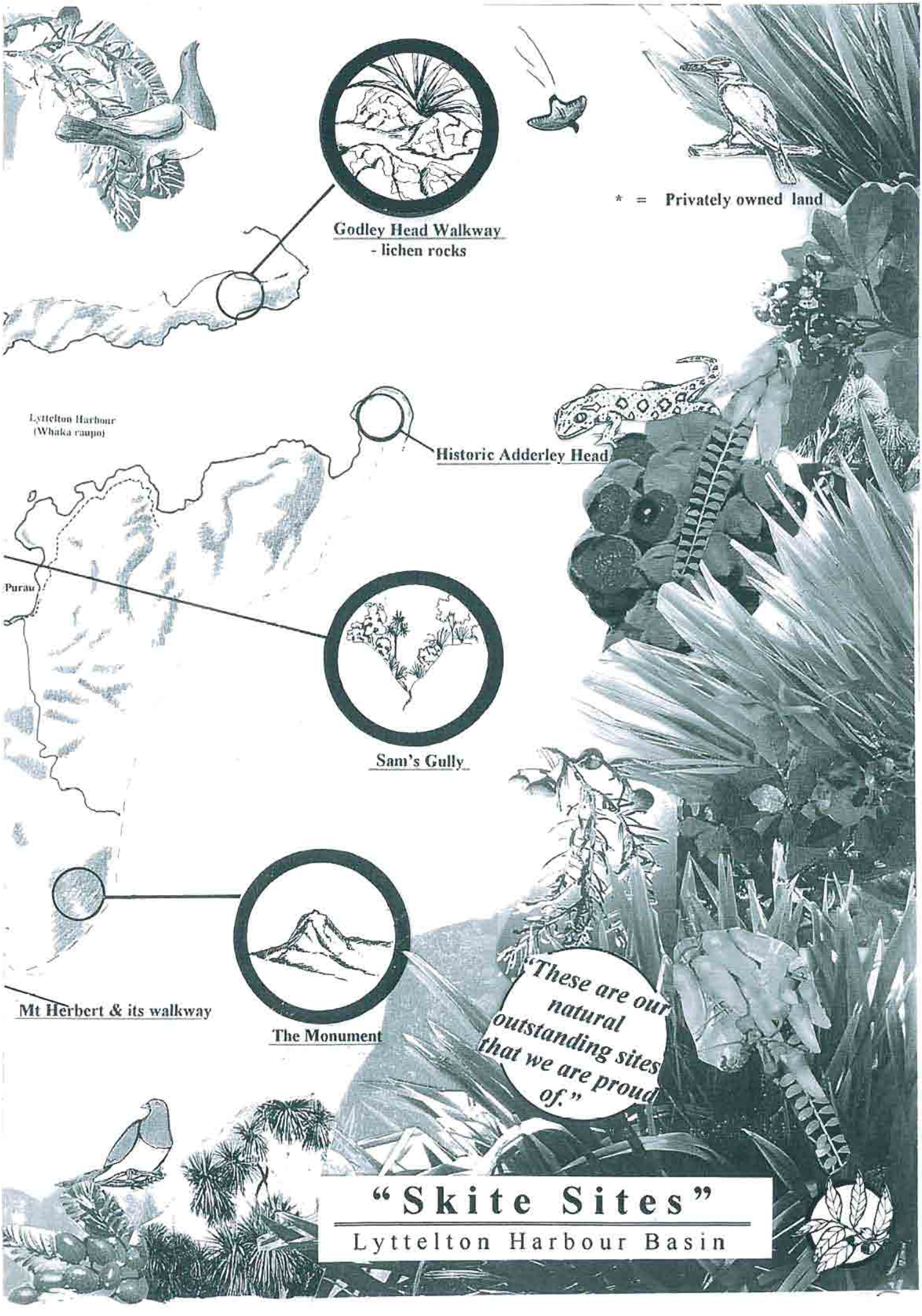
Native plants and animals do not belong uniformly throughout the Basin. The Basin is diverse with many different natural habitats and each species is adapted to part of this range. Habitats are a product of microclimate, topography and substrate - or the soil (shallow, deep, dry, wet, rich, poor). The book provides a guide for recognising and responding to the underlying natural conditions - a framework for recognising and restoring the natural patterns of life in the Lyttelton Harbour Basin. It is ultimately **a plan for action**.

The guide emphasises the historic and contemporary bold **'dynamic processes'** of whole soil-defined **ecosystems** - both destructive and rebuilding. We are reminded that protecting natural sanctuaries or seed sources (e.g. "skite site" remnants), encouraging natural regeneration by controlling weeds and pests, **and** planting trees, are all essential means to the goal of achieving visually and ecologically sustainable, indigenous ecosystems in the Basin. Each system comprises characteristic plants, animals, microbes and their functional linkages that bind them together.

As an information base for restoring and celebrating the nature of the Basin, the guide:

There is never an end to discovery. This guide is therefore a stimulus, a methodology or framework for further discovery. The information presented here is the best available, but you will improve on it a little bit every time you step outside and look around or watch a plant grow.


Witch Hill *
(View from the Summit Road)
Taukahara Bush *
(Private Maori land. View from Governors Bay Road or Summit)
Tors Scenic Reserve
Mt Pleasant Bluffs
(Walking track access)
Sugarloaf Reserve
Bushy backdrop to Governors Bay*
(Summit Road Society land.
Public access on tracks permitted)
Rapaki
Cass Bay
Corsair Bay
Lyttelton
Quail Island
(Otamahua)
Diamond Harbour
Governors Bay
Church Bay
Charteris Bay
Teddington
Ohinetahi Volcanic Trachyte Cavern
Living Springs
ancient Kahikatea Tree *
(Private land. Permission to view from Living Springs Conference Centre)
Head of the Bay's salt marshes
Remnant bush
Private land. Access provided, but keep to track)
Mt Bradley's ring of bluffs
& sub alpine vegetation
Magnificent Gully & Big Rock
in Orton Bradley Park
Remarkable Dykes


Godley Head Walkway
- lichen rocks
* = Privately owned land
Lyttelton Harbour
(Whaka raupo)
Historic Adderley Head
Purau
Sam's Gully
Mt Herbert & its walkway
The Monument
"These are our natural outstanding sites that we are proud of."
"Skite Sites"
Lyttelton Harbour Basin

Native Wildlife of the Harbour Basin

"In the bush that lined the shore, the bellbirds were singing loudly while two woodpigeons, stuffed fat with fuchsia berries, sat lazily on a branch." The basin, a world of birds and bush." "The scrub was not easy to walk through either. It was gay with fantails flitting and swooping everywhere, and bellbirds singing as they searched for the late berries.." "They worked across to the spur on the right, slowly descending. The birds were out for their afternoon feeding. On the ground there were saddlebacks and a pair of the orange-wattled crows, while friendly tomtits and brown bush-robins chattered from the low branches ..." (Elsie Locke, *The Runaway Settlers)*

A diversity of native wildlife belong in the different Harbour Basin ecosystems, hinted at by the "signature" names and drawings developed for this project. Providing suitable plant cover for food and shelter can encourage native birds, insects & lizards. Minimising threats and disturbances will help too, e.g. cat & possum management.

LIZARDS

At least two gecko and one skink species live on the hills - jewelled and common gecko, and common skink. Leave them alone! To encourage lizards, provide suitable predator-proof retreats - safe from domestic cats. A substrate of rocks, logs, or a deep litter layer will provide ideal permanent cover. Over this substrate, plant a vegetation cover including low growing shrubs, such as *Coprosma* spp., a tangle of shrubby pohuehue (*Muehlenbeckia* spp.) or a dense sward of grasses. Many of the native shrubs have the added bonus of providing fruit which will be eaten by lizards. Some are noted on the plant lists - blue or purple fruits are thought to be particularly appealing!

INSECTS

Occurring through central and western Banks Peninsula, Canterbury Tree Weta, *Hemideina femorata*, is one of New Zealand's six tree wetas. It's a forest dweller found mainly in kanuka treelands - so keep old kanuka, plant lots more, and let logs lie. The endemic Banks Peninsula Tree Weta, *H.ricta*, is found further to the west.

BIRDS

Native vegetation provides cover and nesting opportunities for native birds. Vegetation directly or indirectly supplies food from flowers, fruit, buds and foliage. Some particularly important trees and shrubs are shown on the Floral & Food Calendar opposite. Of the limited food available in winter, the fruits of five-finger and lancewood are reputedly "breeding food" for kereru and very important for bellbird. The return of miro trees to the Harbour Basin would be welcomed as, along with pigeonwood, matai and titoki, miro fruits are a renowned kereru food - a kereru is thus shown reaching for miro fruit as the Calendar centrepiece.

Insects associated with plants are an important food resource for birds such as korimako (bellbird), riroriro (grey warbler), pipipi (brown creeper), piwakawaka (fantail), ngiru-ngiru (tomtit), tauhou (silvereye) and pipiwharauroa (shining cuckoo). Insect-eating bush birds that have been displaced in the ecosystems of the Harbour Basin include the rifleman (titi pounamu) and mohua (yellowhead). The pipipi (brown creeper), ngiru-ngiru (tit) and karearea (falcon) are rarely seen here. The nectar-feeding bellbird is resident but the tui had gone. [STOP PRESS The tui has again been seen in the Basin! Autumn 2000]

Favoured local indigenous plant foods of the kereru (NZ pigeon) and korimako (bellbird) include:

Fruits of:

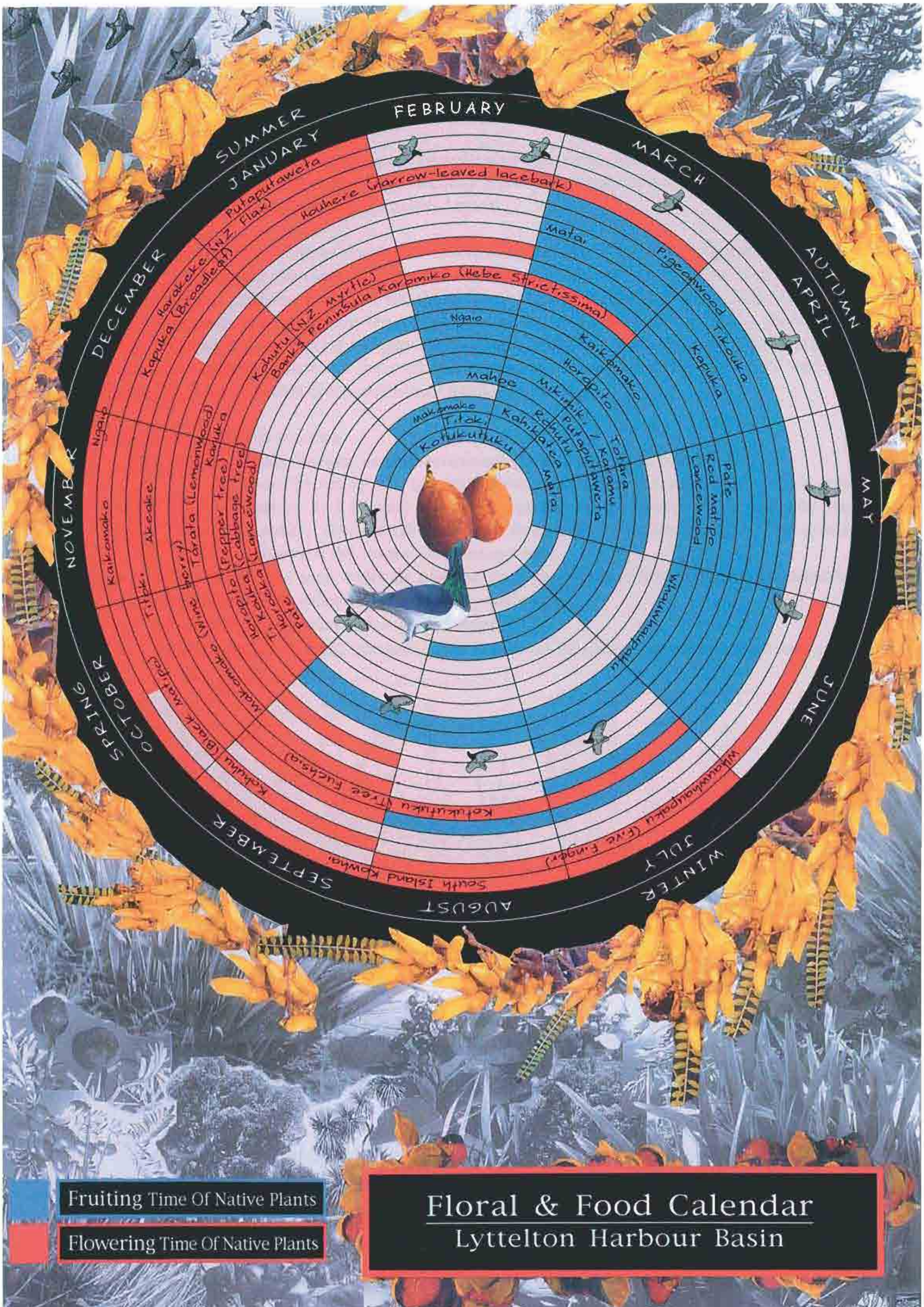
Alectryon excelsus	titoki
Aristotelia serrata	makomako, wineberry
Carpodetus serratus	putaputaweta, marbleleaf
Coprosma spp.	mikimiki, karamu, etc.
Cordyline australis	ti kouka, cabbage tree
Coriaria arborea	tutu
Corokia cotoneaster	korokio
Dacrycarpus dacrydioides	kahikatea, white pine
Fuchsia excorticata	kotukutuku, tree fuchsia
Griselinia spp.	kapuka; puka
Hedycarya arborea	porokaiwhiri, pigeonwood
Lophomyrtus obcordata	rohutu, NZ myrtle
Macropiper excelsum	kawakawa
Melicytus ramiflorus	mahoe, whiteywood
Myoporum laetum	ngaio
Myrsine australis	mapou, red matipo
Passiflora tetrandra	kohia, native passionvine
Pennantia corymbosa	kaikomako
Pittosporum spp.	kohuhu, tarata
Podocarpus spp.	totara, mountain totara
Prumnopitys spp.	miro, matai
Pseudopanax arboreus	whauwhaupaku, five-finger
Pseudopanax crassifolius	horoeka, lancewood
Pseudowintera colorata	horopito, pepperwood
Ripogonum scandens	kareao, supplejack
Rubus spp.	tataramoa, lawyers
Schefflera digitata	patete
Streblus heterophyllus	turepo, small-leaved milk tree

Buds and leaves of:

Aristotelia serrata	makomako, wineberry
Carpodetus serratus	putaputaweta
Coprosma spp.	mikimiki, karamu, etc.
Fuchsia excorticata	kotukutuku, tree fuchsia
Griselinia spp.	kapuka, broadleaf; puka
Melicytus ramiflorus	mahoe, whiteywood
Muehlenbeckia spp.	pohuehue
Plagianthus regius	manatu, ribbonwood
Pseudopanax spp.	horoeka; whauwhaupaku
Sophora microphylla	South Island kowhai

Flowers or nectar of:

Fuchsia excorticata	kotukutuku, tree fuchsia
Phormium tenax	harakeke, flax
Pseudopanax spp.	horoeka; whauwhaupaku
Rubus schmidelioides	tataramoa fine bush lawyer
Sophora microphylla	South Island kowhai


SUMMER
JANUARY
FEBRUARY
MARCH
AUTUMN
APRIL
MAY
JUNE
WINTER
JULY
AUGUST
SEPTEMBER
SPRING
OCTOBER
NOVEMBER
DECEMBER
Putaputaweta
Houhere (narrow-leaved lacebark)
Harakeke (N.Z. Flax)
Kapuka (Broadleaf)
Kohutu (N.Z. Myrtle)
Banks Peninsula Koromiko (Hebe strictissima)
Matai
Pigeonwood
Tikouka
Kapuka
Ngaio
Kaikomako
Horopito
Mahoe
Mikimiki
Putaputaweta
Kohutu
Kahikatea
Makomako
Titoki
Kotukutuku
Totara
Kaikomako
Matai
Pate
Red Matipo
Lancewood
Whauwhaupaku
Ngaio
Kaikomako
Akeake
Titoki
Torata (Lemonwood)
Karamu
Kohuhu
Mako
Horopito (Pepper tree)
Ti Kouka (Cabbage tree)
Horoeka (Lancewood)
Pate
Makomako (Wine berry)
Makomako (Black matipo)
Kohuhu (Black matipo)
Kotukutuku (Tree fuchsia)
South Island Kowhai
Whauwhaupaku (Five finger)
Fruiting Time Of Native Plants
Flowering Time Of Native Plants
Floral & Food Calendar
Lyttelton Harbour Basin

Ecosystems of the Lyttelton Harbour Basin

The Lyttelton Harbour Basin **landscape is complicated** with twists and turns, gullies and flats, highs and lows, hard rock and soft clayey loess, wet bits and dry bits, salty beaches and leached out tops - all shoe-horned into a relatively small, enclosed space.

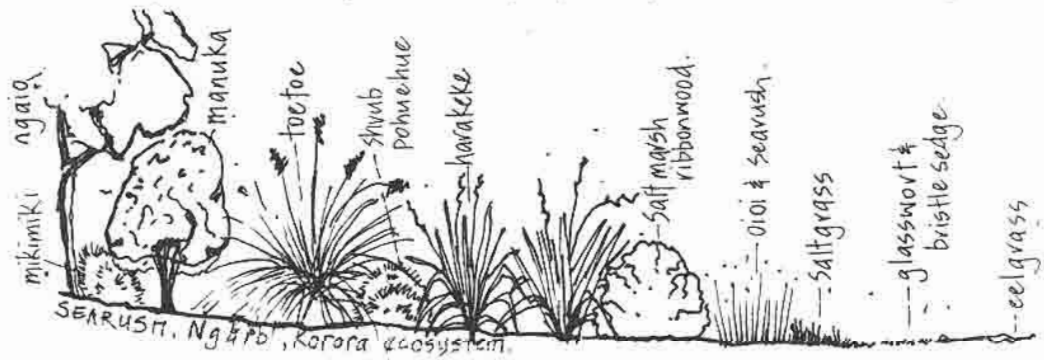
From an understanding of the geological, landform, soil, drainage, climate, and vegetation patterns of the Basin, we interpret the plant habitats and establish a **guide for revegetation** that attempts to mirror the natural patterns, albeit in a simplified form. The key to knowledge and restoration of the natural vegetation, and eventually the whole ecosystem, is characterisation of the place and its potential to support plant species and growth. We start by broadly subdividing the Basin into major habitats or ecosystems. These are depicted and located in the accompanying panoramas and block diagrams. Each ecosystem is given a signature symbol and colour.

Coastal dunes, cliffs and marshes:

SEA RUSH, Ngaio, korora, coastal ecosystem (beach, marsh & rock)

Near the sea are the coastal environments which are dominated by herbaceous, tussock and shrubby vegetation because of the limitations imposed by stress (salinity, tidal inundation) and disturbance (erosive wind). The principal habitats of the coastal environment are:

- some very limited sand dunes or **beaches** near the mouth of the Harbour (associated with what is technically called *Taylors Mistake* sandy soils);
- **salt marsh** (*Motukarara* saline gleyed soils);
- **coastal slopes and cliffs** (predominantly dry, rocky or shallow *Evans* steepland soils);



Above the strandline of **beaches** are naturally found sand binders such as pingao, spinifex, and sand convolvulus. On the more stable sand dunes are opportunities for coastal bush species - ngaio, akeake, and golden akeake and small-leaved shrubs (see *Indigenous Ecosystems of Otautahi Christchurch, Sets 3 & 4.* Lucas Associates, 1997).

The **salt marshes** comprise three zones. The lower marsh is of short herbaceous turfs of glasswort, selliera and bristle sedge; the taller sea rush may extend down into this zone. The middle marsh supports oioi, sea rush, and native celery. The upper marsh is recognised by the dominance of saltmarsh ribbonwood with some harakeke, toetoe, mikimiki, shrub pohuehue, and manuka.

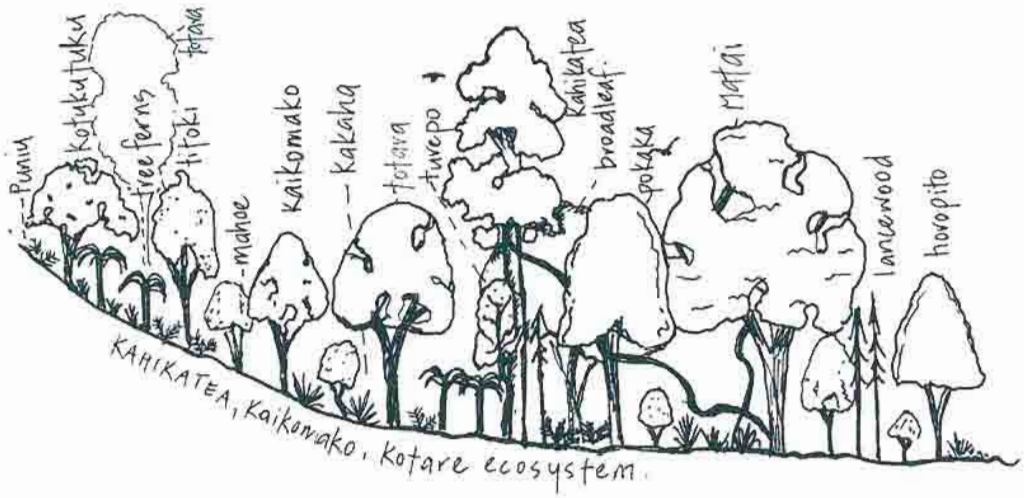
The **rocky** hard shore has, first a band of lichens - like splashes of white, black, and orange paint, a zone of herbaceous and grassy species, and a higher zone of shrubs grading up into coastal bush.

Moist-wet soils of flats and sheltered gullies:

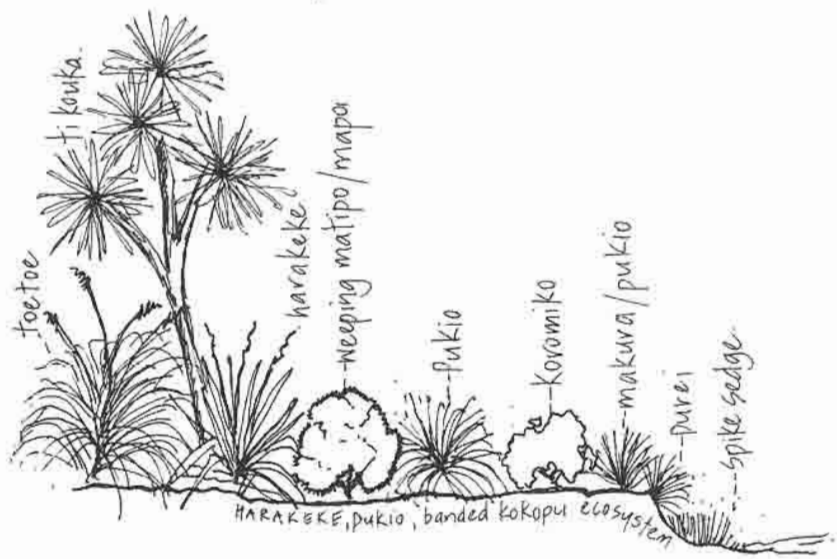
KAHIKATEA, Kaikomako, kotare, gully & swamp forest ecosystem

HARAKEKE, Pukio, banded kokopu, swamp & stream ecosystem &

These are the wet, swampy, or riparian (stream side) habitats. Seepages are present on slopes from near the tops of the hills all the way down to the base which support harakeke, sedges and rushes. Before farmers drained the flats, valley swamps existed with wet, gleyed soils (*Horotane)* on alluvium and toe-slopes of the surrounding hills. Harakeke, toetoe, tussock sedges and rushes, and the woody mikimiki, cabbage trees, manuka and lowland ribbonwood (manatu), with raupo in the wettest places, and would have eventually reverted to the original mature swamp forest of kahikatea, pokaka, and a diverse array of other hardwood trees and shrubs, ferns, lilies, grasses and mosses.



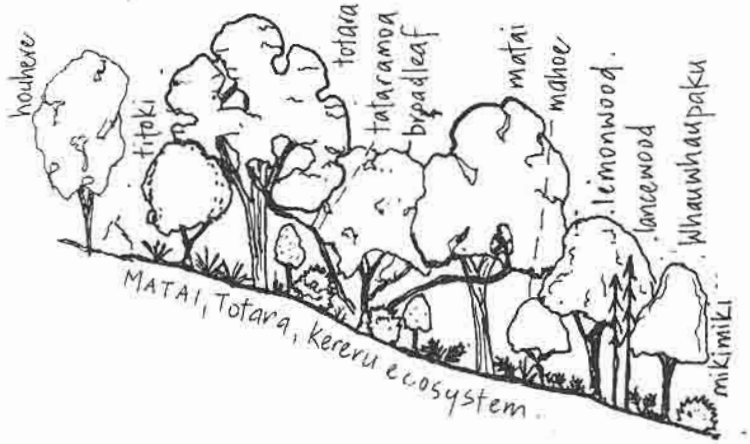
On the broader valley floors, eg. Purau and Orton Bradley Park, are meandering streams whose banks supported tussock sedges and rushes, bog rush, spike sedge and koromiko. On the other hand, the moist but well-drained, shady and sheltered gullies are a haven for a variety of sensitive species such as kawakawa, patete, tree fuchsia, titoki, tree ferns, pigeon-wood, and marble leaf, as well as some of the swamp forest inhabitants.



Deep, rich, well-drained soils of hillslopes:

MATAI, Totara, kereru, moist forest ecosystem

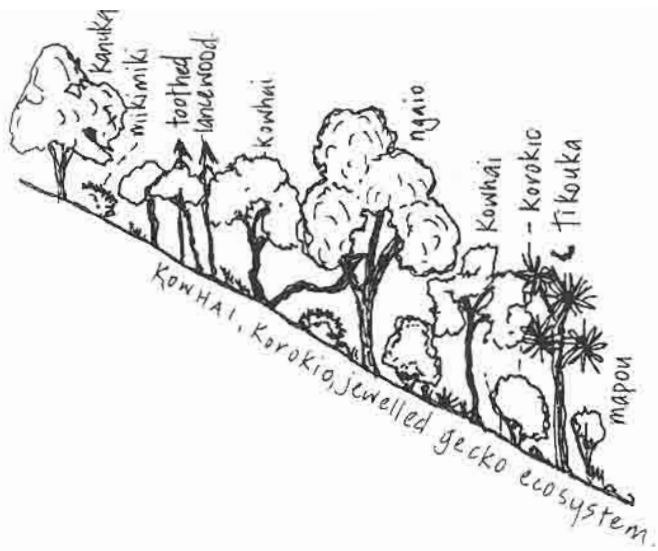
The deep soil environments from loess, and mixed volcanic and loess colluvium on slopes and upper shoulders, and rolling toe-slope fans, represent a whole range of subtle variations - moderately well-drained, toe-slope fans (part *Heathcote* soils), imperfectly drained loessial soils on gentle slopes (*Takahe* soils), moderately well-drained *Kiwi* soils on side slopes, moderately well to imperfectly drained *Clifton* soils on mixed loess and volcanic colluvial slopes, well-drained *Akaroa* soils on loess over sandstone in the Gebbies Pass area on rolling land, imperfectly drained *Pawson* soils on side slopes, and moderately well-drained *Rapaki* volcanic soils on gentle upper slopes. The vegetation on these middle slopes would have been varying dominance of totara and matai and a mix of hardwood canopy trees - mahoe, lemonwood, narrow-leaved lacebark, and broadleaf.



Rocky, steep slopes with shallow, very well-drained soils:

KOWHAI, Korokio, jewelled gecko, dry, rocky ecosystem

The rocky environments form an altitudinal sequence of shallow soils derived from the underlying volcanic rocks with *Evans* steepland soils on lower, steep dry sites, *Cashmere* soils on lower elevation gently sloping shoulders, and *Stewart* steepland soils on higher more humid slopes. The natural vegetation of these sites are drought-tolerant trees and shrubs such as ngaio, kowhai, kanuka, golden akeake, five-finger, cabbage tree, small-leaved shrubs, vines, short tussocks, and small herbs. Higher up on humid and shady sites a greater range of forest species can survive.



Subalpine hill summits and crests in higher rainfall zone:

KAIKAWAKA, Inaka, karearea, humid sub-alpine ecosystem

On the high summits are humid, exposed environments and some areas of gentle, plateau terrain. Pockets of deep (*Summit, Bossu*) and shallower moist soils (parts *Stewart* and *Rapaki*) supported mountain totara, cedar, mountain five-finger, and sub-alpine shrublands of mountain holly, inaka, small koromiko and tall tussock. Today, these uplands are dominated by tussock grasses - silver tussock, hard tussock, snow tussock, and the sub-alpine bush tussock with shrubland and forest on shady crags.

Most of the above ecosystems will eventually become forested, but would normally go through several stages from grassland, bracken fernland, shrubland, kanuka woodland (below 600 m), and eventually the tall podocarp (e.g. totara, matai) forest. The loss of forest and reversion to grass, bracken and scrub has been induced by cutting, burning and grazing.

Some of the notable examples of these ecosystems and geological features are represented as "skite sites" (see pages 3-4).

For each ecosystem type plant lists have been developed (pages 17-27). These lists provide a guide to species that can reasonably be planted for habitat restoration and for local identity. A full list of plant species known to belong in the Harbour Basin is also provided (pages 32 - 42).

Ecosystems of the Lyttelton Harbour Basin

The combination of the various landforms, substrates and species distinguish each ecosystem. As well as being ecologically characterised, ecosystems have a "signature" name, colour and graphic symbol - an icon. A "signature" depicts the land type plus two plants and an animal that belong there. The species of each "signature" symbolise that ecosystem, but are not necessarily confined there. Some plants, like kowhai and harakeke, are wide ranging. The soil types included in each ecosystem are also noted.

BLUE

SEA RUSH,
Ngaio, korora,
coastal ecosystem (marsh, rock & beach)

(*Motukarara, Taylors Mistake*, & part *Evans* soils)

GREEN

KAHIKATEA,
Kaikomako, kotare,
gully & swamp forest ecosystems

(*Horotane* & part *Heathcote* soils)

&

HARAKEKE,
Pukio, banded kokopu,
swamp & stream ecosystem

(*Horotane* & part *Heathcote* soils)

ORANGE

MATAI,
Totara, kereru,
moist forest ecosystem

(*Heathcote, Takahe, Pawson, Akaroa, Rapaki, Kiwi Hill* & *Clifton* soils)

BROWN

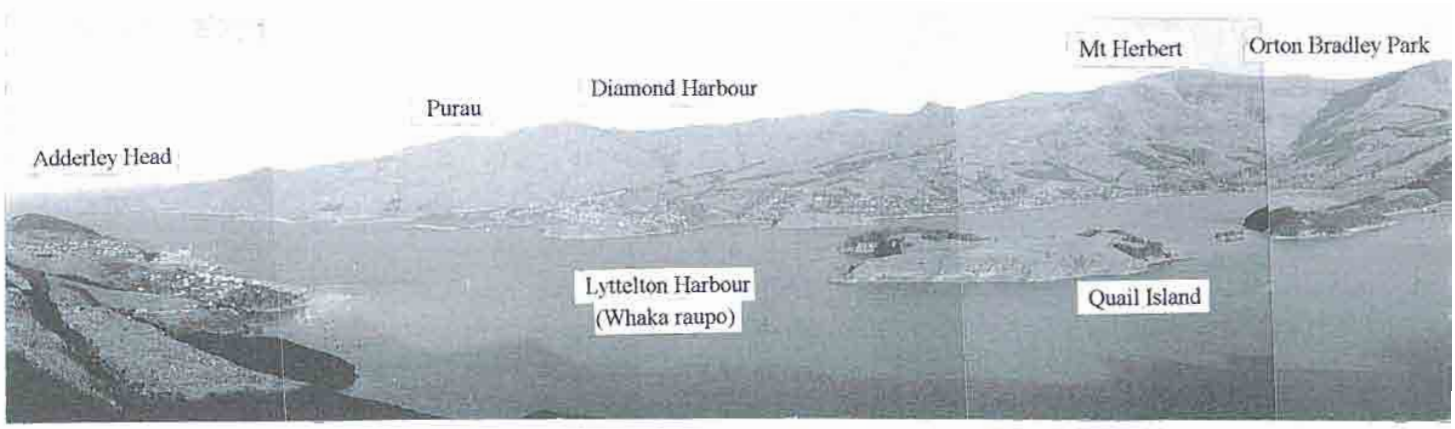
KOWHAI,
Korokio, jewelled gecko,
dry, rocky ecosystem

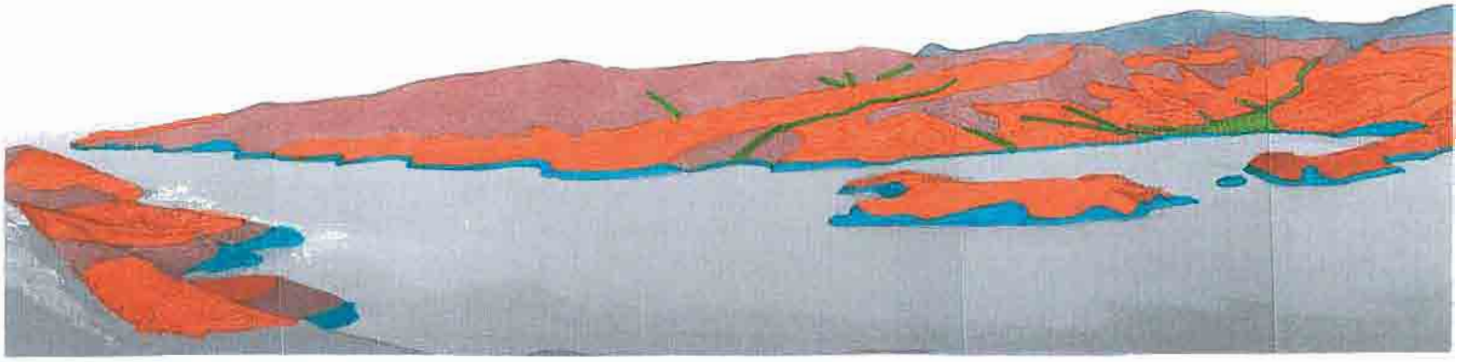
(*Cashmere, Stewart* & *Evans* soils)

GREY

KAIKAWAKA,
Inaka, karearea,
humid sub-alpine ecosystem

(*Bossu, Summit, Rapaki* & part *Stewart* soils)





SEA RUSH,
Ngaio, korora,
coastal ecosystem (rock, beach & marsh)

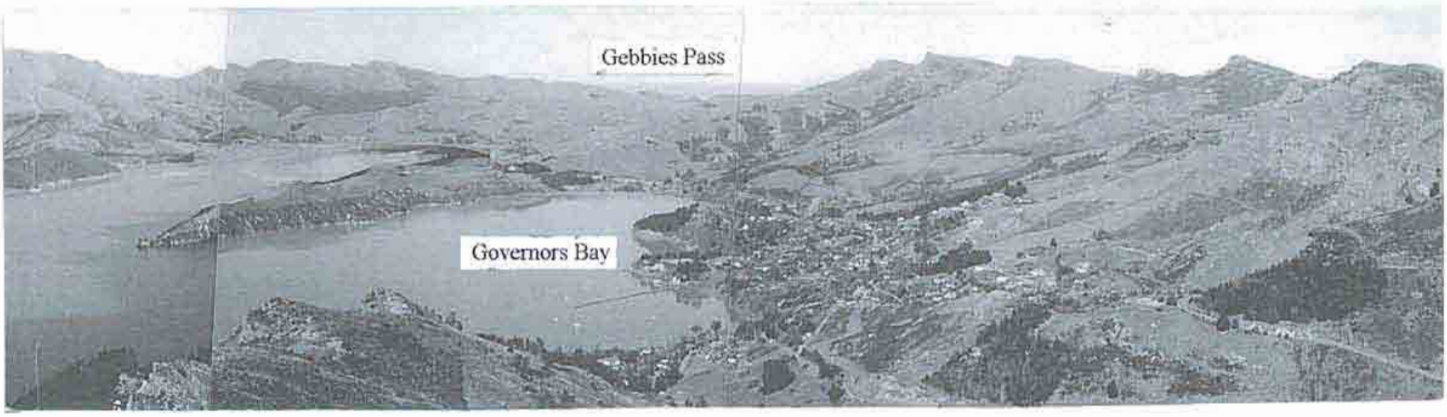
KAHIKATEA,
Kaikomako, kotare,
gully & swamp forest ecosystem

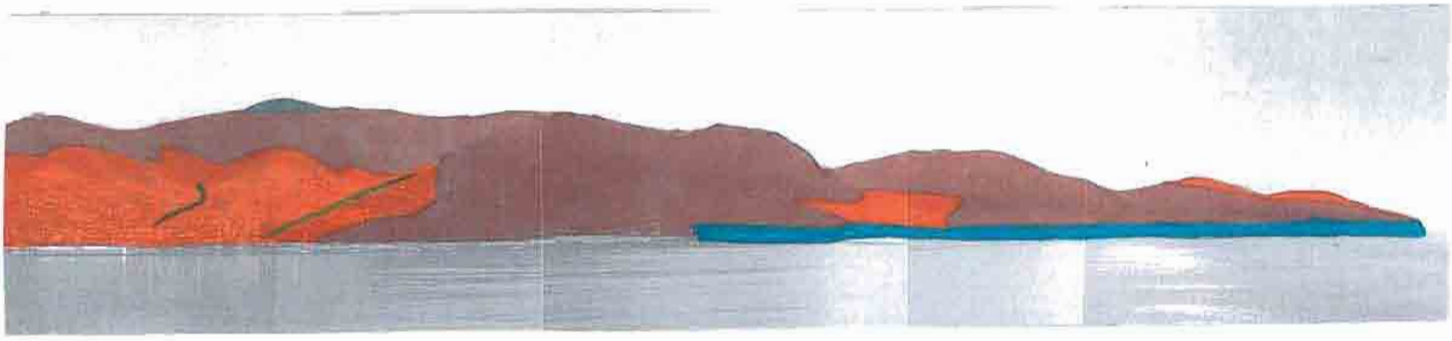
& HARAKEKE,
Pukio, banded kokopu,
swamp & stream ecosystem

MATAI,
Totara, kereru,
moist forest ecosystem

KOWHAI,
Korokio, jewelled gecko,
dry, rocky ecosystem

KAIKAWAKA,
Inaka, karearea,
humid sub-alpine ecosystem



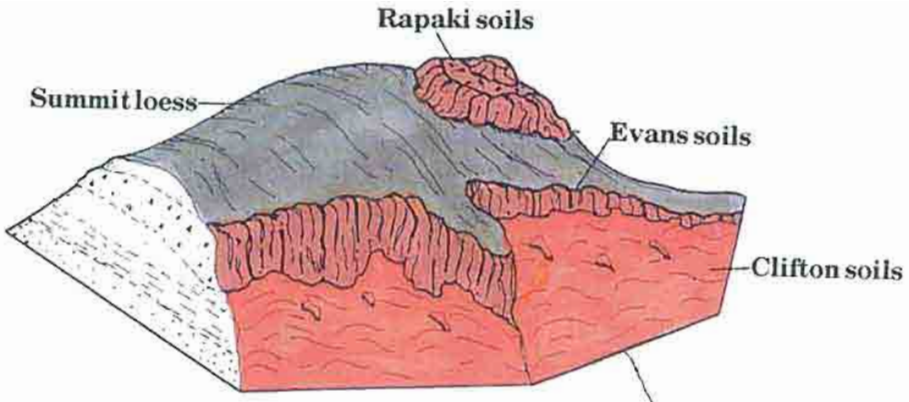


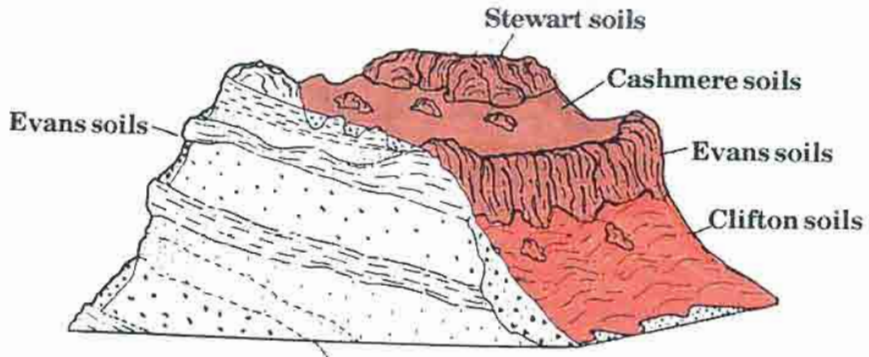
"What colour Ecosystem are you in ?"

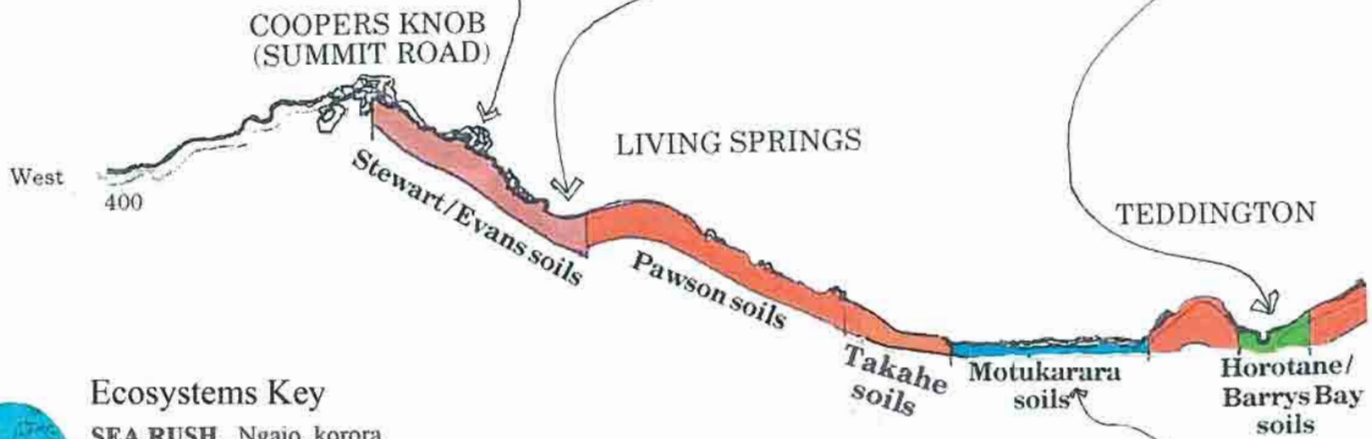
Ecosystem Panoramas

Lyttelton Harbour Basin

"What type of soil and ecosystem is your patch?"







Ecosystems Key

SEA RUSH, Ngaio, korora,
coastal ecosystem (marsh, rock & beach)
(*Motukarara, Taylors Mistake*, & part *Evans* soils)

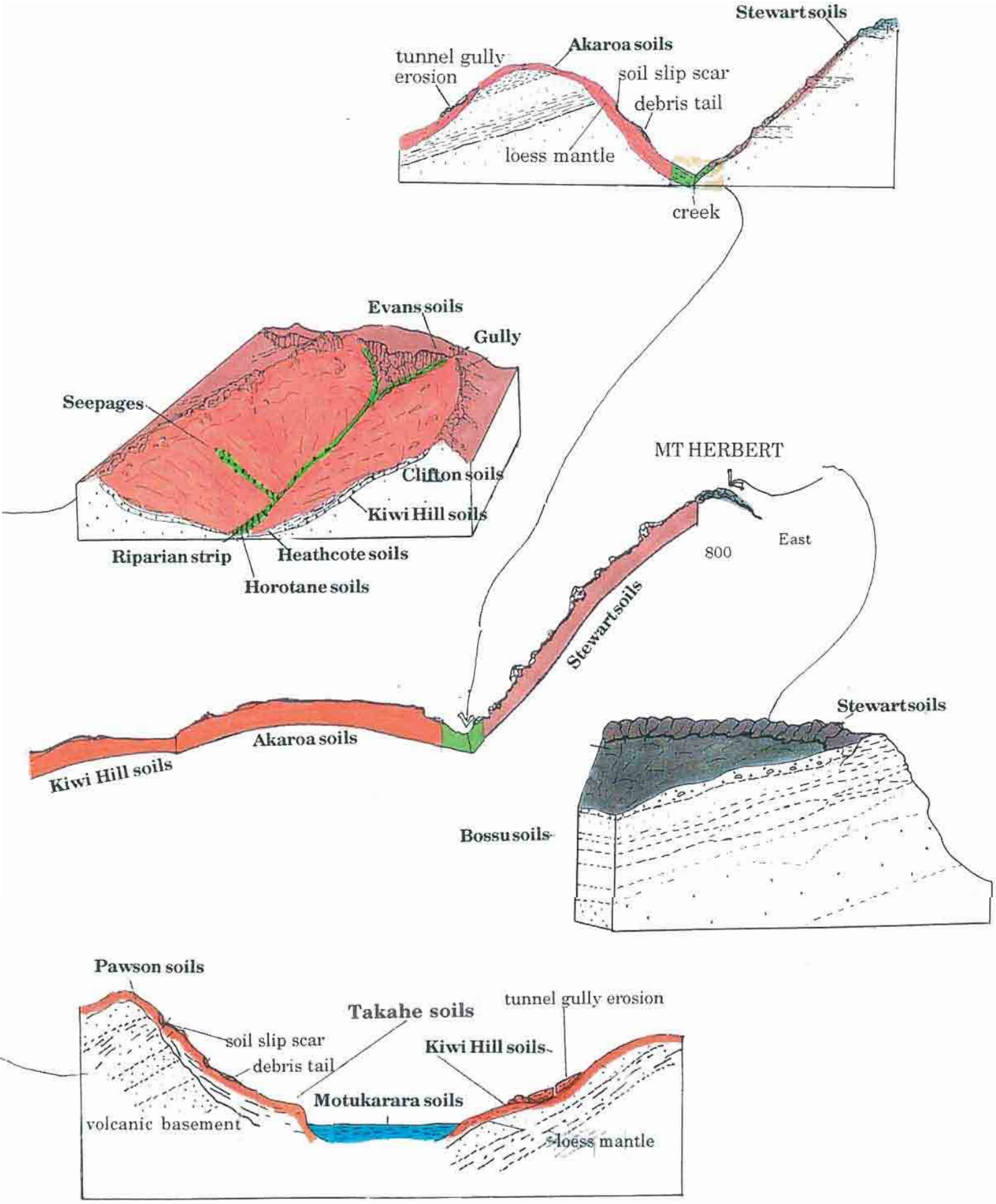
KAHIKATEA, Kaikomako, kotare,
gully & swamp forest ecosystems
(*Horotane* & part *Heathcote* soils)

& **HARAKEKE,** Pukio, banded kokopu,
swamp & stream ecosystem
(*Horotane* & part *Heathcote* soils)

MATAI, Totara, kereru,
moist forest ecosystem
(*Heathcote, Takahe, Pawson, Akaroa, Rapaki, Kiwi Hill & Clifton* soils)

KOWHAI, Korokio, jewelled gecko,
dry, rocky ecosystem
(*Cashmere, Stewart & Evans* soils)

KAIKAWAKA, Inaka, karearea,
humid sub-alpine ecosystem
(*Bossu, Summit, Rapaki* & part *Stewart* soils)



Soils - Land Types - Ecosystems

Lyttelton Harbour Basin

SEA RUSH,
Ngaio, korora,
coastal ecosystem
(rock, beach & marsh)

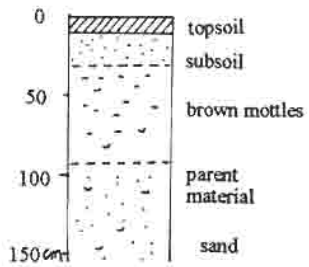
PLANT TOLERANCES:
for sunny, shady, wet , dry and windy conditions shown as:
■ = tolerates or needs
□ = intolerant
½ = tolerant of some
W= tolerates wet or flooded
* = frost tender

FOOD: *for native birds:*
f = Fruit/seed
n = Nectar
b = Bud/foliage and
i = Insects
Plus l = Fruit for *lizards*

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

Landform key at end of list

Motukarara
Soil Profile



Sub-humid, flat to gently undulating harbour margin mudflats, of poorly drained, saline, silts and clays, and minor sand dunes & / or flat to gently sloping valley floors and toe slopes of poorly drained mixed loess and volcanic colluvium and alluvium; steep rocky cliffs with volcanic soils.

PLANT LISTS

		Landform	Tolerances: sun	shade	wet	dry	wind	Food
Trees & Tall Shrubs								
Corynocarpus laevigatus	karaka (pre-European introduction)	▲	■	½	½	■	■ *	f
Coprosma repens	taupata (pre-European introduction)	▲	■	½	□	■	■ *	f
Dodonaea viscosa	**akeake**	▲	■	□	□	■	■ *	
Myoporum laetum	**ngaio**	▲	T ■	½	■	■	■ *	f n
Solanum aviculare	poroporo	▲	T ■	½	½	■	■ *	f
Solanum laciniatum	poroporo	▼	T ■	½	½	■	■ *	f
Shrubs								
Carmichaelia australis	**a NZ broom**	▼	■	□	□	■	■	i
Cordyline australis	**ti kouka, cabbage tree**	▼	■	½	■	■	■	f n i
Coprosma crassifolia	**thick-leaved mikimiki**	▼	■	½	■	■	■	f l
Coprosma propinqua	**mikimiki**	▼	■	■	■	■	■	f i l
Corokia cotoneaster	**korokio**	▲	■	½	□	■	■	f
Helichrysum lanceolatum	niniao	▲	■	□	½	■	■	i
Leptospermum scoparium	manuka, tea tree	▲	■	□	■	■	■	n i
Melicytus alpinus	porcupine shrub	▲	■	□	□	■	■	f l
Muehlenbeckia astonii	**shrubby pohuehue** (in adj. Ecol. Dist.)	▼	■	□	½	■	■	f n l
Muehlenbeckia complexa	**pohuehue**	▼	■	□	½	■	■	f b l
Plagianthus divaricatus	**salt marsh ribbonwood**	♣	■	□	■	□	■	i
Tussocks, Reeds & Flaxes								
Bolboschoenus caldwellii	a clubrush	ww	W	■	□	■	□	■
Carex litorosa	shore sedge	ll		■	□	■	□	■
Cortaderia richardii	**toetoe**	♣		■	□	■	■	■
Cyperus ustulatus	umbrella sedge, upoko tangata	♣		■	□	■	½	■
Hierochloe redolens	holy grass, karetu	♣		■	□	■	½	■
Juncus maritimus	**sea rush**	—	W	■	□	■	□	■
Leptinella dioica	cotula	ll		■	½	½	½	■
Leptocarpus similis	**oioi, jointed wire rush**	ll	W	■	□	■	□	■
Phormium tenax	**harakeke, NZ flax**	♣	W	■	□	■	■	■ n
Schoenoplectus pungens	three-square	ll	W	■	□	■	□	■
Schoenoplectus validus	**lake club rush**	ww	W	■	□	■	□	■

		Landform	Tolerances (sun, shade, wet, dry, wind)	
Vines & Scramblers				
Clematis afoliata	pohue, leafless scrambling clematis	▼	■□□■■	i
Rubus schmidelioides	tataramoa, fine bush lawyer	▲	■½½■■	f
Groundcovers				
Apium prostratum	sea celery	II	■½½½■	*
Lachnagrostis littoralis subsp. salaria		♣	■□□■■	
Chenopodium glaucum		II	■□½■■	*
Cotula coronopifolia	bachelors button	II	■□■□■	
Crassula sinclairii		—	■□■□■	
Disphyma australe	**NZ ice plant**	▼	■½½½■	*
Elymus solandri	blue wheat grass	▼	■□□■■	
Einadia allanii		▼	■½□■■	
Haloragis erecta		▼	■½□■½	
Isolepis cernua	bristle sedge	≡	■□■□■	
Isolepis nodosa	**knobby clubrush**	▼	■½□■■	
Libertia ixioides	mikoikoi, NZ iris	▲	■■½■■	
Lilaeopsis novae-zelandiae		≡	■□■□■	
Limosella lineata	NZ mudwort	—	■□■½■	
Linum monogynum	rauhuia	▼	■□□■■	
Luzula banksiana	NZ wood rush	▲	■□□■■	
Microlaena polynoda	creeping rice grass	▲	½½□■□	
Microlaena stipoides	meadow rice grass	▼	□■□■■	
Mimulus repens	sea musk	II	■□■□■	*
Poa cita	**silver tussock, wiwi**	▼	■□■■■	
Puccinellia stricta / novae-zelandiae	saltmarsh grass	≡	■□■□■	
Pyrrosia eleagnifolia	leather leaf fern	▼	■½□■■	*
Rytidosperma spp.	danthonia bunch grasses	▼	■□□■■	
Sarcocornia quinqueflora	glasswort	≡	■□■½■	
Samolus repens	moakoakoa, sea primrose	II	■□■½■	
Selliera radicans	**selliera**	II	■□■½■	
Suaeda novae-zelandiae		II	■□■½■	
Tetragonia trigyna	**NZ spinach**	▼	■½□■½	*
Triglochin striatum	arrow grass	II	■½■□■	
Zostera muelleri	eel grass	—	■□■□■	
Ground Ferns				
Asplenium oblongifolium	**shining spleenwort**	▼	½■□½□	*
Asplenium obtusatum	coastal spleenwort	▼	■□½■■	*

Landform Key:

- ♣ = upper salt marsh - minor salinity
- II = middle saltmarsh - moderate salinity
- ≡ = lower marsh - high salinity
- ww = brackish aquatic emergent species
- — = bare mud
- ▲ = higher ridges, banks or gullies
- ▼ = lower ridges or banks

korora = white-flippered penguin

For additional information on sand dune plantings
refer to Indigenous Ecosystems of Otautahi Christchurch - Set 4

KAHIKATEA,
Kaikomako, kotare,
gully & swamp forest ecosystem

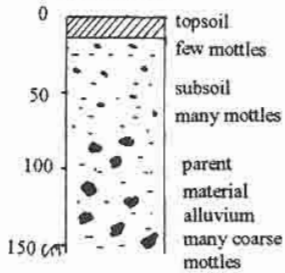
PLANT TOLERANCES:
for sunny, shady, wet , dry and windy conditions shown as:
■ = tolerates or needs
□ = intolerant
½ = tolerant of some
* = frost tender

FOOD: *for native birds:*
f = Fruit/seed
n = Nectar
b = Bud/foliage and
i = Insects
Plus **l** = Fruit for ***lizards***

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

Landform key at end of list

Horotane / Barrys Bay
Soil Profile



Sub-humid, flat to gently sloping valley floors and lower toe slopes of poorly drained mixed loess and volcanic colluvium and alluvium.

PLANT LISTS

				Tolerances	
Tall Trees		**Landform**	**Elevation (m)**	sun shade wet dry wind	**Food**
Dacrycarpus dacrydioides	**kahikatea, white pine**	– V	5 - 500	■ ½ ■ □ ■	f i
Elaeocarpus hookerianus	**pokaka**	–	15 - 510	■ ½ ■ □ □	f i
Podocarpus totara	totara	– V	20 - 460	■ ½ ■ ■ ■	f b i
Prumnopitys ferruginea	miro	– V	40 - 320	½ ■ ½ □ □ *	f
Prumnopitys taxifolia	matai, black pine	– V	20 - 650	■ ½ ■ ½ ■	f b i
Trees & Tall Shrubs					
Alectryon excelsus	titoki	V–	40 - 320	½ ■ ½ □ □ *	f i
Carpodetus serratus	putaputaweta, marbleleaf	V–	80 - 800	½ ■ ■ □ □ *	f b i
Coprosma linariifolia	yellow-wood	– V	15 - 750	½ ■ ■ ½ ½	f l
Coprosma robusta	**karamu**	– V	5 - 620	■ ■ ■ ■ ■	f
Coprosma rotundifolia	round-leaved coprosma	V–	30 - 750	½ ■ ■ ½ ½ *	f
Cordyline australis	**ti kouka, cabbage tree**	– V	10 - 650	■ ½ ■ ■ ■	f n i
Coriaria arborea	tree tutu	V	5 - 155 T	■ ½ ■ ½ □	f
Fuchsia excorticata	kotukutuku, tree fuchsia (deciduous)	V	10 - 800	½ ½ ½ □ □ *	f n
Griselinia littoralis	**kapuka, broadleaf**	– V	15 - 800	■ ■ ■ ■ ■	f b i
Griselinia lucida	kapuka, broadleaf	V–	15 - 200	■ ■ □ ■ ■ *	f b i
Hedycarya arborea	porokaiwhiri, pigeonwood	V	6 - 645	½ ½ ½ □ □ *	f i
Leptospermum scoparium	manuka, tea tree	–	90 - 650	■ □ ■ ■ ■	n i
Lophomyrtus obcordata	rohutu, NZ myrtle	– V	10 - 440	■ ■ ■ ■ ■	f
Macropiper excelsum	kawakawa	V	5 - 500	½ ½ ■ ■ ½ *	f
Melicytus ramiflorus	mahoe, whiteywood	V	5 - 700	■ ■ □ □ ■ *	b n i
Myrsine australis	mapou, red matipo	V–	10 - 700	■ ■ □ ■ ■ *	f i
Pennantia corymbosa	kaikomako	–	5 - 440	½ ½ ■ □ ½	f n i
Pittosporum eugenioides	**tarata, lemonwood**	V–	10 - 800	■ ■ ■ ■ □	f i
Pittosporum tenuifolium	**kohuhu, black matipo**	– V	10 - 800	■ ■ ■ ■ ■	f i
Plagianthus regius	**manatu, lowland ribbonwood** (decid.)	–	10 - 660	■ □ ■ ½ ■	i b
Pseudopanax arboreus	whauwhaupaku, five finger	V	10 - 700	■ ■ ½ ½ ½ *	f n i
Pseudopanax crassifolius	**horoeka, lancewood**	– V	80 - 800	■ ½ ■ ■ ■	f b n
Pseudowintera colorata	horopito, pepper tree	– V	120 - 800	■ ■ ■ □ ½ *	f
Schefflera digitata	patete, seven-finger	V	10 - 650	■ ■ ½ □ □ *	f
Streblus heterophyllus	turepo, small-leaved milk tree	– V	10 - 530	½ ■ ■ □ □ *	f

				Tolerances	
Shrubs		**Landform**	**Elevation (m)**	sun shade wet dry wind	**Food**
Coprosma areolata	veined coprosma	– V	10 - 200	■■■½□*	f l
Coprosma rhamnoides	red-fruited mikimiki	–	30 - 840	■■½■■	f b
Coprosma rubra	red-stemmed coprosma	–	50 - 650	■½■½■	f l
Melicope simplex	poataniwha	–	5 - 600	■■■½½*	f i
Melicytus micranthus	manakura, shrubby mahoe	V–	10 - 100	■■■½□*	f n b
Myrsine divaricata	weeping mapou	–	40 - 890	■■■½■	f l
Neomyrtus pedunculata	rohutu, NZ myrtle	–	100 - 750	½■■□□*	f n i
Pseudopanax anomalus	a shrub pseudopanax	–	20 - 200	½½■½½*	f n
Vines					
Clematis paniculata	puawananga, bush clematis	– V		■½□□□*	i
Metrosideros diffusa	climbing rata	V–	10 - 650	½½½□□*	n
Parsonsia spp.	NZ jasmine	V–	5 - 750	½■½□□	b
Passiflora tetrandra	kohia, native passionvine	– V	5 - 200	½½½□□*	f
Ripogonum scandens	kareao, supplejack	V–	5 - 200	½½½□□*	f
Rubus cissoides	tataramoa, bush lawyer	– V	5 - 800	■½½□½	f
Groundcovers					
Anemanthele lessoniana	bamboo tussock, windgrass	– V	10 - 300	■■½½■	
Astelia fragrans	**kakaha, bush flax**	– V	20 - 750	½■■□□	f i
Carex forsteri, Carex solandri	sedges	V–	5 - 650	□■■□□	
Microlaena avenacea	bush rice grass	–	5 - 600	½½■½½*	
Ranunculus reflexus	a native buttercup	– V	15 - 650	□■½□□	
Uncinia leptostachya	hook sedge	–	15 - 600	□■■□□	
Uncinia uncinata	watau, hook sedge	– V	120 - 750	□■■□□	
Tree & Ground Ferns					
Asplenium bulbiferum	manamana, hen and chicken fern	V-	5 - 750	□■■□□*	
Asplenium oblongifolium	shining spleenwort	V-	5 - 750	½■□½□	
Blechnum novae-zelandiae	kiokio	V–	10 - 300	½■■□□	
Blechnum colensoi		V	50 - 300	□■■□□*	
Blechnum discolor	crown fern	V–	80 - 720	□■■□□*	
Blechnum fluviatile	kiwakiwa	V–	5 - 750	□■■□□*	
Cyathea dealbata	ponga, silver tree fern	V	5 - 650	□■■□□*	
Cyathea smithii	katote, soft tree fern	V–	5 - 650	□■■□□*	i
Dicksonia fibrosa	kuripaka, wheki ponga tree fern	V–	32 - 590	□■■□□*	i
Dicksonia squarrosa	wheki, rough tree fern	V	200 - 650	½■■□□*	i
Histiopteris incisa	mata, water fern	–	5 - 200	½■■□□	
Hypolepis ambigua	rough pig fern	–	5 - 200	½■■□□	
Lastreopsis glabella		V	5 - 150	□■½□□*	
Pellaea rotundifolia	button fern	– V	5 - 300	■■□■■	
Microsorum pustulatum(Phymatosorus)	maratata, hounds tongue fern	– V	15 - 750	½■■■□	
Pneumatopteris pennigera	gully fern	V	5 - 200	□■½□□*	
Polystichum vestitum	puniu, shield fern	V–	5 - 800	½■■□□	

Landform Key:
V = sheltered / moist
– = swamp forest
(when there are 2 symbols ie. V – the first symbol is its most preferred location)

T = toxic for toddlers

Kotare = New Zealand kingfisher

HARAKEKE,
Pukio, banded kokopu, swamp & stream ecosystem

PLANT TOLERANCES:
for sunny, shady, wet , dry and windy conditions shown as:
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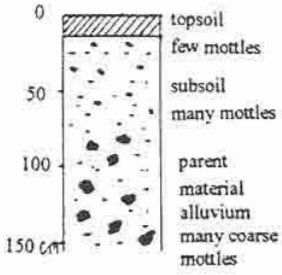
½ = tolerant of some
W= tolerates wet or flooded

FOOD: *for native birds:*
f = Fruit/seed
n = Nectar
b = Bud/foliage and
i = Insects
Plus **l** = Fruit for ***lizards***

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

Horotane / Barrys Bay
Soil Profile



Sub-humid to humid, flat to gently sloping valley floor riparian margins, swampy hollows, and concave hillside seeps with poorly drained loess colluvium and mixed loess and volcanic colluvium and alluvium.

PLANT LISTS

Shrubs, Tussocks & Flax-like Plants		Landform	Elevation (m)	Tolerances: sun	shade	wet	dry	wind	Food
Carex secta, Carex virgata	**pukio, makura, sedges**	▨ S	10 - 300	■	□	■	□	■	
Coprosma propinqua	**mikimiki**	▨ S	10 - 750	■	■	■	■	■	f l
Coprosma sp' t'	mikimiki	▨ S	90 - 850	■	½	■	½	■	f
Hebe salicifolia	**koromiko**	S	10 - 650	■	½	½	½	■	i
Juncus gregiflorus	**wiwi, tussock rush**	▨ S	5 - 400	■	□	■	□	■	
Juncus sarophorus	**wiwi, tussock rush**	▨ S	5 - 400	■	□	■	□	■	
Juncus pallidus	wiwi, tussock rush	▨ S	5 - 200	■	□	■	□	■	
Myrsine divaricata	weeping mapou	▨	20 - 800	■	■	■	½	□	f i l
Phormium tenax	**harakeke, NZ flax**	▨ S	10 - 450	■	□	■	■	■	n i
Typha orientalis	raupo, bull rush	▨	5 - 200	■	□	■	□	■	
Groundcovers									
Bulbinella angustifolia	Maori onion, bog lily (seepages only)	▨	10 - 400	■	□	■	□	■	
Carex buchananii	purei, sedge	▨ S	5 - 200	■	□	■	□	■	
Carex flagellifera	purei, sedge	▨ S	5 - 200	■	□	■	□	■	
Carex geminata	purei, sedge	S	5 - 300	■	□	■	□	■	
Cortaderia richardii	**toetoe**	S	5 - 420	■	□	■	■	■	
Eleocharis acuta	spike sedge	▨ S	5 - 300	■	□	■	□	■	
Schoenus pauciflorus	bog rush	▨ S	10 - 450	■	□	■	□	■	
Ground Ferns									
Blechnum novae-zelandiae	kiokio	S	10 - 750	½	■	■	□	□	
Blechnum minus	swamp kiokio	S ▨	5 - 200	■	½	■	□	□	
Histiopteris incisa	mata, water fern	S	5 - 200	½	■	■	□	□	
Polystichum vestitum	puniu, shield fern	S	5 - 800	½	■	■	□	□	

Landform Key:

▨ = swamps
S = stream margins

pukio = Carex secta, ballerina grass; banded kokopu = a native Galaxiidae fish

MATAI,
Totara, kereru, moist forest ecosystem

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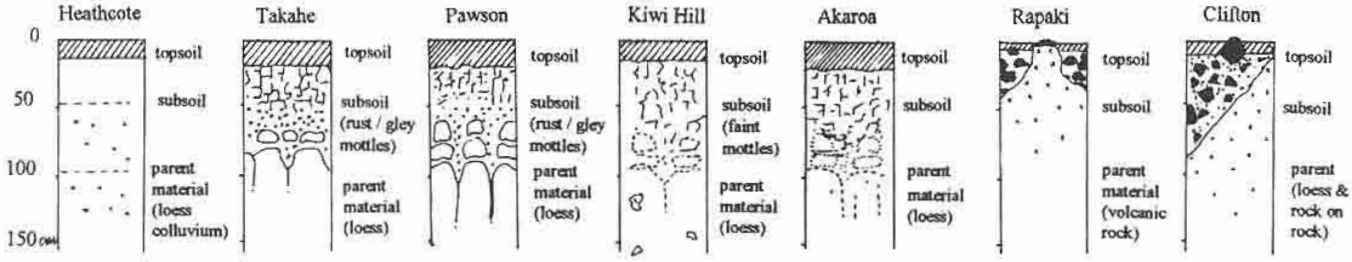
Plus l = Fruit for *lizards*

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

Soil Profiles



Sub-humid to humid, gently undulating to rolling fans and toe slopes, rolling ridges, and moderately steep to steep hill slopes with imperfectly to moderately well drained reworked loess colluvium or mixed loess and volcanic colluvium, or well drained volcanic soils.

The soil sequence represents a moisture gradient from wet / poorly drained in winter to well drained shallower soils. Plant selection, using wet & dry tolerances, should represent this.

PLANT LISTS

Tall Trees

		Elevation (m)	Tolerances: sun shade wet dry wind	Food
Dacrycarpus dacrydioides	kahikatea, white pine	15 - 500	■ ½ ■ □ ■	f i
Elaeocarpus hookerianus	pokaka	15 - 510	■ ½ ■ □ □	f i
Podocarpus hallii	mountain totara	340 - 840	■ ½ ■ ■ ■	f b i
Podocarpus totara	**totara**	15 - 460	■ ½ ■ ■ ■	f b i
Prumnopitys ferruginea	miro	40 - 320	½ ■ ½ □ □ *	f b
Prumnopitys taxifolia	matai, black pine	15 - 650	■ ■ ■ ■ □	f b i

Trees & Tall Shrubs

Alectryon excelsus	titoki	50 - 400	■ □ ■ ½ □ *	f
Aristotelia serrata	makomako, wineberry (semi-decid.)	100 - 800	½ ½ ■ ½ □ *	f i
Carpodetus serratus	putaputaweta, marbleleaf	80 - 800	½ ■ ■ □ □ *	f b i
Coprosma linariifolia	yellow-wood	50 - 750	½ ■ ■ ½ ½	f l
Coprosma lucida	shining karamu	50 - 750	■ ■ ■ ■ ■	f
Coprosma robusta	**karamu**	15 - 440	■ ■ ■ ■ ■	f
Coprosma rotundifolia	round-leaved coprosma	150 - 750	½ ■ ■ ½ ½	f
Cordyline australis	**ti kouka, cabbage tree**	10 - 650	■ ½ ■ ■ ■	f n i
Fuchsia excorticata	kotukutuku, tree fuchsia (deciduous)	50 - 800	½ ½ ½ □ □ *	f n b i
Griselinia littoralis	**kapuka, broadleaf**	15 - 800	■ ■ ■ ■ ■	f b i
Griselinia lucida	puka (can be epiphytic, adj. Ecol. Dist.)	20 - 200	■ ■ □ ■ ■ *	f b i
Hedycarya arborea	porokaiwhiri, pigeonwood	50 - 650	½ ½ ½ □ □ *	f i
Hoheria angustifolia	**houhere, narrow-leaved lacebark**	10 - 700	■ □ ■ ■ ■	i
Hoheria populnea[1]	houhere, South Island lacebark	20 - 650	■ ½ □ ½ ½	i
Kunzea ericoides	**kanuka**	10 - 600	■ □ ½ ■ ■	n i
Leptospermum scoparium	manuka, tea tree	90 - 650	■ □ ■ ■ ■	n i
Lophomyrtus obcordata	rohutu, NZ myrtle	20 - 440	■ ■ ■ ■ ■	f
Macropiper excelsum	kawakawa	50 - 200	½ ½ ■ ■ ½ *	f
Melicope simplex	poataniwha	20 - 600	■ ■ ■ ½ ½ *	f i

[1] This is not the common, broad-leaved North Island *H. sextylosa* which is being eliminated from Riccarton Bush. Some botanists believe *H. populnea* (South Island form) to be a hybrid between *H. sextylosa* and *H.angustifolia* however seeds collected from Banks Peninsula give 'true', consistent and distictive progeny.

		Elevation (m)		Tolerances: sun	shade	wet	dry	wind		Food
Melicytus ramiflorus	**mahoe, whiteywood**	10 - 700		■	■	□	□	■	*	n b i f l
Myoporum laetum	**ngaio**	10 - 520	T	■	½	■	■	■	*	f n
Myrsine australis	mapou, red matipo	20 - 700		■	■	□	■	■	*	f l l
Olearia fragrantissima	fragrant tree daisy (deciduous)	100 - 300		■	□	□	½	■		i
Olearia paniculata	**akiraho, golden akeake**	10 - 800		■	□	□	■	■		i
Pennantia corymbosa	kaikomako	150 - 440		½	½	■	□	½		f n i
Pittosporum eugenioides	**tarata, lemonwood**	10 - 800		■	■	■	■	□		f
Pittosporum tenuifolium	**kohuhu, black matipo**	10 - 800		■	■	■	■	■		f i
Plagianthus regius	manatu, lowland ribbonwood (decid.)	10 - 660		■	□	■	½	■		i
Pseudopanax arboreus	**whauwhaupaku, five-finger**	10 - 700		■	■	½	½	½	*	f n i
Pseudopanax crassifolius	**horoeka, lancewood**	80 - 800		■	½	■	■	■		f n b i
Pseudowintera colorata	horopito, pepper wood	150 - 800		■	■	■	□	½	*	f
Solanum laciniatum	poroporo	20 - 690	T	■	½	½	■	■	*	f
Sophora microphylla	South Island kowhai (deciduous)	10 - 680	T	■	½	½	■	■		n i
Streblus heterophyllus	turepo, small-leaved milk tree	50 - 530		½	■	■	□	□	*	f

Shrubs

Carmichaelia australis	a NZ broom	5 - 450		■	□	□	■	■		i
Coprosma areolata	veined coprosma	100 - 200		■	■	■	½	□	*	f l
Coprosma crassifolia	thick-leaved mikimiki	10 - 680		■	½	■	■	■		f l
Coprosma propinqua	**mikimiki**	15 - 750		■	■	■	■	■		f l
Coprosma rhamnoides	red-fruited mikimiki	120 - 840		■	■	½	½	■		f b
Coprosma rigida	stiff mikimiki	40 - 800		■	½	½	■	■		f
Coprosma rubra	red-stemmed coprosma	100 - 650		■	½	■	½	■		f l
Coprosma sp'.t'	red-stemmed coprosma	100 - 850		■	½	■	½	■		f l
Coprosma virescens	pale green coprosma	20 - 540		■	½	½	■	■		f l
Coprosma wallii	mikimiki	200 - 700		■	½	½	½	■		f
Corokia cotoneaster	korokio	40 - 800		■	□	□	■	■		f n
Cyathodes juniperina	mingimingi	200 - 700		■	■	½	■	■		f
Hebe salicifolia	**koromiko**	100 - 840		■	½	½	■	■		i
Helichrysum lanceolatum	niniao	40 - 650		■	□	½	■	■		i
Leucopogon fasciculatus	mingimingi	200 - 500		■	½	½	½	■		f n
Melicytus micranthus	manakura, shrubby mahoe	50 - 100		½	■	■	½	□	*	f l
Raukawa anomalus (syn. *Pseudopanax*)	shrub pseudopanax	20 - 600		½	½	■	½	■	*	f n

Vines & Scramblers

Brachyglottis sciadophila	climbing daisy	200 - 690		■	½	□	½	■	*	
Carmichaelia kirkii	climbing broom	10 - 200		½	■	½	½	■		i
Clematis foetida	scented clematis	20 - 500		■	½	□	½	■	*	i
Clematis marata	a small scrambling clematis	50 - 500		½	½	½	■	½		i
Clematis paniculata	pua wananga, bush clematis	200 - 750		½	■	■	□	□	*	n
Muehlenbeckia australis	pohuehue	10 - 650		■	½	■	■	■		f
Parsonsia spp.	NZ jasmines	20 - 200		½	■	½	□	□		b
Passiflora tetrandra	kohia, native passionvine	5 - 200		½	½	½	□	□	*	f
Rubus cissoides	tataramoa, bush lawyer	300 - 800		■	½	½	■	■		f
Rubus schmidelioides	tataramoa, fine bush lawyer	15 - 750		■	½	½	■	■		f b
Rubus squarrosus	tataramoa, leafless lawyer	75 - 420		■	½	½	■	■		f

Groundcovers, Tussocks & Flax - like Plants		Elevation (m)	Tolerances: sun	shade	wet	dry	wind	Food
Aciphylla subflabellata	taramea, fine speargrass	200 - 500	■	□	½	■	■	i
Anemanthele lessoniana	wind grass, bamboo tussock	20 - 300	■	■	½	■	■	
Astelia fragrans	**kakaha, bush flax**	50 - 750	½	■	■	□	□	f i
Carex forsteri	sedge	150 - 650	□	■	■	□	□	
Carex solandri	sedge	150 - 750	□	■	■	□	□	
Cortaderia richardii	**toetoe**	20 - 420	■	□	■	■	■	
Elymus solandri	blue wheat grass	7 - 800	■	□	□	■	■	
Festuca "blue tussock"	Banks Peninsula blue tussock	50 - 730	■	□	½	■	■	
Festuca novae-zelandiae	fescue/ hard tussock	300 - 500	■	□	½	■	■	
Isolepis nodosa	knobby clubrush	5 - 250	■	□	½	■	■	
Libertia ixioides	mikoikoi, NZ iris	100 - 500	■	■	½	■	■	
Microlaena polynoda	creeping rice grass	200 - 400	½	½	□	■	□	
Phormium tenax	**harakeke, NZ flax**	10 - 450	■	□	■	■	■	n l
Poa cita	**wiwi, silver tussock**	10 - 840	■	□	■	■	■	f
Ranunculus reflexus	a native buttercup	15 - 650	□	■	½	□	□	
Rytidosperma spp.	danthonia bunch grasses	5 - 750	■	□	□	■	■	
Uncinia silvestris	hook sedge	50 - 600	□	■	½	□	□	
Uncinia uncinata	watau, hook sedge	120 - 750	□	■	■	□	□	

Tree & Ground Ferns									
Asplenium appendiculatum	ground spleenwort	40 - 750	□	■	□	½	□	*	
Asplenium bulbiferum	manamana, hen and chicken fern	120 - 750	□	■	■	□	□	*	b
Blechnum penna-marina	kiokio, small hardfern	150 - 750	■	■	■	½	□		
Blechnum procerum	a kiokio	300 - 750	½	■	■	□	■		
Cyathea dealbata	ponga, silver tree fern	120 - 200	□	■	■	□	□	*	
Cyathea smithii	katote, soft tree fern	150 - 650	□	■	■	□	□	*	i
Dicksonia fibrosa	kuripaka, wheki ponga	120 - 400	□	■	■	□	□	*	i
Dicksonia squarrosa	wheki, rough tree fern	200 - 650	½	■	■	□	□	*	i
Hypolepis millefolium	thousand-leaved fern	200 - 800	■	□	½	□	■		
Microsorum pustulatum (Phymatosorus)	maratata, hound's tongue fern	10 - 750	½	■	■	■	□		
Polystichum richardii	pikopiko, shield fern	10 - 750	½	■	■	□	□	*	
Pteridium esculentum	rahurahu, bracken fern	10 - 750	■	½	½	■	■		

T = toxic for toddlers
* = frost tender
Bold = main species for relatively fast growing first stage planting into open sites.

Matai = black pine; kereru = New Zealand pigeon

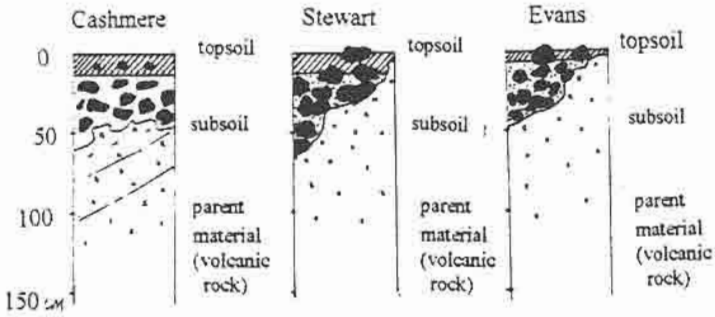
KOWHAI,
Korokio, jewelled gecko, dry, rocky ecosystem

PLANT TOLERANCES:
for sunny, shady, wet , dry and windy conditions shown as:
■ = tolerates or needs
□ = intolerant
½ = tolerant of some
* = frost tender

FOOD: *for native birds:*
f = Fruit/seed
n = Nectar
b = Bud/foliage and
i = Insects
Plus ***l*** = Fruit for ***lizards***

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

Soil Profiles



Sub-humid to humid easy rolling summits and shoulders and steep to very steep rocky ridges and bluffs with excessively drained to well-drained volcanic soils and minor loess.

PLANT LISTS

		Elevation (m)		Tolerances: sun	shade	wet	dry	wind	Food
Tall Trees									
Podocarpus hallii	mountain totara	340 - 840		■	½	■	■	■	f b i
Podocarpus totara	**totara**	150 - 460		■	½	■	■	■	f b i
Prumnopitys taxifolia	matai, black pine	150 - 650		■	■	■	½	■	f b i
Trees & Tall Shrubs									
Coprosma linariifolia	yellow-wood	150 - 750		½	■	■	½	½	f l
Coprosma lucida	**shining karamu**	150 - 750		■	■	■	■	■	f
Coprosma repens	taupata (pre - European introduction)	5 - 150		■	½	□	■	■ *	f
Coprosma robusta	**karamu**	40 - 620		■	■	■	■	■	f
Coprosma rotundifolia	round-leaved coprosma	150 - 750		½	■	■	½	½ *	f
Cordyline australis	**ti kouka, cabbage tree**	10 - 650		■	½	■	■	■	f n i
Corynocarpus laevigatus	karaka (pre-European introduction)	10 - 40		■	½	□	■	■ *	f
Discaria toumatou	matagouri (deciduous)	10 - 660		■	□	½	■	■	n i
Dodonaea viscosa	**akeake**	15 - 360		■	□	□	■	■ *	
Griselinia littoralis	**kapuka, broadleaf**	15 - 800		■	■	■	■	■	f b i
Hoheria angustifolia	**houhere, narrow-leaved lacebark**	150 - 700		■	□	■	■	■	i
Hoheria populnea [1]	**houhere, South Island lacebark**	20 - 650		■	½	□	½	½	i
Kunzea ericoides	**kanuka**	10 - 750		■	□	½	■	■	n i
Lophomyrtus obcordata	rohutu, NZ myrtle	150 - 440		■	■	■	■	■	f
Melicope simplex	poataniwha	200 - 600		■	■	■	½	½ *	f i
Melicytus ramiflorus	mahoe, whiteywood	10 - 700		■	■	□	□	■ *	n b i l
Myoporum laetum	**ngaio**	10 - 420	T	■	½	■	■	■ *	f n
Myrsine australis	mapou, red matipo	10 - 440		■	■	□	■	■ *	f i
Neomyrtus pedunculata	rohutu	400 - 750		½	■	■	□	□ *	f n
Olearia avicenniifolia	a tree daisy	400 - 540		■	□	½	■	■	n i
Olearia fragrantissima	fragrant tree daisy (deciduous)	115 - 310		■	□	□	½	■	n i

[1] This is not the common, broad-leaved North Island *H. sextylosa* which is being eliminated from Riccarton Bush. Some botanists believe *H. populnea* (South Island form) to be a hybrid between *H. sextylosa* and *H. angustifolia* however seeds collected from Banks Peninsula give 'true', consistent and distinctive progeny.

		Elevation (m)		Tolerances: sun / shade / wet / dry / wind	Food
Olearia paniculata	**akiraho, golden akeake**	5 - 800		■ □ □ ■ ■	i
Pittosporum eugenioides	**tarata, lemonwood**	10 - 800		■ ■ ■ ■ □	f
Pittosporum tenuifolium	**kohuhu, black matipo**	40 - 800		■ ■ ■ ■ ■	f i
Plagianthus regius	manatu, lowland ribbonwood (decid.)	20 - 450		■ ½ ■ ½ ■	i
Pseudopanax arboreus	**whauwhaupaku, five-finger**	40 - 700		■ ■ ½ ½ ½ *	f n i
Pseudopanax colensoi	mountain five-finger	520 - 800		■ ■ ½ □ ½	f n
Pseudopanax crassifolius	horoeka, lancewood	180 - 800		■ ½ ■ ■ ■	f n b i
Pseudopanax ferox	toothed lancewood	200 - 550		■ □ □ □ □	f n b i
Pseudowintera colorata	horopito, pepper tree	360 - 800		■ ■ ■ □ ½ *	f
Solanum aviculare	poroporo	60 - 510	T	■ ½ ½ ■ ■ *	f
Solanum laciniatum	poroporo	30 - 690	T	■ ½ ½ ■ ■ *	f
Sophora microphylla	**South Island kowhai (deciduous)**	10 - 680	T	■ ½ ½ ■ ■	n i
Shrubs					
Aristotelia fruticosa	mountain wineberry	725 - 820		■ ½ ½ ■ ■	f
Carmichaelia australis	a NZ broom	10 - 420		■ □ □ ■ ■	i
Ozothamnus leptophylla (syn. *Cassinia*)	tauhinu	300 - 840		■ □ ■ ■ ■	i
Coprosma crassifolia	**thick-leaved mikimiki**	10 - 680		■ ½ ■ ■ ■	f l
Coprosma propinqua	**mikimiki**	15 - 850		■ ■ ■ ■ ■	f l
Coprosma rhamnoides	red-fruited mikimiki	150 - 840		■ ■ ½ ■ ■	f b
Coprosma rigida	mikimiki	40 - 840		■ ½ ½ ■ ■	f
Coprosma sp. 't'	mikimiki	100 - 850		■ ½ ■ ½ ■	f
Coprosma virescens	**pale green coprosma**	20 - 538		■ ½ ½ ■ ■	f l
Coprosma wallii	mikimiki	210 - 705		■ ½ ½ ½ ■	f l
Corokia cotoneaster	**korokio**	40 - 840		■ □ □ ■ ■	f n
Cyathodes juniperina	mingimingi	420 - 440		■ ■ ½ ■ ■	f
Hebe salicifolia	koromiko	200 - 840		■ ½ ½ ■ ■	i
Hebe strictissima	**a Banks Peninsula koromiko**	23 - 840		■ □ □ ½ ■	i
Helichrysum lanceolatum	niniao	40 - 650		■ □ ½ ■ ■	i
Heliohebe lavaudiana	a Banks Peninsula koromiko	300 - 840		■ □ □ ½ ■	i
Melicytus alpinus	porcupine shrub	10 - 850		■ □ □ ■ ■	f l
Muehlenbeckia astonii	shrub pohuehue (in adj. Ecol. Dist.)	10 - 200		■ □ ½ ■ ■	f n l
Myrsine divaricata	weeping mapou	400 - 890		■ ■ ■ ½ ■	f i l
Sophora prostrata	dwarf kowhai	10 - 560	T	■ □ □ ■ ■	n
Tussocks and Flax-Like Plants					
Aciphylla subflabellata	taramea, fine speargrass	200 - 490		■ □ ½ ■ ■	i
Anemanthele lessoniana	bamboo tussock, wind grass			■ ■ ■ ■ ■	
Chionochloa conspicua	**large snow tussock**	200 - 850		■ □ ½ ½ ■	
Chionochloa rigida	narrow-leaved snow tussock	300 - 550		■ □ ½ ½ ■	
Festuca "blue tussock"	**Banks Peninsula blue tussock**	7 - 730		■ □ ½ ■ ■	
Festuca novae-zelandiae	hard tussock	150 - 800		■ □ ½ ■ ■	
Phormium cookianum	wharariki, mountain flax	750		■ □ ½ ½ ■	n
Poa cita	**silver tussock, wiwi**	10 - 800		■ □ ■ ■ ■	
Vines & Scramblers					
Brachyglottis sciadophila	climbling groundsel	200 - 690		■ ½ □ ½ ■ *	
Clematis afoliata	pohue, leafless scrambling clematis	6 - 560		■ □ □ ■ ■	i
Clematis foetida	scented clematis	50 - 665		■ ½ □ ½ ■ *	i
Clematis marata	a small scrambling clematis			½ ½ □ ■ ■ *	i
Clematis paniculata	puawananga, bush clematis	195 - 660		■ ½ □ □ □ *	i
Elymus solandri	blue wheat grass	7 - 800		■ □ □ ■ ■	
Muehlenbeckia complexa	pohuehue	7 - 840		■ □ ½ ■ ■	f b l
Parsonsia spp.	NZ jasmines	20 - 750		½ ■ ½ □ ■	n
Rubus cissoides	tataramoa, bush lawyer	118 - 840		■ ½ ½ ■ ■	f
Rubus schmidelioides	tataramoa, fine bush lawyer	15 - 750		■ ½ ½ ■ ■	f b
Rubus squarrosus	tataramoa, leafless lawyer	75 - 420		■ ½ ½ ■ ■	f

Groundcovers

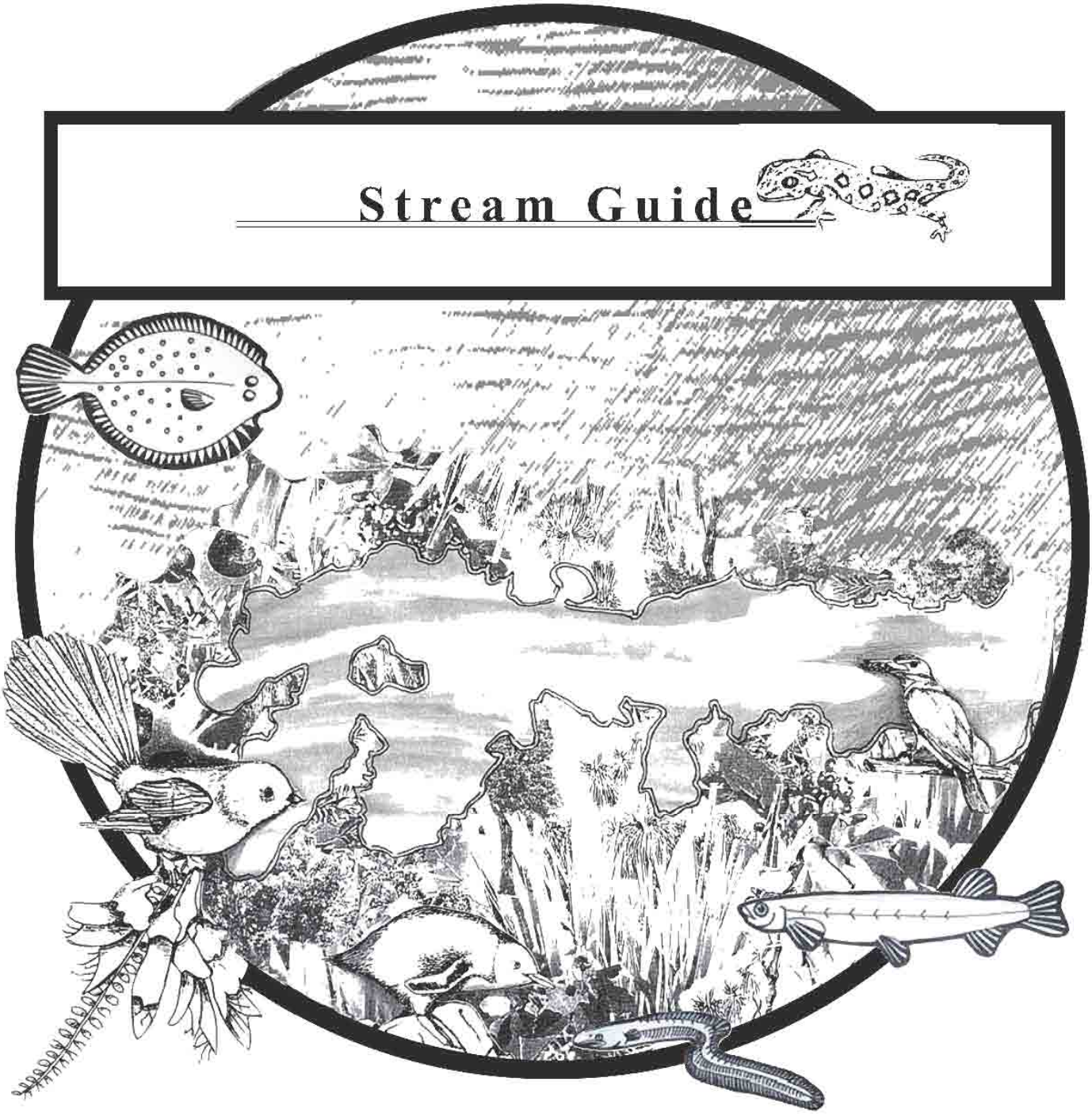
		Elevation(m)	Tolerances: sun	shade	wet	dry	wind	
Brachyglottis lagopus	Banks Peninsula daisy	340 - 750	■	½	□	□	■	*
Dianella nigra	**turutu, inkberry**	300 - 400	■	½	□	½	■	f
Dichelachne crinita	plume grass	8 - 750	■	½	□	■	■	
Epilobium cinereum	willow herb	50 - 450	■	□	□	■	■	
Haloragis erecta	toatoa	10 - 200	■	□	□	■	■	*
Hypericum gramineum	NZ St Johns wort	20 - 200	■	□	□	■	■	
Leptinella minor		290 - 450	■	□	½	■	■	
Libertia ixioides	**mikoikoi, NZ iris**	100 - 500	■	■	½	■	■	
Linum monogynum	rauhuia	7 - 250	■	□	□	■	■	
Luzula banksiana	NZ wood rush	10 - 440	■	□	□	■	■	
Microlaena stipoides	meadow rice grass	20 - 300	■	½	□	■	■	
Ranunculus reflexus	NZ buttercup	15 - 650	□	■	□	□	□	
Raoulia monroi	NZ scabweed	100 - 400	■	□	□	■	■	
Rytidosperma spp.	danthonia bunch grasses	5 - 750	■	□	□	■	■	
Senecio glaucophyllus		300 - 450	■	□	□	■	■	*
Wahlenbergia gracilis	NZ harebell	5 - 450	■	½	□	½	□	

Ferns

Asplenium appendiculatum		40 - 750	□	■	□	½	□	*
Cheilanthes spp.	cloak ferns	10 - 450	■	□	□	■	■	
Pellaea rotundifolia	**tarawera, button fern**	40 - 300	■	■	□	■	■	
Microsorum pustulatum (Phymatosorus)	**maratata, hound's tongue fern**	10 - 750	½	■	■	■	□	
Polystichum richardii	pikopiko, shield fern	5 - 750	½	■	□	½	□	*
Pteridium esculentum	rahurahu, bracken fern	5 - 820	■	½	½	■	■	

T = toxic to toddlers

Stream Guide



Lyttelton Harbour Basin *Stream Guide*

Project Background & Vision

For the last seven years the booklet "Indigenous Ecosystems of the Lyttelton Harbour Basin" has provided information about local plants and animals. People have used it for restoration projects, garden design, landscape planning, and ideas for shelter and soil stability, but it did not include information about stream habitats.

Over the last few years our attention has been drawn to projects that highlight the need to protect our streams. Environment Canterbury's Living Streams programme has provided general information about stream ecosystems. Rapaki Runanga is undertaking a big project to restore the Omaru Stream that flows through their community. Several neighbouring landowners in the Zephyr Valley, Governors Bay, have covenanted their bush with the QE11 National Trust to create a continuous area of protected habitat for native fauna and flora. The stream that flows through this bush was purposely included in the covenants because the importance of stream values was at last being recognised.

More recently, DoC has undertaken surveys of the fish and habitat of some Governors Bay streams. Many of our native Banded Kokopu were found in the Zephyr Stream, along with a few eels and a bully, but only two small Banded Kokopu were found in Link Stream that has been recently contaminated by silt discharge. In order to flourish, our native fish require cool, clean water in streams shaded by trees and bordered by plants that filter silt before it enters the water and provide habitat for insects for fish tucker.

It is therefore timely to produce a stream planting guide because our streams are under threat from discharges and development. We need to work together to protect what we have left. This Stream Guide, as an addition to the "Indigenous Ecosystems of the Lyttelton Harbour Basin", will help us do that.

The Lyttleton Harbour Basin Indigenous Ecosystem group are grateful to Environment Canterbury for their funding contribution enabling this publication.

This *Stream Guide* explores the natural history of streams and their associated vegetation within the basin, and provides guidance as to how best to practically protect and revitalise the life in them. The ecosystem types identified in the earlier document provide the structural context for this Stream Guide.

A stream may be spring fed and permanently wet with characteristic pools, riffles and eddies. Or much of the year a stream may be a mere indentation in the ground surface where water flows or seeps only after heavy rain - an ephemeral stream. Whether boldly babbling above the ground, or silently slithering beneath and through the basin's valleys and floors, each stream has a role to play in the composite of waterways. The stream character is a result of the water supply, substrate and steepness of the stream path - the land type.

A single stream may have several different forms, depending on the terrain through which it passes.

- Streams originate below the crater rim in the rocky KOWHAI ecosystem;
- pass on down through the deep hillslope soils of the MATAI ecosystem;
- or, to the gullys of the steep KAHIKATEA ecosystem;
- and,down to the valley floors of the gentle KAHIKATEA; and HARAKEKE ecosystems; and,
- finally discharging to the harbour from the SEA RUSH ecosystem, via brackish tidal streams.

The land immediately next to a stream is vitally important for protecting water quality and the diverse wildlife both in and around the stream. Well-managed riparian* margins can help control stream bank erosion, provide habitat for wildlife, and filter out pollution from entering the stream, all of which will lead to a healthier stream. (*Riparian refers to the stream and the land either side that influences or is influenced by that stream).

This *Stream Guide* has separate planting guides for each of the ecosystem types. The natural or potential character of a stream, and, its surrounding lands, determines the vegetation that appropriately belongs there. Individual ecosystem type diagrams and plant lists are provided in the following pages. As described previously, the ecosystems each have a 'signature' name, colour and symbol - an icon. Refer to pp. 11 - 19 for information to identify where each ecosystem is located in the wider Basin landscape.

using the guide

From the maps and data from p.16 on, identify by colour code what ECOSYSTEM your stream is located within – KOWHAI, MATAI, KAHIKATEA (either steep or gentle), HARAKEKE, or SEA RUSH. Turn to that colour-coded section (within pp.40-57), look at the STREAM PROFILE drawings and match the zones as best you can to your stream situation.

Within the selected ecosystem, choose the 'woodland' or 'shrubland' option that best suits your circumstances or preferred design. For example, the shrubland option will be most suitable in a semi-open extensively grazed environment.

Identify the relevant landforms or planting zones:

- **margins** are permanently wet to moist and are close to the level of the base flow. There may be small terraces or benches in the first two zones (diagrams pp. 38-39).
- **lower slopes** are usually moist and relate to the occasional fresh (small floods that occur every 1-3 months after significant rain events).
- **upper slopes** relate to the level of the infrequent (approximately annual) flood.

Ephemeralstreams will support only the last two zones.

Go to the top of the tick table and find the PLANTING ZONE for which you are choosing plants. Select from the plants down the column which get a tick. The ticks in the column track across to the species name from which you can compile a list for planting in that zone. Bolded names are most suitable as nurse species that can be planted in the open.

Match the 'key number' of plants in the lists with the number in the STREAM PROFILE drawings. These remind you of the plant's form and preferred position(s) for planting.

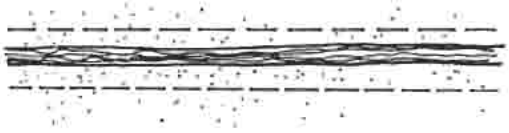
Check PLANT TOLERANCES in the chart, so that you get the shade, moisture and shelter conditions just right for each species. Little tolerance of sun may also mean the plants will get frosted in the open (❄ symbol indicates frost sensitivity when young). Browse tolerance by sheep, rabbits and hares is noted.

stream profiles

Each ecosystem section has cross section drawings of typical natural profiles. Slopes and terraces are shown, as well as the different substrates – from hard rock to soft bed streams. The stream profile diagrams assist in understanding how a stream and its vegetation might have looked originally, and help guide restoration.

restoring the natural stream form

Before undertaking any planting programme gather information about the natural form of your stream. If possible, it is ideal to restore the natural alignment and profile of the stream, such as meanders and gentle banks. Ask neighbours who have been in the area for a long time if they know if the stream has been straightened or deepened. Have there been floods in the past, and how high have they come? Go out during rainfall and look around the stream; old channels may be evident as the water ponds and flows across the land. Think carefully about why the stream was realigned originally and whether these reasons are still relevant. You want to ensure that you will not be creating flooding or erosion risks for you or your neighbour. Note that currently all works in the bed or banks of waterways require resource consents from Environment Canterbury.



landforms as planting zones

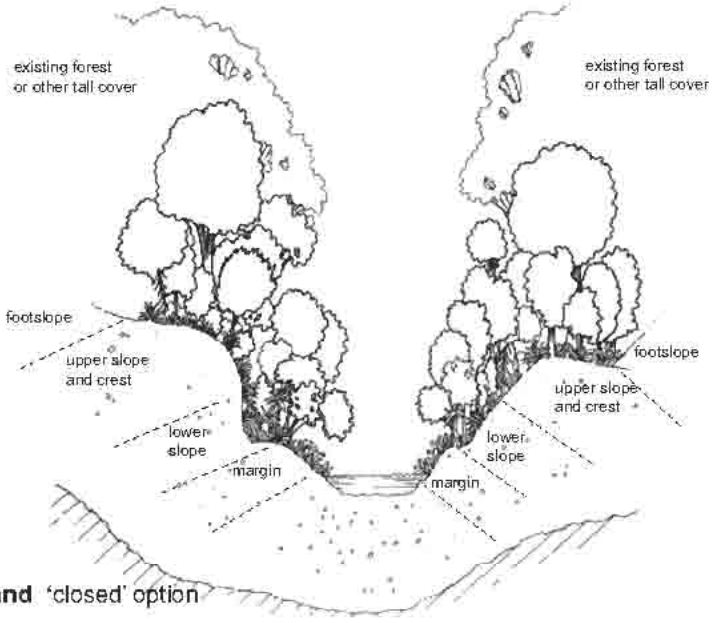
Along each length of natural stream there are different streamside landforms that vary in their wetness, steepness and rockiness. Typical landforms are shown in the profile drawings for each ecosystem – some with hill slopes or bluffs above the riparian influence, representing the broader contextual ecosystem type, then running down to an upper slope, lower slope, stream margin, and stream bed (whether bedrock, silt or gravel). Some lower reaches will also be influenced by tidal activity, resulting in saline or brackish conditions. For each stream profile, these landforms identify planting zones. The range of trees, shrubs, vines, tussocks, ferns and other ground cover plants are drawn and keyed to each planting zone, and listed in the following charts. The appropriate niche for each species can thus be identified.

choosing plant species

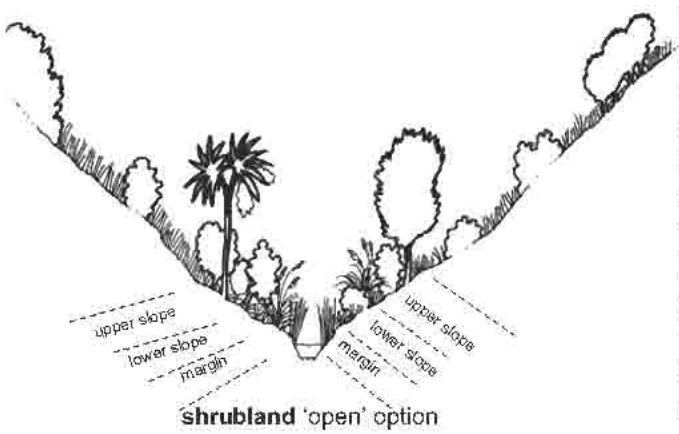
To assist in choosing species for a planting project, each plant for each type of stream profile is listed, and its preferred situation noted through the charts of plant tolerances, as well as the planting zones. The full, partial or negligible tolerance of each species to sun, shade, wet, dry, windy, frosty and browsing conditions is charted. It is desirable to familiarise yourself with these limits as a cross check that plants are in the right place, situation or time, thereby avoiding costly failures. But the ecosystem type, planting zone and woodland/ shrubland option will be the key criteria for choosing the right plants. Species in bold are those to be planted first as they are generally fast growing and tolerant of exposure to sun, frost and wind and may be somewhat browse tolerant. Particularly for upper slopes, refer also to the 'main' ecosystem lists (pp. 21-33).

woodland v shrubland option

Ideally stream waters are shaded to enhance in-stream habitat values and to prevent weed growth. The 'woodland' planting option provides guidance for dense tree cover on streamsides that will achieve a shaded natural stream corridor. Some streams will already be shaded by (exotic) tree cover, bluffs, banks or buildings. New native plantings can be carefully phased in to replace exotic trees and shrubs whilst retaining continuity of shade to suppress weeds. Out on the flats, dense shrub, flax and sedge plantings can provide some shade and good habitat indefinitely or as a nursery for eventual swamp forest. Some stream reaches will be in full or partial sunlight, through past or present management, or, where landowners prefer more open space, such as when a stream is close to a house.



woodland 'closed' option



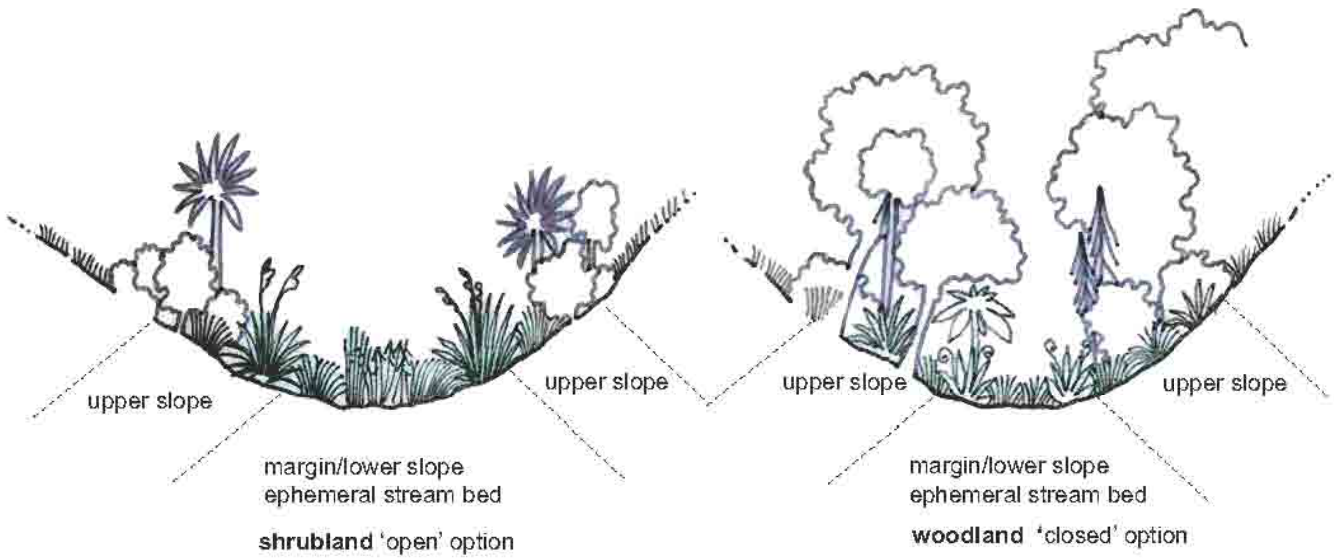
shrubland 'open' option

For each stream type, a guide for both taller "woodland" and lower "shrubland" options is provided. The woodland option achieves a treed corridor – a bush strip with a well-shaded stream. The shrubland option has plantings that can be established in the open and which will enable a reasonably open character to be retained - and possibly even careful sheep grazing. To convert an open grassed situation to a closed one, you may start by planting hardy, spreading tussocks, shrubs or small trees (bold plant names in list) to provide initial shelter, shade and protection from browse. Then a few years later underplant with more sensitive species to form a long term canopy and rich understorey (non-bold plant names).

Go to page 58 for guidance on implementing your planting

ephemeral streams

Where a stream is ephemeral, flowing only occasionally, continue the margin planting across the stream bed.



barriers and beds

By removing artificial barriers (such as culverts) to seasonal migrations of fish from the harbour you will be able to maximise the natural character of your stream bed. Ensure the bed is not contaminated with layers of sediment from accelerated upstream erosion, worst case scenarios may require excavation, remember to check with Environment Canterbury to see if you need a resource consent. The SEA RUSH ecosystem naturally comprises soft mobile substrate. Elsewhere shaded rock pools and oxygenated riffles are the best fish habitat.

stream crossings

As fords and culverts can damage stream values, try to avoid crossings wherever possible. If stream crossings are required, use bridges in preference to culverts, to avoid a stepped bed and smooth sides which some fish have difficulty in negotiating.

stock management

Ensure stock are kept well clear of streams and their margins – ideally fence at least 5m back from channel. If not planted, rank grass is preferable to stock on stream banks. Wider unfenced riparian areas might be achieved and protected through 'shrubland' species, which tolerate sheep browsing once well established.

top to toe

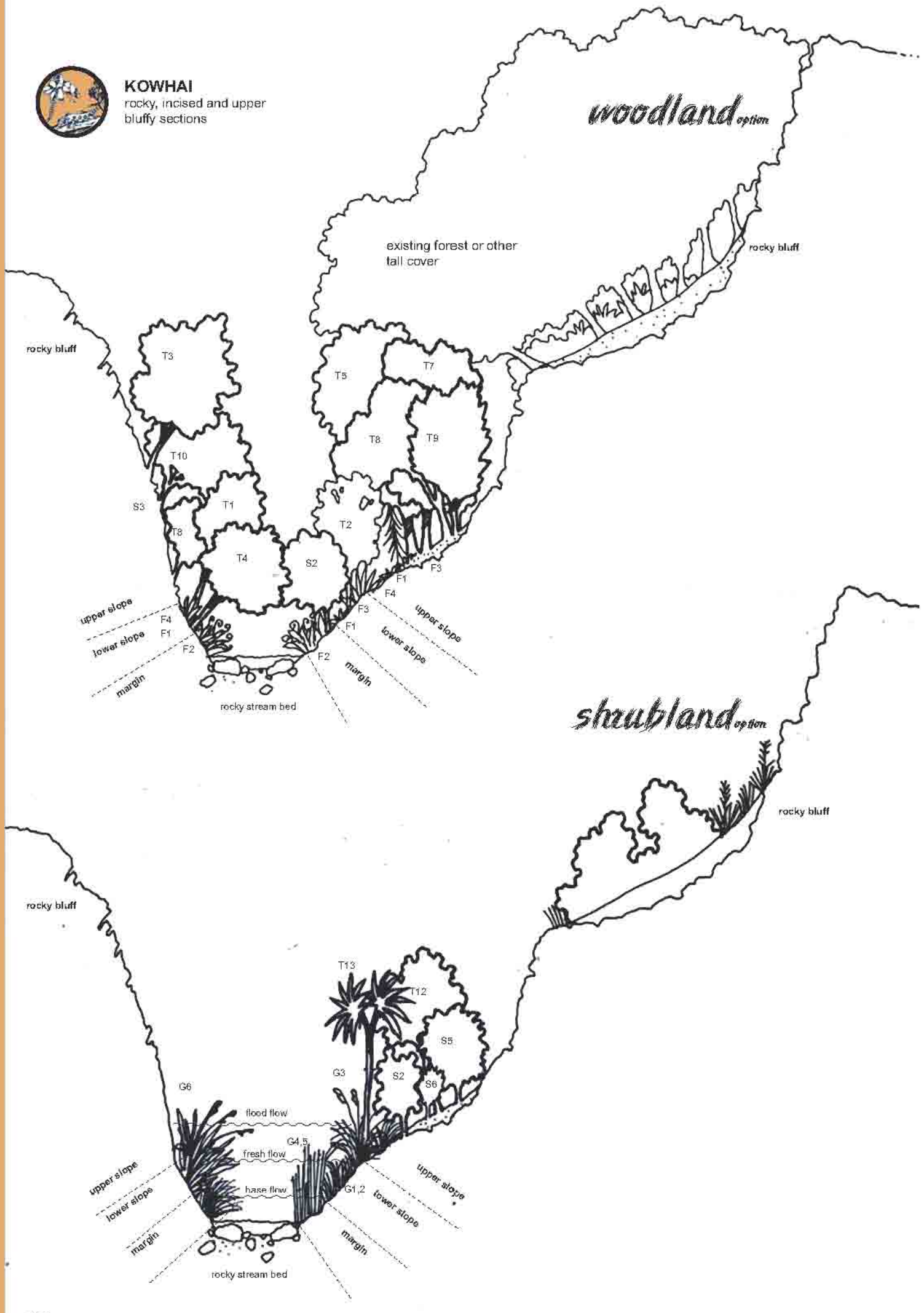
When planning a stream management project, think about the full length of the stream, and where possible address issues in the upper catchment first – such as erosion and weeds. Weed seed and sediment will travel downstream, so it is better to begin planting and weed management at the top and work down.

The beginning and end of a tributary or stream, the springs and the discharge points, all need to be carefully managed, destocked and densely vegetated. If there is land disturbance, from earthworks, tracking or stock damage, relocate stock and tracks, revegetate the ground surface, and in the short term, position straw bales at point source locations of discharges to temporarily reduce sediment input into streams until the adjacent land surface has healed.

stream or catchment vision

Encourage land managers, your own neighbours and other interested parties to collectively develop a vision and an overall management strategy for their stream or whole catchment. You might form a stream care group and set up a monitoring system. Encourage neighbourhood recognition that whole stream management is essential if the quality and multiple benefits of a waterway are to be achieved and sustained.

KOWHAI
rocky, incised and upper bluffy sections



KOWHAI

Rocky, incised and upper bluffy sections usually ephemeral streams

Key

- ❄ initially frost tender
- B browse-tolerant once established
- D deciduous
- T toxic
- **Bold** = main species for relatively fast growing first stage planting into open sites

Plant tolerances

- ■ tolerates or needs
- ▪ tolerant of some
- □ intolerant of

Planting zones

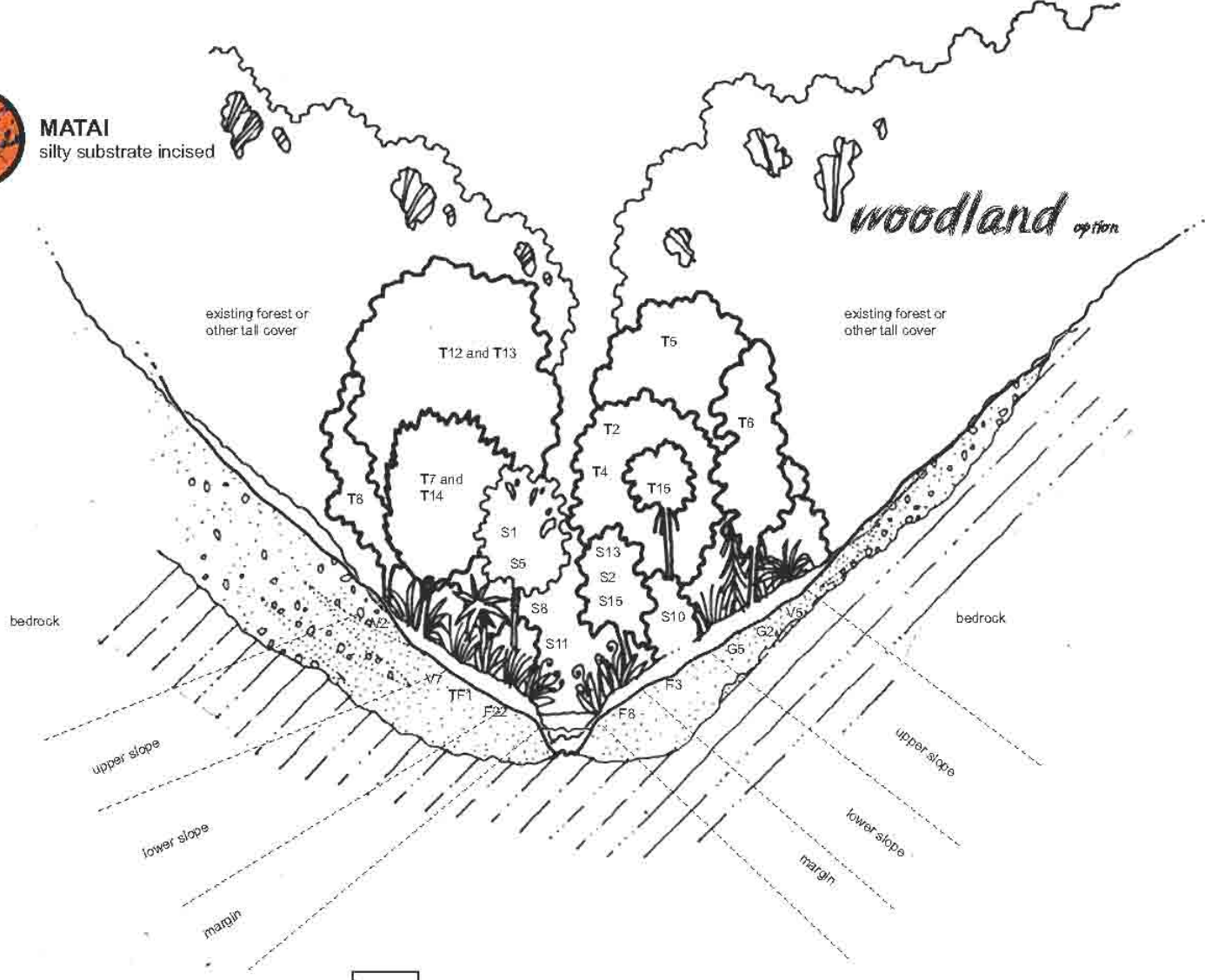
woodland option

Key No.	Botanical name	Common name		B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Trees												
T1	***Aristotelia serrata***	**makomako, wineberry**	❄		✶	■	■	■	□	□		✓	
T2	*Carpodetus serratus*	putaputaweta,marbleleaf	❄	✶		▪	■	▪	▪	□		✓	✓
T3	***Dodonaea viscosa***	**akeake**	❄	✶		■	▪	□	■	■			✓
T4	*Fuchsia excorticata*	kotukutuku, tree fuchsia	❄		✶	▪	■	▪	□	□		✓	
T5	***Griselinia littoralis***	**kapuka, broadleaf**				■	■	▪	■	■			✓
T6	***Myoporum laetum***	**ngaio**	T ❄	✶		■	▪	□	■	■			✓
T7	***Pittosporum eugenioides***	**tarata, lemonwood**				■	▪	▪	■	▪			✓
T8	***Pittosporum tenuifolium***	**kohuhu, black matipo**				■	■	■	■	■		✓	✓
T9	*Podocarpus totara*	totara		✶		■	▪	▪	■	■		✓	✓
T10	***Pseudopanax arboreus***	**whauwhaupaku, five-finger**	❄			■	■	▪	▪	▪			✓
T11	*Pseudopanax crassifolius*	horoeka, lancewood				■	▪	▪	▪	■			✓
T12	*Sophora microphylla*	South Island kowhai			✶	■	▪	▪	■	■			✓
	Shrubs												
S3	***Hebe salicifolia***	**koromiko**				■	▪	▪	▪	■		✓	
	Ferns	Common name											
F1	*Blechnum penna-marina*	dwarf kiokio		✶		■	■	■	▪	□		✓	✓
F2	*Blechnum minus/nz*	swamp kiokio		✶		■	■	■	□	□	✓		
F3	*Polystichum neozelandicum*	black shield fern (syn.*richardii*)				▪	■	▪	▪	□		✓	✓
F4	*Microsorum pustulatus*	maratata, hounds tongue fern				▪	■	▪	▪	□		✓	✓

shrubland option

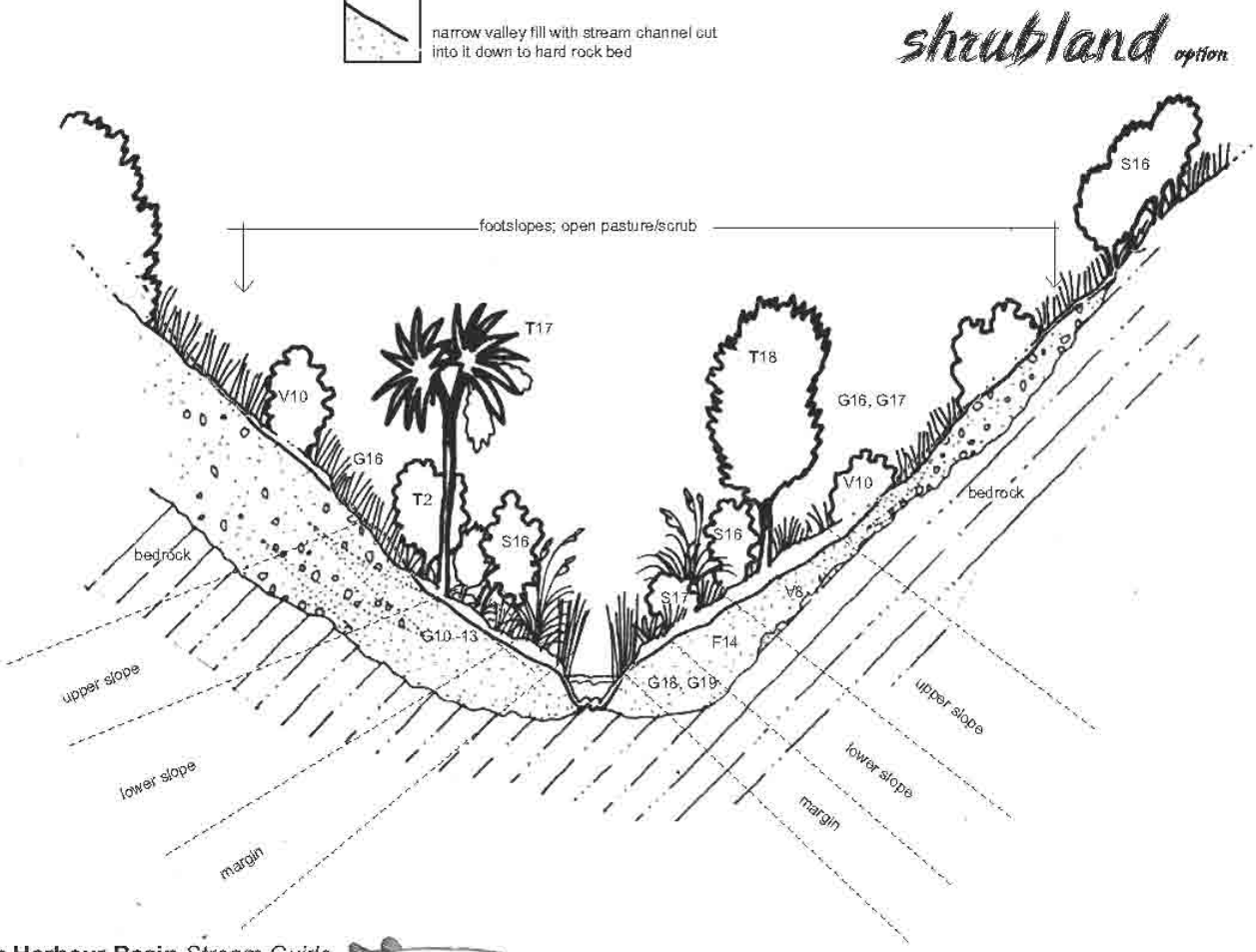
	Trees												
T13	***Cordyline australis***	**ti kouka, cabbage tree**		✶		■	□	▪	■	■		✓	✓
T14	***Kunzea ericoides***	**kanuka**		✶		■	□	▪	■	■			✓
T15	***Olearia paniculata***	**akiraho, golden akeake**		✶		■	□	□	■	■			✓
T12	*Sophora microphylla*	South Island kowhai			✶	■	▪	▪	■	■			✓
	Shrubs												
S1	***Coprosma propinqua***	**mikimiki**				■	■	■	■	■		✓	✓
S2	*Coprosma rhamnoides*	red-fruited mikimiki		✶		■	■	▪	▪	■		✓	
S3	***Coprosma crassifolius***			✶		■	▪	▪	▪	■		✓	✓
S5	*Myrsine divaricata*	weeping mapou		✶		■	▪	■	▪	■		✓	✓
S6	***Ozothamnus leptophylla***	**tauhinu (syn. *Cassinia*)**		✶		■	□	▪	■	■			✓
	Grasses and flax-like plants												
G1	*Carex buchananii,C.flagellifera*	purei, sedge		✶		■	□	■	□	■	✓	✓	
G2	***Carex geminata,C.virgata***	**purei, cutty grass**		✶		■	□	■	□	■	✓	✓	
G3	***Cortaderia richardii***	**toe toe**		✶		■	□	■	■	■		✓	
G4	***Juncus gregiflorus,J. pallidus***	**wiwi, tussock rush**		✶		■	□	■	▪	■	✓	✓	
G5	***Juncus sarophorus***	**wiwi, tussock rush**		✶		■	□	■	□	■	✓	✓	
G6	***Phormium tenax***	**harakeke, NZ Flax**		✶		■	□	■	■	■		✓	

MATAI
silty substrate incised



mixed colluvium on upper side slopes (or backslope/footslope)

narrow valley fill with stream channel cut into it down to hard rock bed



MATAI
silty substrate incised

Key

❄ initially frost tender
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D deciduous
T toxic
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Plant tolerances

■ tolerates or needs
▪ tolerant of some
□ intolerant of

Planting zones

woodland option

Key No.	Botanical name	Common name		B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Trees												
T1	***Aristotelia serrata***	**makomako, wineberry**			✶	▪	▪	▪	□	□		✓	
T2	*Carpodetus serratus*	putaputaweta, marbleleaf	❄	✶		▪	■	▪	▪	□		✓	✓
T3	***Dodonaea viscosa***	**akeake**	❄	✶		■	▪	□	■	■			✓
T4	*Fuchsia excorticata*	kotukutuku, tree fucshia	❄		✶	▪	■	▪	□	□		✓	
T5	***Griselinia littoralis***	**kapuka, broadleaf**				■	■	▪	■	■			✓
T6	***Hoheria angustifolia***	**houhere, houi, narrow-leaved lacebark**				■	▪	▪	■	■			✓
T7	*Lophomyrtus obcordata*	rohutu, NZ Myrtle	❄	✶		■	■	■	▪	■			✓
T8	*Melicytus ramiflorus*	mahoe	❄			■	■	▪	▪	□			✓
T9	***Myoporum laetum***	**ngaio**	T ❄	✶		■	▪	□	■	■			✓
T10	*Pennantia corymbosa*	kaikomako, ducksfeet	❄	✶		▪	▪	■	▪	■		✓	✓
T11	***Pittosporum eugenioides***	**tarata, lemonwood**				■	▪	▪	■	▪			✓
T12	*Podocarpus totara*	totara		✶		■	▪	■	■	■		✓	✓
T13	*Prumnopitys taxifolia*	matai, black pine		✶		■	▪	▪	■	■		✓	✓
T14	***Pseudopanax arboreus***	**whauwhaupaku, five-finger**	❄			■	■	▪	▪	▪			✓
T15	*Pseudopanax crassifolius*	horoeka, lancewood				■	▪	▪	■	■			✓
T16	*Sophora microphylla*	South Island kowhai			✶	■	▪	▪	■	■			✓
	Shrubs												
S1	*Coprosma areolata*	lace-leaved coprosma	❄			▪	■	▪	□	□		✓	
S2	*Coprosma linariifolia*	yellow wood, narrow-leaved coprosma				▪	■	▪	▪	▪		✓	✓
S3	*Coprosma lucida*	shining karamu	❄			■	■	▪	■	■			✓
S4	***Coprosma robusta***	**karamu**				■	■	■	■	■		✓	✓
S5	*Coprosma rotundifolia*	round-leaved coprosma	❄			▪	■	■	□	▪		✓	
S6	***Coprosma rubra***	**red mikimiki**				■	■	▪	▪	▪			✓
S7	*Coprosma rhamnoides*	red-fruited mikimiki		✶		■	■	▪	▪	■		✓	✓
S8	*Coriaria arborea*	tree tutu	T	✶		■	▪	▪	▪	□		✓	
S9	*Fuchsia perscandens*	shrub fuchsia	❄		✶	▪	▪	▪	□	□		✓	
S10	*Macropiper excelsum*	kawakawa	❄			▪	■	▪	▪	▪		✓	
S11	*Melicope simplex*	poataniwha				■	■	▪	▪	■			✓
S12	*Melicytus micranthus*	manakura, shrubby mahoe	❄			▪	■	■	▪	□		✓	
S13	*Myrsine australis*	mapou	❄			■	■	▪	▪	■		✓	✓
S14	*Raukawa anomalus* (syn *Pseudopanax*)	shrub pseudapanax				▪	▪	■	▪	▪		✓	
S15	*Schefflera digitata*	patete, sevenfinger	❄			▪	■	▪	□	□		✓	
	Vines												
V1	*Carmichaelia kirkii*	climbing broom				▪	■	▪	■	■			✓

MATAI
silty substrate incised

Key

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

Plant tolerances

■ tolerates or needs
□ intolerant of
▪ tolerant of some

Planting zones

woodland cont'd

Key No.	Botanical name	Common name		B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Vines and trailers (cont'd)												
V2	*Clematis foetida*	fragrant clematis		✶		■	▪	□	▪	■			✓
V3	*Clematis paniculata*	puawananga, bush clematis		✶		■	■	▪	□	□		✓	✓
V4	*Metrosideros diffusa*	climing rata	❄			▪	■	▪	□	□		✓	
V5	*Parsonsia heterophylla*	NZ jasmine		✶		■	■	▪	▪	■		✓	✓
V6	*Passiflora tetrandra*	kohia, native passionvine	❄			▪	■	▪	□	□		✓	
V7	*Ripogonum scandens*	kareao, supplejack	❄			▪	■	▪	□	□		✓	
V8	*Rubus cissoides*	tataramoa, bush lawyer		✶		■	▪	▪	□	▪		✓	
V9	*Rubus schmidelioides*	tataramoa, fine bush lawyer		✶		■	▪	▪	■	■			✓
	Grasses and flax-like tussocks												
G1	*Anemanthele lessoniana*	bamboo tussock,wind grass		✶		■	■	▪	▪	■		✓	✓
G2	*Astelia fragrans*	bushflax				▪	■	■	□	□		✓	✓
G3	*Carex forsteri, C. solandri*	purei, cutty grass		✶		□	■	■	□	□		✓	
G4	*Microlaena avenacea*	bush rice grass		✶		▪	■	■	□	▪		✓	
G5	*Microlaena polynoda*	creeping rice grass		✶		▪	■	□	■	□		✓	✓
G6	*Uncinia spp.*	hooked sedges		✶		□	■	■	□	□		✓	
	Ferns - ground ferns												
F1	*Adiantum cunninghamii*	maidenhair fern	❄			□	■	□	□	□		✓	
F2	*Asplenium appendiculatum*	ground spleenwort	❄			□	■	□	▪	□		✓	✓
F3	*Asplenium bulbiferum*	hen and chicken fern	❄			□	■	▪	□	□		✓	
F4	*Asplenium hookerianum*	Hookers spleenwort	❄			□	■	□	▪	□			✓
F5	*Asplenium oblongifolium*	shining spleenwort	❄			▪	■	□	▪	□		✓	✓
F6	*Blechnum chambersii*	kiokio, hard fern	❄	✶		□	■	■	□	□	✓		
F7	*Blechnum colensoi*	peretao, waterfall fern	❄	✶		□	■	■	□	□	✓		
F8	*Blechnum discolor*	piupiu, crown fern	❄	✶		□	■	■	□	□		✓	
F9	*Blechnum fluviatile*	kiwakiwa	❄			□	■	■	□	□	✓		
F10	*Blechnum minus/nz*	swamp kiokio		✶		■	▪	■	□	▪	✓		
F11	*Blechnum penna-marina*	dwarf kiokio		✶		■	■	■	▪	□		✓	✓
F12	*Blechnum procerum*	bog kiokio		✶		▪	■	■	□	■		✓	✓
F13	*Blechnum vulcanicum*	triangular kiokio		✶		□	■	□	▪	□		✓	
F14	*Histiopteris incisa*	mata, water fern	❄	✶	✶	▪	■	■	□	□	✓		
F15	*Hypolepis ambigua*	rough pigfern		✶	✶	□	■	■	□	□		✓	
F16	*Lastreopsis glabella*	smooth shield fern	❄	✶		□	■	▪	□	□		✓	
F17	*Lastreopsis velutina*	velvet fern	❄			□	■	■	▪	□		✓	
F18	*Leptolepia novae-zelandiae*	lace fern	❄			□	■	■	□	□		✓	
F19	*Leptopteris hymenophylloides*	heruheru, single crape fern	❄			□	■	▪	□	□	✓		
F20	*Pellaea rotundifolia*	tarawera, button fern		✶		▪	■	▪	▪	□			✓
F21	*Pyrrosia eleagnifolia*	ngarara wehi, leather-leaf fern		✶		■	▪	□	▪	▪			✓
F22	*Polystichum neozelandicum*	black shield fern (syn. *richardii*)				□	■	▪	▪	□		✓	✓

MATAI
silty substrate incised

Key

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B browse-tolerant once established
D deciduous
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Plant tolerances
■ tolerates or needs
▪ tolerant of some
□ intolerant of

Planting zones

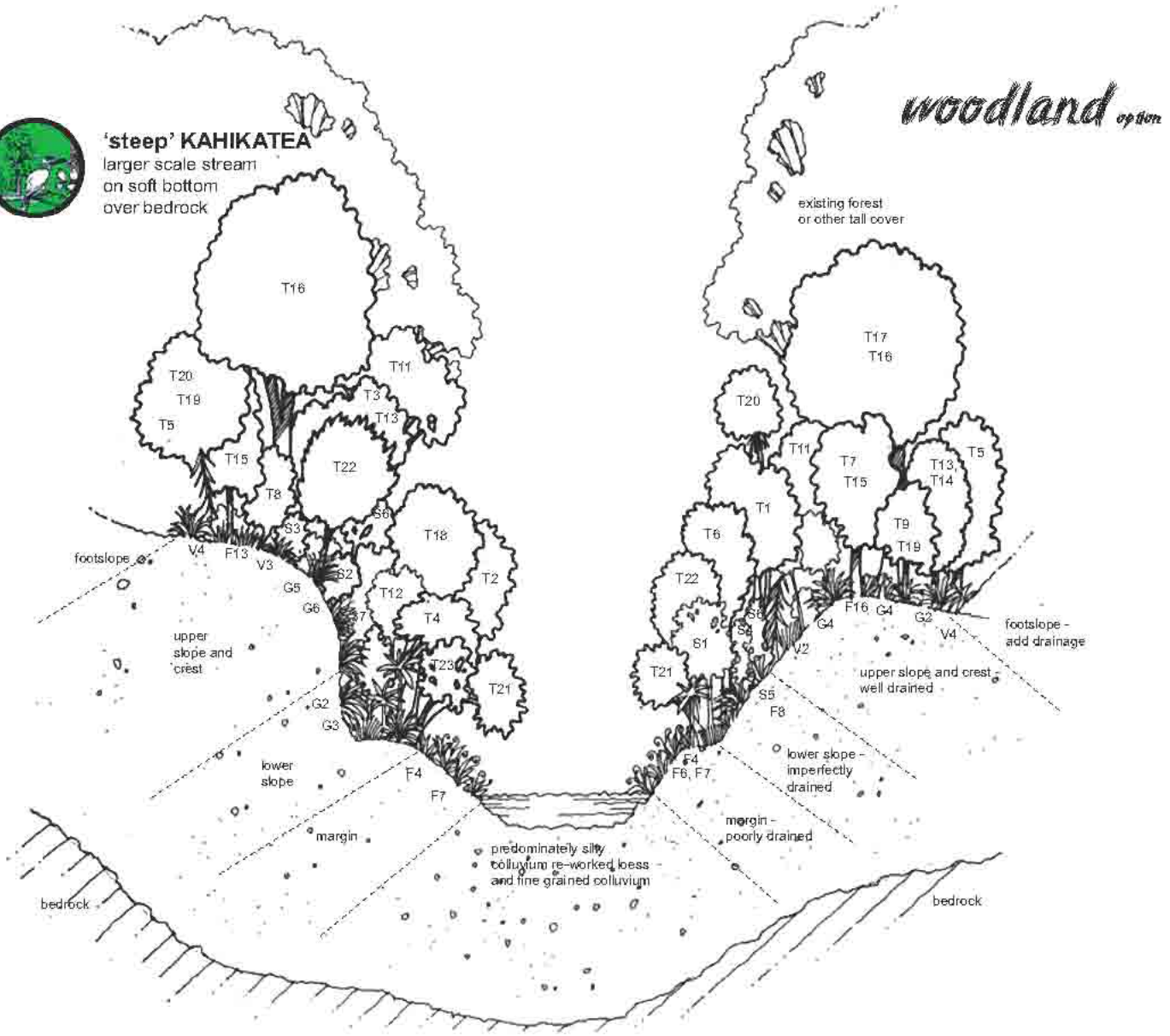
woodland option

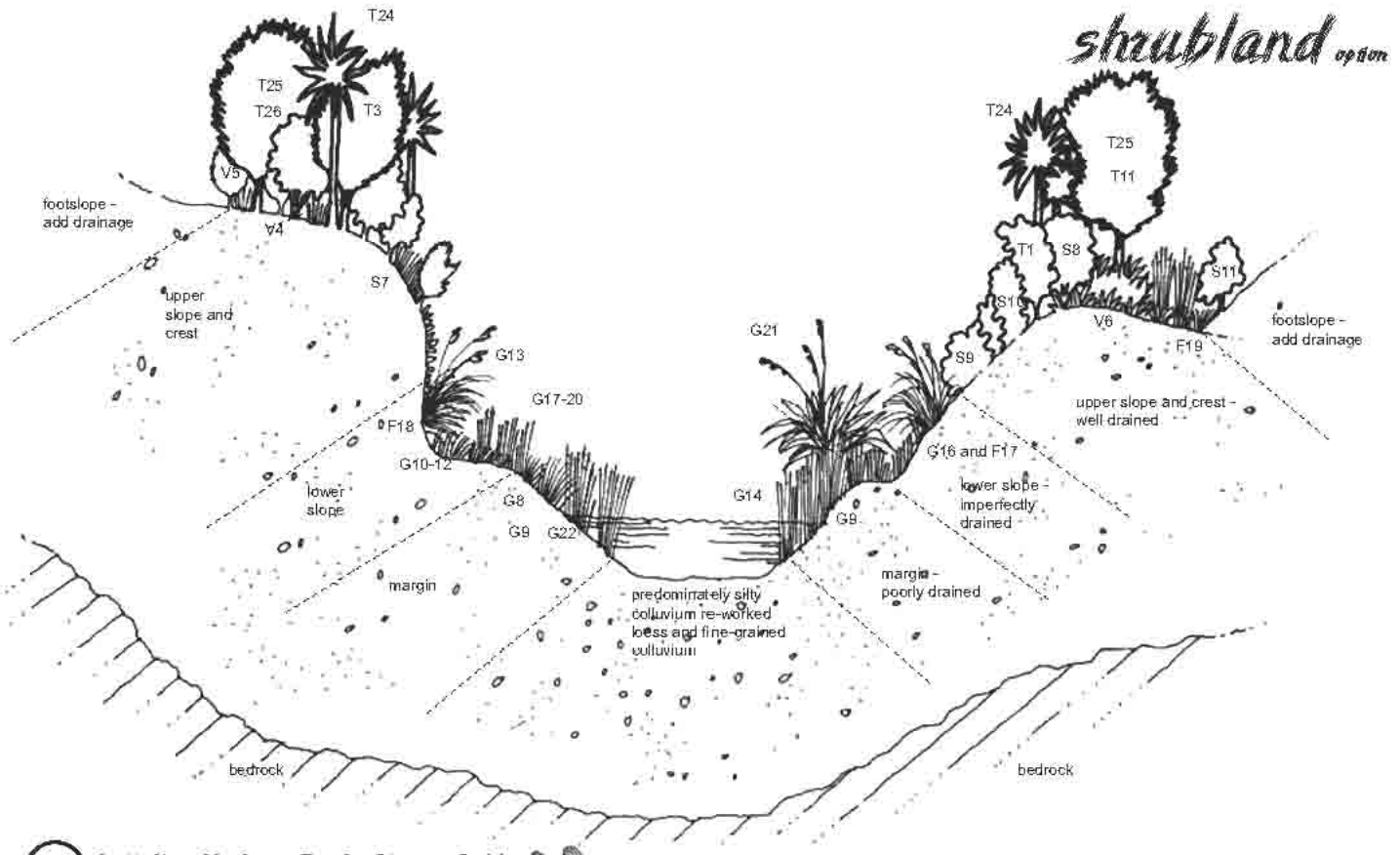
Key No.	Botanical name	Common name		B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Ferns - ground ferns (cont'd)												
F23	*Polystichum vestitum*	puniu, prickly shield fern				▪	■	■	□	□	✓	✓	
F24	*Pneumatopteris pennigera*	pakau, feather or gully fern	❄			□	■	▪	□	□	✓		
	- tree ferns												
TF1	*Cyathea dealbata*	ponga, silver fern	❄	*		□	■	■	□	□		✓	
TF2	*Cyathea smithii*	katote, soft tree fern	❄	*		□	■	■	□	□		✓	
TF3	*Dicksonia fibrosa*	kuripaka, wheki ponga	❄			□	■	■	□	□		✓	
TF4	*Dicksonia squarrosa*	wheki, rough tree fern	❄			▪	■	■	▪	□		✓	

shrubland option

	Trees												
T2	*Carpodetus serratus*	putaputaweta,marbleleaf	❄	*		▪	■	▪	▪	□		✓	✓
T17	***Cordyline australis***	**ti kouka, cabbage tree**		*		■	▪	■	■	■		✓	✓
T18	***Kunzea ericoides***	**kanuka**		*		■	□	▪	■	■			✓
	Shrubs												
S16	*Myrsine divaricata*	weeping mapou		*		■	▪	■	▪	▪		✓	
S17	*Urtica linearifolia*	swamp nettle	❄	*		▪	▪	■	□	□	✓		
	Vines and trailers												
V10	***Muehlenbeckia complexa***	**scrambling pohuehue**		*		■	□	▪	■	■		✓	✓
V8	*Rubus schmidelioides*	tataramoa, fine bush lawyer		*		■	▪	▪	■	■			✓
V11	*Rubus squarrosus*	tataramoa, leafless lawyer		*		■	▪	▪	■	■			✓
	Grasses and flax-like plants												
G7	*Carex appressa*	purei, cutty grass		*		■	□	■	□	■	✓	✓	
G8	*Carex buchananii*	purei, sedge		*		■	□	■	□	■	✓	✓	
G9	*Carex flagellifera*	purei, sedge		*		■	□	■	□	■		✓	
G10	***Carex geminata***	**purei, cutty grass**		*		■	□	■	□	■	✓	✓	
G11	***Carex secta***	**pukio, tussock sedge**		*		■	□	■	□	■	✓	✓	
G12	***Carex virgata***	**pukio, tussock sedge**		*		■	□	■	□	■	✓	✓	
G13	***Cortaderia richardii***	**toe toe**		*		■	□	■	■	■		✓	
G14	*Eleocharis acuta*	spike sedge		*		■	□	■	□	■	✓		
G15	*Hierochloe redolens*	holy grass, karetu				■	□	▪	▪	■		✓	✓
G16	***Isolepis nodosa***	**knobby clubrush**		*		■	□	▪	■	■		✓	✓
G17	***Juncus australis***	**wiwi, tussock rush**		*		■	□	■	□	■	✓	✓	
G18	***Juncus gregiflorus***	**wiwi, tussock rush**		*		■	□	■	□	■	✓	✓	
G19	***Juncus pallidus, J. sarophorus***	**wiwi, tussock rush**		*		■	□	■	□	■	✓	✓	
G20	*Polygonum salicifolium*	NZ knotweed		*		■	□	■	□	▪	✓		
	Ferns - ground ferns												
F15	*Hypolepis ambigua*	rough pigfern		*		□	■	■	□	□		✓	
F25	*Paesia scaberula*	matata, scented lace/ring fern		*		■	▪	▪	▪	□		✓	

'steep' KAHIKATEA
larger scale stream
on soft bottom
over bedrock





'steep' KAHIKATEA

larger scale stream on soft bottom over bedrock

woodland option

Key

- ❄ initially frost tender
- B browse-tolerant once established
- D deciduous
- T toxic
- **Bold** = main species for relatively fast growing first stage planting into open sites

Plant tolerances

- ■ tolerates or needs
- ▪ tolerant of some
- □ intolerant of

Planting zones

Key No.	Botanical name	Common name	B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Trees											
T1	*Carpodetus serratus*	putaputaweta, marbleleaf ❄	✶		▪	■	▪	▪	□		✓	✓
T2	*Dacrycarpus dacrydioides*	kahikatea, white pine	✶		■	▪	■	□	■		✓	
T3	***Dodonaea viscosa***	**akeake** ❄	✶		■	▪	□	■	■			✓
T4	*Fuchsia excorticata*	kotukutuku, tree fucshia ❄		✶	▪	■	▪	□	□		✓	
T5	***Griselinia littoralis***	**kapuka, broadleaf**			■	■	▪	■	■			✓
T6	*Hedycarya arborescens*	porokaiwhiri, pigeonwood ❄			▪	■	▪	□	□		✓	
T7	***Hoheria angustifolia***	**houhere, narrow-lvd lacebark**	✶		■	▪	▪	■	■			✓
T8	*Lophomyrtus obcordata*	rohutu, NZ myrtle	✶		■	▪	▪	▪	■		✓	✓
T9	*Melicytus ramiflorus*	mahoe ❄			■	■	▪	▪	□		✓	✓
T10	*Melicope simplex*	poataniwha ❄			▪	■	▪	▪	■		✓	✓
T11	***Myoporum laetum***	**ngaio** T ❄	✶		■	▪	□	■	■			✓
T12	*Pennantia corymbosa*	kaikomako,ducksfeet ❄	✶		▪	▪	▪	▪	▪		✓	✓
T13	***Pittosporum eugenioides***	**tarata, lemonwood**			■	▪	▪	■	▪			✓
T14	***Pittosporum tenuifolium***	**kohuhu, black matipo**			■	■	■	■	■	✓		✓
T15	***Plagianthus regius***	**manatu, lowland ribbonwood**	✶	✶	■	▪	▪	▪	■		✓	✓
T16	*Podocarpus totara*	totara	✶		■	▪	▪	■	▪			✓
T17	*Prumnopitys taxifolia*	matai, black pine	✶		■	▪	■	■	■		✓	✓
T18	*Prumnopitys ferruginea*	miro ❄	✶		▪	■	▪	□	□		✓	
T19	***Pseudopanax arboreus***	**whauwhaupaku, five-finger** ❄			■	■	▪	▪	▪			✓
T20	*Pseudopanax crassifolius*	horoeka, lancewood			■	▪	▪	■	■			✓
T21	Schefflera digitata	patete, sevenfinger ❄			▪	■	▪	□	□		✓	
T22	*Sophora microphylla*	South Island kowhai		✶	■	▪	▪	■	■			✓
T23	*Streblus heterophyllus*	turepo, milk tree ❄	✶		▪	■	■	□	□		✓	
	Shrubs											
S1	*Coprosma areolata*	lace-leaved coprosma ❄			■	■	▪	▪	□		✓	
S2	*Coprosma lucida*	shining karamu			■	■	▪	■	■			✓
S3	**Coprosma robusta**	**karamu**			■	■	■	■	■	✓		✓
S4	*Coprosma rubra*	red mikimiki			■	▪	▪	▪	□			✓
S5	*Coriaria arborea*	tree tutu T ❄	✶		■	▪	▪	▪	□		✓	
S6	*Myrsine australis*	mapou ❄	✶		■	■	▪	▪	▪		✓	✓
	Vines and trailers											
V1	*Clematis foetida*	fragrant clematis	✶		■	▪	□	▪	■			✓
V2	*Clematis paniculata*	puawananga, bush clematis ❄	✶		■	■	▪	□	□		✓	✓
V3	*Parsonsia heterophylla*	NZ jasmine	✶		■	■	▪	□	■		✓	✓
V4	*Rubus schmidelioides*	tataramoa, fine bush lawyer	✶		■	▪	▪	■	■			✓
	Grasses and flax-like plants											
G1	*Anemanthele lessoniana*	bamboo tussock, wind grass	✶		■	■	▪	▪	■		✓	✓

'steep' KAHIKATEA
larger scale stream on soft bottom over bedrock

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Plant tolerances
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Planting zones

woodland option

Key No.	Botanical name	Common name		B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Grasses and flax-like plants (cont'd)												
G2	*Astelia fragrans*	kakaha, bush lily				▪	■	■	□	□		✓	✓
G3	*Carex forsteri*	purei, cutty grass		✱		□	■	■	□	□		✓	
G4	*Dianella nigra*	turutu, ink berry				■	▪	□	▪	■			✓
G5	*Libertia ixioides*	mikoikoi, NZ iris		✱		■	■	▪	■	■		✓	✓
G6	*Microlaena avenacea, M.polynoda*	bush rice grass, creeping rice grass				▪	▪	□	■	■		✓	✓
	Ferns - ground ferns												
F1	*Adiantum cunninghamii*	maidenhair fern	❄			□	■	□	□	□		✓	
F2	*Asplenium hookerianum*	Hookers spleenwort	❄			□	■	□	▪	□		✓	✓
F3	*Asplenium oblongifolium*	shining spleenwort	❄			▪	■	□	▪	□		✓	✓
F4	*Blechnum chambersii*	kiokio, hard fern	❄	✱		□	■	■	□	□	✓		
F5	*Blechnum colensoi*	peretao, waterfall fern	❄	✱		□	■	■	□	□	✓		
F6	*Blechnum fluviatile*	kiwakiwa	❄			□	■	■	□	□	✓	✓	
F7	*Blechnum minus/nz*	swamp kiokio		✱		■	▪	■	□	□	✓		
F8	*Blechnum penna-marina*	dwarf kiokio		✱		■	■	■	▪	□		✓	✓
F9	*Histiopteris incisa*	mata, water fern	❄	✱	✱	▪	■	■	□	□	✓		
F10	*Leptopteris hymenophylloides*	heruheru, single crape fern	❄			□	■	■	□	□	✓		
F11	*Microsorum pustulatum*	maratata, hounds tongue fern	❄			▪	■	■	■	□		✓	✓
F12	*Pellaea rotundifolia*	tarawera, button fern	❄	✱		▪	■	▪	▪	▪		✓	✓
F13	*Polystichum neozelandicum*	black shield fern (syn.*richardii*)	❄			□	■	▪	▪	□		✓	✓
F14	*Polystichum vestitum*	puniu, shield fern	❄			▪	■	■	□	□	✓	✓	
F15	*Pneumatopteris pennigera*	pakau, feather or gully fern	❄			□	■	■	□	□	✓		
F16	*Pyrrosia eleagnifolia*	ngarara wehi, leather-leaf fern	❄	✱		■	□	□	■	■		✓	✓

shrubland option

	Trees												
T1	*Carpodetus serratus*	putaputaweta,marbleleaf	❄	✱		▪	■	▪	▪	□		✓	✓
T24	***Cordyline australis***	**ti kouka, cabbage tree**		✱		■	▪	■	■	■		✓	✓
T3	***Dodonaea viscosa***	**akeake**	❄	✱		■	▪	□	■	■			✓
T25	***Kunzea ericoides***	**kanuka**		✱		■	□	▪	■	■			✓
T26	***Olearia paniculata***	**akiraho, golden akeake**		✱		■	□	□	■	■			✓
T11	***Myoporum latetum***	**ngaio**	T ❄	✱		■	▪	□	■	■			✓
	Shrubs												
S7	*Carmichaelia kirkii*	climbing broom				▪	■	▪	▪	■		✓	✓
S8	*Coprosma rhamnoides*	variable coprosma		✱		■	■	▪	▪	■		✓	
S9	***Hebe salicifolia***	**koromiko**				■	▪	▪	▪	▪		✓	✓
S10	*Myrsine divaricata*	weeping mapou		✱		■	▪	■	▪	▪		✓	✓

'steep' KAHIKATEA
larger scale stream on soft bottom over bedrock

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Planting zones

shrubland option

Key No.	Botanical name	Common name	B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Shrubs (cont'd)											
S11	***Ozothamnus leptophylla*** **(syn. *Cassinia*)**	**tauhinu**	*		■	□	▪	■	■			✓
	Vines and trailers											
V5	***Muehlenbeckia complexa***	**scrambling pohuehue**	*	*	■	□	▪	■	■		✓	✓
V4	*Rubus schmidelioides*	tataramoa, fine bush lawyer	*		■	▪	▪	■	■		✓	✓
V6	*Rubus squarrosus*	tataramoa, leafless lawyer	*		■	▪	▪	■	■		✓	✓
	Grasses and flax-like plants											
G7	*Carex appressa*	purei, cutty grass	*		■	□	■	□	■	✓		
G8	***Carex secta***	**pukio, tussock sedge**	*		■	□	■	□	■	✓		
G9	***Carex virgata***	**pukio, tussock sedge**	*		■	□	■	□	■	✓		
G10	***Carex buchananii***	**purei, sedge**	*		■	□	■	□	■	✓		
G11	***Carex flagellifera***	**purei, sedge**	*		■	□	■	□	■	✓		
G12	***Carex geminata***	**purei, cutty grass**	*		■	□	■	□	■	✓	✓	
G13	***Cortaderia richardii***	**toe toe**	*		■	□	■	■	■	✓	✓	
G14	***Eleocharis acuta***	**spike sedge**	*		■	□	■	□	■	✓		
G15	*Hierochloe redolens*	holy grass, karetu			■	□	■	▪	■	✓	✓	
G16	***Isolepis nodosa***	**knobby clubrush**	*		■	□	▪	■	■		✓	✓
G17	***Juncus australis***	**wiwi, tussock rush**	*		■	□	■	□	■	✓	✓	
G18	***Juncus gregiflorus***	**wiwi, tussock rush**	*		■	□	■	□	■	✓	✓	
G19	***Juncus pallidus***	**wiwi, tussock rush**	*		■	□	■	□	■	✓		
G20	***Juncus sarophorus***	**wiwi, tussock rush**	*		■	□	■	□	■	✓		
G21	***Phormium tenax***	**harakeke, NZ Flax**	*		■	□	■	■	■	✓	✓	
G22	*Polygonum salicifolium*	NZ knotweed	*		■	□	■	□	▪	✓		
	Ferns - ground ferns											
F17	*Hypolepis ambigua*	rough pigfern ❄	*	*	□	■	■	□	□		✓	
F18	*Paesia scaberula*	matata, scented lace/ring fern	*		■	▪	▪	▪	□		✓	✓
F19	***Pteridium esculentum***	**rahurahu, bracken fern**	*	*	■	▪	▪	■	■			✓

'gentle' KAHIKATEA
dominant sand to fine gravel substrate

and

HARAKEKE
dominant coarse gravel to bouldery substrate

woodland option

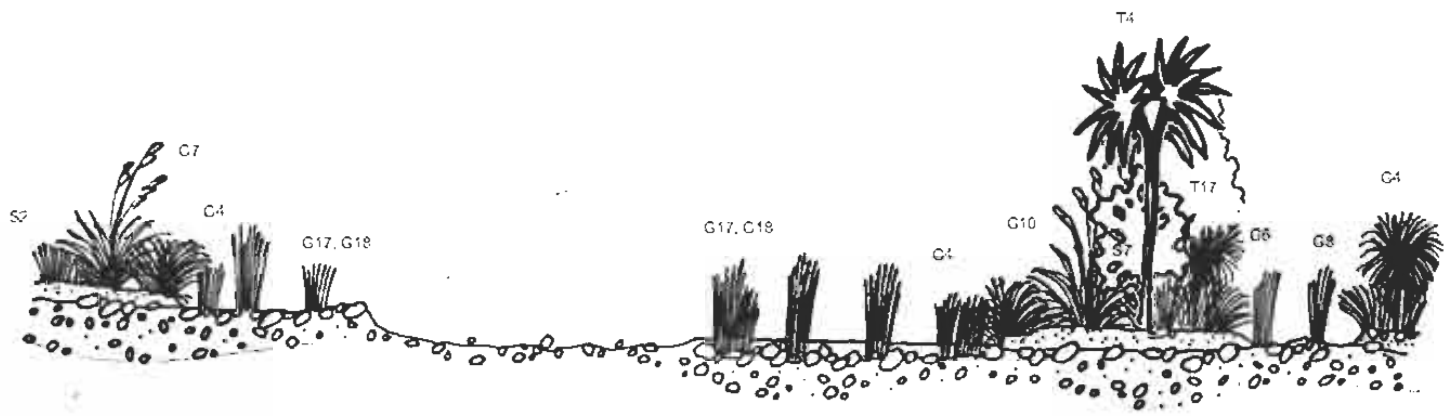
shallow silts overlaying fine gravels and deep silts over coarse gravels

stony channel edge

stony channel edge

deep silts overlaying fine gravels

shrubland option



shallow silts overlaying fine gravels and deep silts over coarse gravels

stony channel edge

stony channel edge

deep silts overlaying fine gravels

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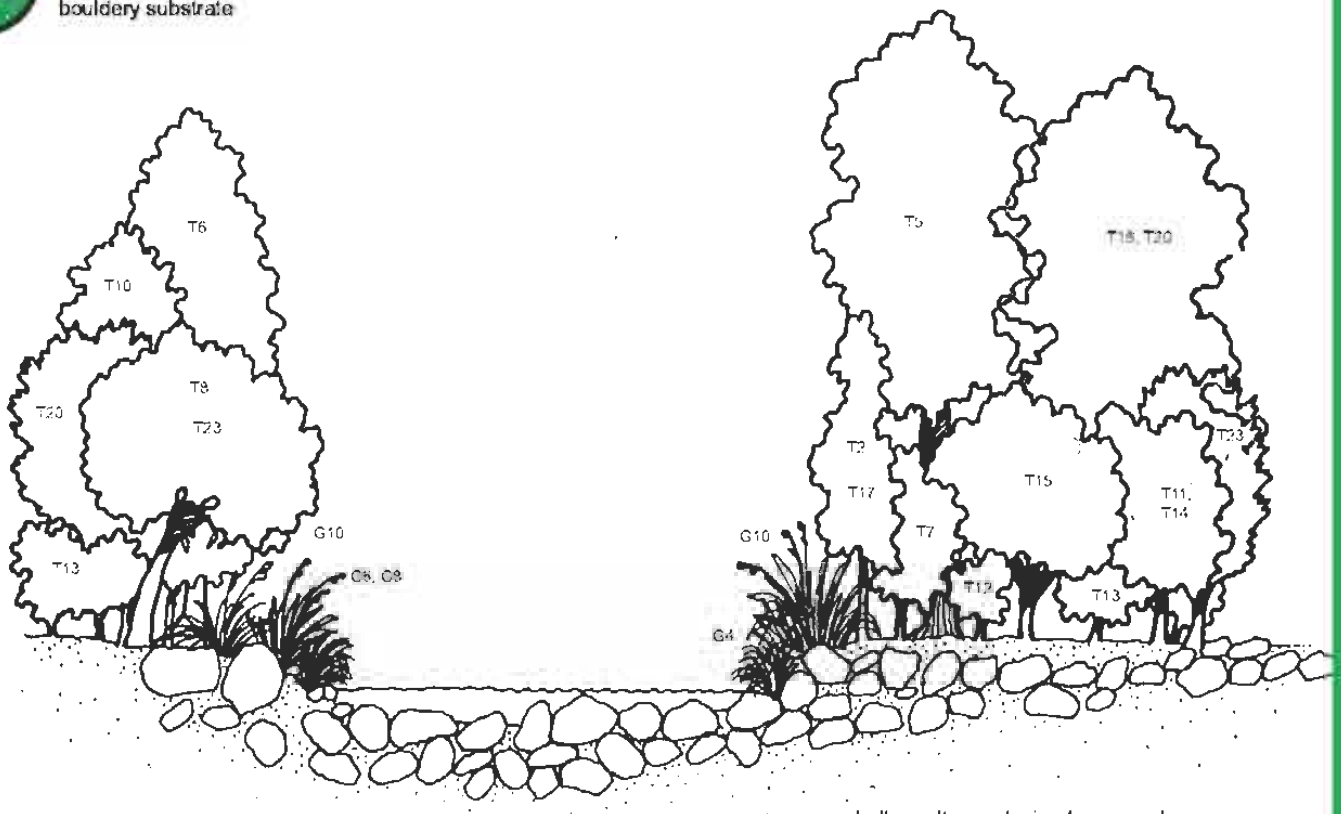
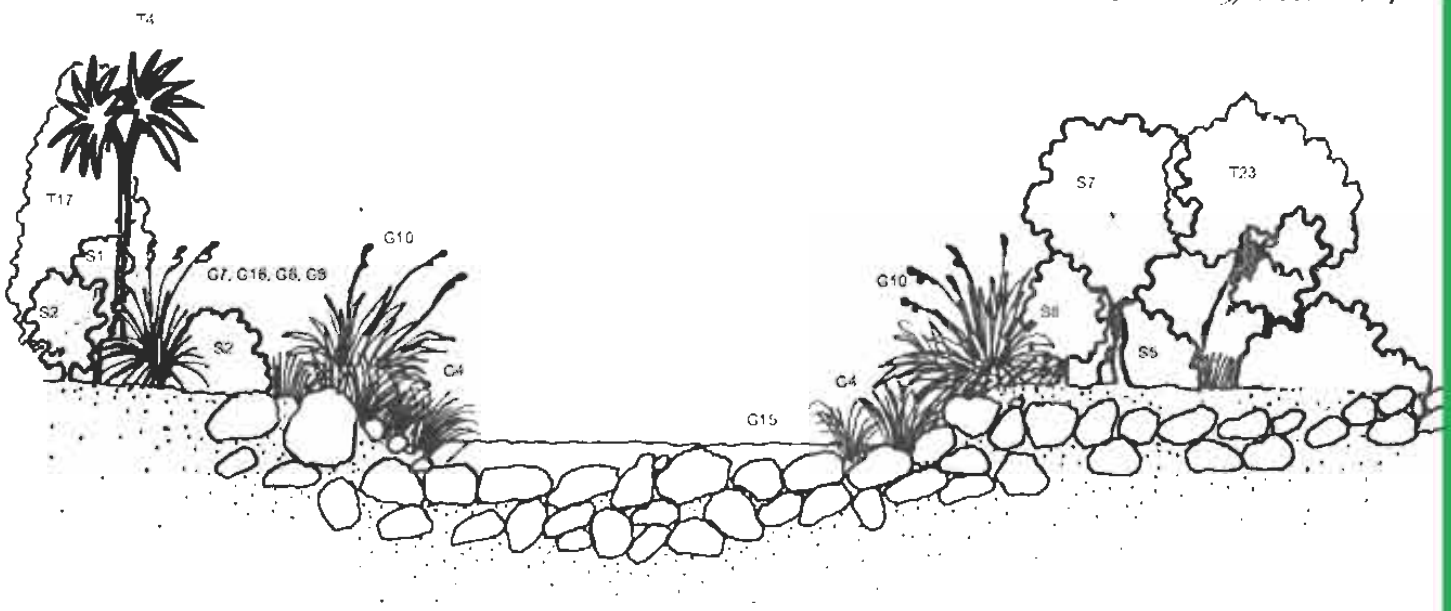


deep silts overlaying fine gravels | stony channel edge | shallow silts overlaying fine gravels and deep silts over coarse gravels

shrubland option



deep silts overlaying fine gravels | stony channel edge | shallow silts overlaying fine gravels and deep silts over coarse gravels

'gentle' KAHIKATEA

and

HARAKEKE

woodland option

Key

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Planting zones

Key No.	Botanical name	Common name		B	D	sun	shade	wet	dry	wind	shallow silts overlaying fine gravels and deep silts over coarse gravels	stony channel edge	deep silts overlaying fine gravels
	Trees												
T1	*Alectryon excelsus*	titoki	❄			▪	▪	▪	▪	□			✓
T2	***Aristotelia serrata***	**makomako, wineberry**	❄		✱	▪	▪	▪	□	□			✓
T3	*Carpodetus serratus*	putaputaweta, marbleleaf	❄	✱		▪	■	▪	▪	□			✓
T4	***Cordyline australis***	**ti kouka, cabbage tree**		✱		■	▪	■	■	■	✓	✓	✓
T5	*Dacrycarpus dacrydioides*	Kahikatea, white pine		✱		■	▪	■	□	■			✓
T6	***Elaeocarpus hookerianus***	**pokaka**		✱		■	▪	■	□	▪			✓
T7	*Fuchsia excorticata*	kotukutuku, tree fucshia	❄		✱	▪	■	▪	□	□			✓
T8	***Griselinia littoralis***	**kapuka, broadleaf**				■	■	▪	■	■	✓		✓
T9	*Hedycarya arborescens*	porokaiwhiri, pigeonwood	❄			■	▪	▪	▪	□			✓
T10	***Hoheria angustifolia***	**houhere, narrow-leaved lacebark**		✱		■	□	■	■	■	✓		✓
T11	*Lophomyrtus obcordata*	rohutu, NZ Myrtle	❄			■	■	■	▪	■	✓		✓
T12	*Melicope simplex*	poataniwha	❄			■	■	■	▪	▪	✓		✓
T13	*Myrsine australis*	mapou, red matipo	❄			■	■	□	■	■	✓		✓
T14	*Pennantia corymbosa*	kaikomako, ducksfeet	❄	✱		■	▪	■	▪	□			✓
T15	***Pittosporum eugenioides***	**tarata, lemonwood**				■	▪	▪	■	▪	✓		✓
T16	***Pittosporum tenuifolium***	**kohuhu, black matipo**											✓
T17	***Plagianthus regius***	**manatu, lowland ribbonwood**		✱	✱	■	▪	▪	▪	■	✓		✓
T18	*Podocarpus totara*	totara				■	▪	■	■	■	✓		✓
T19	*Prumnopitys ferruginea*	miro	❄	✱		▪	■	▪	□	□			✓
T20	*Prumnopitys taxifolia*	matai, black pine		✱		■	▪	■	■	■	✓		✓
T21	*Pseudopanax crassifolius*	horoeka, lancewood				■	▪	▪	■	■	✓		✓
T22	*Schefflera digitata*	pate, sevenfinger	❄			▪	■	▪	□	□			✓
T23	*Sophora microphylla*	South island kowhai			✱	■	▪	▪	■	■	✓		✓
T24	*Streblus heterophyllus*	turepo, milk tree	❄	✱		■	■	■	□	□			✓
	Shrubs												
S1	*Coprosma areolata*	lace-leaved coprosma	❄			■	■	▪	▪	□			✓
S2	***Coprosma propinqua***	**mikimiki**		✱		■	■	■	■	■	✓		✓
S3	***Coprosma rotundifolia***	**round-leaved coprosma**	❄			▪	■	■	▪	▪			✓
S4	*Coriaria arborea*	tree tutu	T ❄	✱	✱	■	▪	▪	▪	□	✓	✓	✓
S5	*Fuchsia perscandens*	shrub fuchsia	❄		✱	▪	▪	▪	□	□			
S6	***Hebe salicifolia***	**koromiko**				■	▪	▪	▪	▪	✓	✓	✓
S7	***Leptosperum scoparium***	**manuka, tea tree**		✱		■	▪	■	■	■	✓	✓	✓
S8	*Macropiper excelsum*	kawakawa	❄			▪	▪	■	■	▪			✓
S9	*Melicytus micranthus*	manakura, shrubby mahoe	❄			■	■	■	▪	□			✓
S10	*Raukawa anomalus* (syn. *Pseudopanax*)	shrub pseudopanax		✱		▪	▪	■	▪	▪			✓
S11	*Pseudowintera colorata*	horopito, peppertree (shrub)		✱		■	■	■	□	▪			✓

gentle' KAHIKATEA

and

HARAKEKE

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Key No.	Botanical name	Common name		B	D	sun	shade	wet	dry	wind	shallow silts overlaying fine gravels and deep silts over coarse gravels	stony channel edge	deep silts overlaying fine gravels
	Vines and trailers												
V1	*Clematis paniculata*	puawananga, bush clematis		*		■	■	▪	□	□	✓		✓
V2	*Metrosideros diffusa*	climing rata vine	❄			▪	▪	▪	□	□			✓
V3	*Passiflora tetrandra*	kohia, native passionvine	❄			▪	▪	▪	□	□			✓
V4	*Ripogonum scandens*	kareao, supplejack	❄			▪	▪	▪	□	□			✓
V5	*Rubus cissoides*	tataramoa, bush lawyer		*		■	▪	▪	□	▪	✓		✓
	Grasses and flax-like plants												
G1	*Anemanthele lessoniana*	bamboo tussock,wind grass		*		■	■	▪	■	▪	✓		✓
G2	*Astelia fragrans*	kakaha, bush lily				▪	■	■	□	□	✓		✓
G3	*Carex forsteri*	purei, cutty grass		*		□	■	■	□	□			✓
G4	***Carex secta***	**pukio, tussock sedge**		*		■	□	■	□	■		✓	
G5	*Carex solandri*	purei, cutty grass		*		□	■	■	□	□			✓
G6	***Carex virgata***	**pukio, tussock sedge**		*		■	□	■	□	■		✓	✓
G7	***Cortaderia richardii***	**toe toe**		*		■	□	■	■	■	✓	✓	✓
G8	***Cyperus ustulatus***	**giant umbrella sedge, toetoe upokotangata**		*		■	□	■	▪	■		✓	✓
G9	*Microlaena avenacea*	bush rice grass	❄	*		■	▪	□	■	■			✓
G10	***Phormium tenax***	**harakeke, NZ Flax**		*		■	□	■	■	■	✓	✓	✓
G11	*Uncinia spp.*	hooked sedge		*		□	■	■	□	□			✓
	Ferns - ground ferns												
F1	*Adiantum cunninghamii*	maidenhair fern	❄			□	■	□	□	□			✓
F2	*Asplenium appendiculatum*	ground spleenwort	❄			□	■	□	▪	□	✓		✓
F3	*Asplenium bulbiferum*	hen and chicken fern, pikopiko	❄			□	■	▪	□	□			✓
F4	*Asplenium oblongifolium*	shinging spleenwort	❄			▪	■	□	▪	□	✓		✓
F5	*Blechnum fluviatile*	kiwakiwa	❄			□	■	■	□	□			✓
F6	*Blechnum nz/minus*	swamp kiokio		*		■	▪	■	□	□		✓	
F7	*Blechnum vulcanicum*	korokio	❄			□	■	■	□	□	✓		
F8	*Hypolepis ambigua*	rough pigfern	❄	*	*	□	■	■	□	□	✓	✓	✓
F9	*Lastreopsis glabella*	smooth shield fern	❄			□	■	▪	□	□			✓
F10	*Lastreopsis velutina*	velvet fern	❄			□	■	■	▪	□			✓
F11	*Leptolepia novae-zelandiae*	lace fern	❄			□	■	■	□	□			✓
F12	*Polystichum neozelandicum*	black shield fern (syn.*richardii*)	❄			□	■	▪	▪	□	✓		✓
F13	*Polystichum vestitum*	prickly shield fern	❄			▪	■	■	□	□		✓	✓
F14	*Pteris macilenta*	titipo, sweet brake fern	❄	*	*	▪	■	▪	▪	□	✓		✓
	tree ferns												
TF1	*Cyathea dealbata*	ponga, silver fern	❄	*		▪	■	▪	▪	□	✓		✓
TF2	*Cyathea smithii*	katote, soft tree fern	❄	*		□	■	■	□	□			✓
TF3	*Dicksonia fibrosa*	kuripuka, wheki ponga	❄			▪	■	▪	▪	▪			✓

'gentle' KAHIKATEA

and

HARAKEKE

Key

❄ initially frost tender

B browse-tolerant once established

D deciduous

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

Planting tolerances

■ tolerates or needs

▪ tolerant of some

□ intolerant of

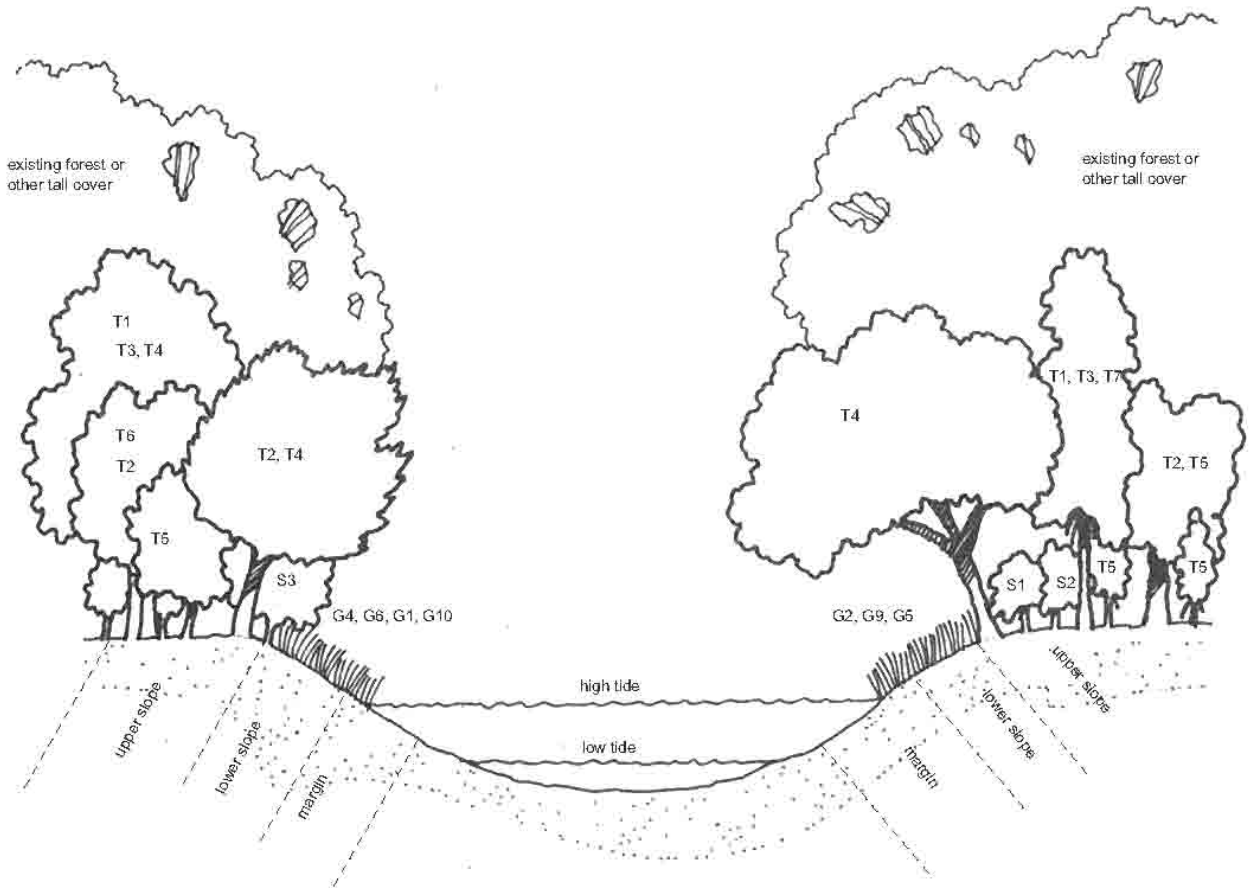
Planting zones

grassland/shrubland option

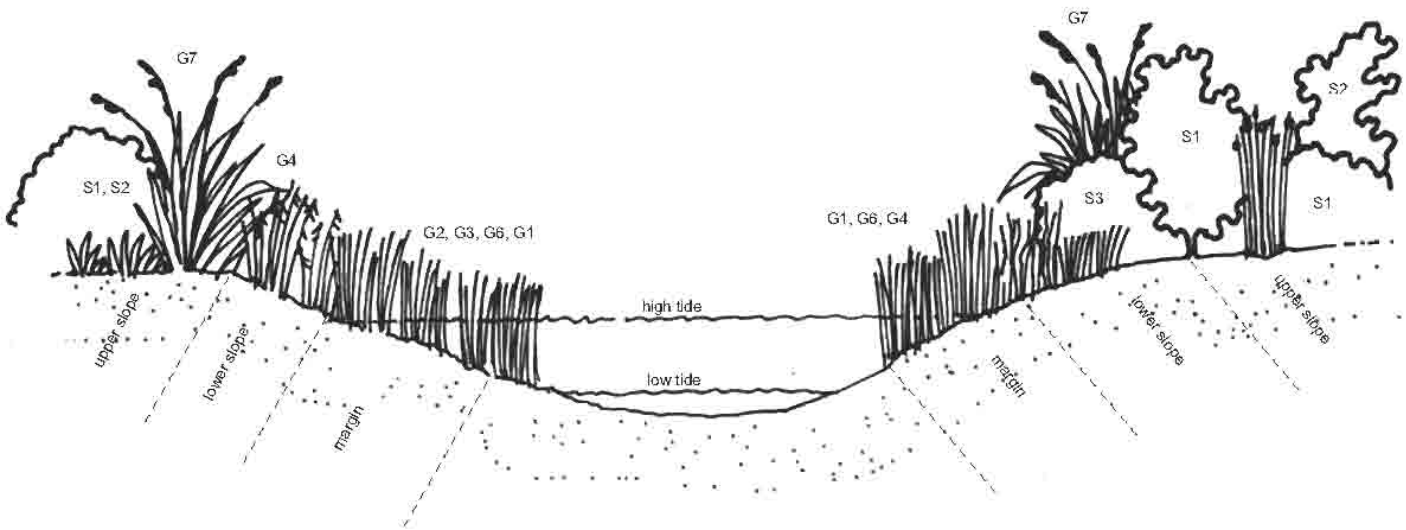
					sun	shade	wet	dry	wind	shallow silts overlaying fine gravels and deep silts over coarse gravels	stony channel edge	deep silts overlaying fine gravels
	Trees											
T4	***Cordyline australis***	**ti kouka, cabbage tree**	✱		■	▪	■	■	■	✓	✓	✓
T17	***Plagianthus regius***	**manatu, lowland ribbonwood**	✱	✱	■	▪	▪	▪	■	✓		✓
T23	*Sophora microphylla*	South Island kowhai		✱	■	▪	▪	■	■	✓		✓
	Shrubs											
S2	***Coprosma propinqua***	**mikimiki**			■	■	■	■	■	✓	✓	✓
S7	***Leptospermum scoparium***	**manuka, tea tree**	✱		■	▪	■	■	■	✓	✓	✓
	ferns											
F6	*Blechnum nz/minus*	swamp kiokio	✱		■	▪	■	□	□		✓	
F7	*Hypolepis ambigua*	rough pigfern	✱		□	■	■	□	□	✓	✓	✓
	Grasses and flax-like plants											
G12	***Carex buchananii***	**purei, sedge**	✱		■	□	■	□	■		✓	✓
G13	***Carex flagellifera***	**purei, sedge**	✱		■	□	■	□	■	✓	✓	✓
G14	***Carex geminata***	**purei, cutty grass**	✱	✱	■	□	■	□	■	✓	✓	✓
G4	**Carex secta**	**pukio, tussock sedge**			■	□	■	□	■		✓	
G6	***Carex virgata***	**pukio, tussock sedge**	✱		■	□	■	□	■		✓	✓
G7	***Cortaderia richardii***	**toe toe**			■	□	■	■	■	✓	✓	✓
G8	***Cyperus ustulatus***	**umbrella sedge, upolo tangata**	✱		■	□	■	▪	■		✓	✓
G15	***Eleocharis acuta***	**spike sedge**	✱		■	□	■	□	■		✓	
G16	***Isolepis nodosa***	**knobby clubrush**	✱		■	□	▪	■	■	✓		✓
G17	***Juncus pallidus***	**wiwi, tussock rush**	✱		■	□	■	□	■		✓	✓
G18	***Juncus sarophorus***	**wiwi, tussock rush**	✱		■	□	■	□	■		✓	✓
G10	***Phormium tenax***	**harakeke, NZ Flax**			■	□	■	■	■		✓	✓
G19	*Polygonum salicifolium*	NZ knotweed	✱		■	□	■	□	▪		✓	

SEA RUSH
brackish tidal stream including
marginal high banks and slopes

woodland option



shrubland option



SEA RUSH
brackish tidal stream

Key

❄ initially frost tender
B browse-tolerant once established
D deciduous
T toxic
Bold = main species for relatively fast growing first stage planting into open sites

Plant tolerances

■ tolerates or needs
▪ tolerant of some
□ intolerant of

Planting zones

woodland option

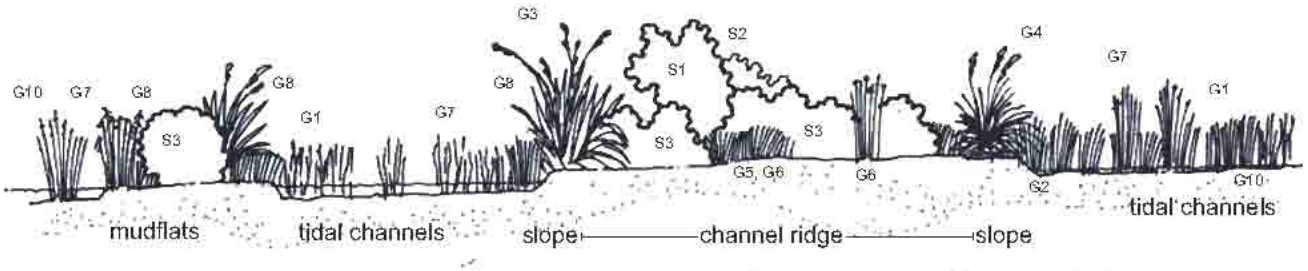
Key No.	Botanical name	Common name	B	D	sun	shade	wet	dry	wind	margin	lower slope	upper slope
	Trees											
T1	***Dodonaea viscosa***	**akeake** ❄	*		■	▪	□	■	■			✓
T2	*Griselinia littoralis*	kapuka, broadleaf			■	■	▪	■	■			✓
T3	***Hoheria angustifolia***	**houhere, narrow-lved lacebark**	*		■	▪	▪	■	■			✓
T4	***Myoporum laetum***	**ngaio** T ❄	*		■	▪	□	■	■			✓
T5	Myrsine australis	red mapau ❄			▪	■	▪	▪	■			✓
T6	***Olearia paniculata***	**golden akeake**	*		■	□	□	■	■			✓
T7	***Plagianthus regius***	**manatu, lowland ribbonwood**	*	*	■	▪	▪	▪	■			✓

shrubland option

	Shrubs											
S1	***Coprosma propinqua***	**mikimiki**	*		■	■	■	■	■		✓	✓
S2	***Muehlenbeckia complexa***	**scrambling pohuehue**	*		■	□	▪	■				✓
S3	***Plagianthus divaricatus***	**marsh ribbonwood**	*		■	□	■	▪	■		✓	✓
	Grasses and flax-like plants											
G1	***Apodasmia similis***	**oioi, *Leptocarpus similis***	*		■	▪	■	▪	■	✓	✓	
G2	***Bolboschoenus caldwellii***	**a clubrush**	*	*	■	□	■	□	■	✓		
G3	*Carex litorosa*	shore sedge	*		■	□	■	□	■	✓		
G4	***Cyperus ustulatus***	giant umbrella sedge,upokotangata	*		■	□	■	▪	■		✓	✓
G5	***Isolepis nodosa***	**knobby clubrush**	*		■	□	▪	■	■		✓	✓
G6	***Juncus maritimus***	**wiwi, sea rush**	*		■	□	■	□	■	✓	✓	
G7	***Phormium tenax***	**harakeke, NZ flax**	*		■	□	■	■	■		✓	✓
G8	*Puccinellia spp.*	salt grasses	*		■	□	■	□	■	✓		
G9	***Schoenoplectus pungens***	**three-square**	*	*	■	□	■	□	■	✓	✓	
G10	***Schoenoplectus tabernaemontanei***	**lake clubrush**	*	*	■	□	■	□	■	✓		

SEA RUSH
of tidal channels, mudflats and ridges

shrubland option



fine grained silty and sandy substrate. Poorly drained,saturated at high tide.

Lower down the tidal sequence the areas between channels are mudflats and low ridges. These may support eel grass and salt marsh succulents, herbs and turfs, which will colonise on their own.

SEA RUSH
mudflats and channels

shrubland option

Key

- ❄ initially frost tender
- B browse-tolerant once established
- D deciduous
- ⊤ toxic
- **Bold** = main species for relatively fast growing first stage planting into open sites

Plant tolerances

- ■ tolerates or needs
- □ intolerant of
- ▪ tolerant of some

Planting zones

Key No.	Botanical name	Common name	B	D	sun	shade	wet	dry	wind	channel edge	channel slope/ridge	mudflat
	Shrubs											
S1	***Coprosma propinqua***	mikimiki	✱		■	▪	■	■	■		✓	
S2	***Muehlenbeckia complexa***		✱	✱	■	▪	▪	■	■		✓	
S3	***Plagianthus divaricatus***	marsh ribbonwood	✱		■	□	■	▪	■		✓	
	Grasses and flax-like plants											
G1	***Apodasmia similis***	oioi, *Leptocarpus similis*	✱		■	▪	■	▪	■	✓	✓	✓
G2	***Bolboschoenus caldwellii***	a clubrush	✱	✱	■	□	■	□	■	✓		✓
G3	*Carex litorosa*	shore sedge	✱		■	□	■	□	■	✓		✓
G4	***Cortaderia richardii***	toe toe	✱		■	□	■	■	■		✓	
G5	***Cyperus ustulatus***	giant umbrella sedge, toetoe upokotangata	✱		■	□	■	▪	■	✓	✓	
G6	***Isolepis nodosa***	knobby clubrush	✱		■	□	▪	■	■		✓	
G7	***Juncus maritimus***	wiwi, sea rush	✱		■	□	■	□	■	✓		
G8	***Phormium tenax***	harakeke, NZ flax	✱		■	□	■	■	■		✓	
G9	***Puccinellia stricta/novae-zelandiae***	saltmarsh grass	✱		■	□	■	□	■	✓		✓
G10	***Schoenoplectus pungens***	three-square	✱	✱	■	□	■	□	■	✓		✓

How to go about it...

prepare a planting plan

Prepare a planting plan and a staging plan. Do this well in advance of planting time so that you can order plants and get the site prepared. Plants in bold type are hardy fast growing species for initial (nursery) planting of open sites. Other species can be incorporated after 2-3 years.

The initial aim is to achieve a dense cover that shades out competing grasses and weeds.

plant spacings

Allow for;

- large trees 5m from other plants of the same species or 1m from smaller growing plants.
- small trees 1.5m spacings on centres
- shrubs and tall tussocks (pukio, NZ flax and toetoe)1m-1.5m spacings,
- short tussocks and ferns 0.5m-0.75m spacing

For stream management, ensure dense plantings at margins to create good cover at ground level, to filter run off, as well as in the overhead canopy, to shade the stream, and provide nesting habitat.

order plants well in advance

select a nursery specialising in native plants and that guarantees they were sourced locally in Canterbury.

Motukarara Native Plant Nursery (DoC), Motukarara Ph 329 7846
Trees for Canterbury, 42 Charlesworth St, Woolston, Christchurch Ph 982-1028
Wai-Ora Nursery, 48 Watsons Rd, Harewood, Christchurch Ph 359 7407
Fern Factor, Newtons Rd, RD 5, Christchurch
Ph 344 0297 ferns@fernfactor.co.nz

If you hold plants before planting, make sure they are watered every day otherwise in their small pots they become stressed. Minimise the holding period as they will become rootbound, moribund and vulnerable to failure.

planting times

plant 'margin' species right down to the water's edge/margin during the summer. Other species should be planted during autumn (hardy plants) or spring (frost-tender plants).

Some ground cover plants, slow growing, and/or frost sensitive species should be planted after some initial cover has established and remnant dense grass managed (ie 1-3 years after first plantings). Examples include most ferns and tree ferns, tree fuchsia, kawakawa and miro.

prepare the site

1. Prepare the site well in advance of planting. Completely remove invasive weeds, including convolvulus, ivy, periwinkle, honeysuckle, pampas grass, grey willow, alder and yellow flag iris.

2. Contact Environment Canterbury customer services 353 9007 to discuss if weed spraying is appropriate, and if so, what is the best approach. Check out www.ecan.govt.nz/Our+Environment/Pests+and+Weeds/.

3. Crack willows, tagasaste and elderberry may provide shading to the stream, a nursery for underplanting. They can be removed later once the new plants are well established.

4. Clear all vegetation for about 1 metre diameter around each planting position.

5. Rip ground or fork it to about half a metre depth if it is heavily compacted. Apply soil conditioner if topsoil is degraded.

6.Ensure grazing animals are permanently fenced out of the stream corridor before planting begins. Ephemeral stream channels at the top of the catchment may be planted with browse-tolerant shrubs and tussocks.

setting out

Set out plants in their correct zones, remembering to space plants correctly. Ensure the plants have been well soaked and that they do not sit out in the sun, prior to planting.

planting

Prune off entangled roots, set the plant into a bed of soft, worked soil at the bottom of an ample hole and repack crumbled soil around the root mass tightly to prevent air gaps.

On dry, steep sites dig the plant into a deep hole so that there is a hollow left in the ground around the stem to catch the rain.

On wet sites, plant in a shallower hole so that the top of the root mass and associated soil is at ground level or for woody plants even slightly mounded above it in permanently saturated conditions.

Ensure plants within the waterway are well planted, compacted around their base or anchored with stones.

Give the plants and surrounding dry ground a good watering after planting. Where possible, stake small plants so they are easily located.

maintenance and monitoring

Regularly check on the plants' health for several years after establishment.

Remember that plants on dry banks will flourish if watered occasionally in summer. Replant areas where plants have died, so long as you know the reason why they died.

Weeding around plants is essential to avoid competition and stress. This should be carried out on a monthly basis in spring (especially in first few years) or as required. Exercise extreme caution when using 'weed-eaters' or herbicide. Many years of growth are wiped out by ring-barking or spray drift.

Nearer the water, careful weed control is needed on an ongoing basis until the area is self maintaining - once tussocks or shrubs have overtopped grass.

Monitor the growth of your streamside plantings - enjoy how they thrive, develop, attract wildlife, and become self maintaining - and learn from experience to modify planting or maintenance. Take photos at the beginning and then periodically.

mulch

On dry sites mulch with bark chips (up to 10cm depth), newspaper, woollen mats, or other degradable materials such as carpet underlay (which is not rubberised).

Do not use mulch on wet sites or anywhere near the water flow, as mulch is likely to be washed away, and may cause stream blockages or over-saturation.

instream management

Concerned about sediment? Call Environment Canterbury pollution line 366 4663 if you notice sediment discharge. Also be proactive and submit your request for high level sediment control for new subdivision consents.

How best to work with existing culverts. There are various options to mitigate adverse effects; such as creating a fish ladder by placing large rocks in flow below the culvert for fish to climb up. Cut a V-notch along the bottom of the culvert to allow for water to flow through during low flow periods. If scouring has occurred you may need to re-batter and plant banks, and reassess the size, level and/or placement of the culvert, removing or moving the culvert. Check with Council first.

additional references.....

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Davis. M., and Meurk. C., 2001. *Protecting and restoring our natural heritage, a practical guide*. Department of Conservation, Christchurch.

Johnson, P.N. 1989. *Wetland Plants in New Zealand*. DSIR Publishing.

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Metcalf, L. 2000. *New Zealand trees and shrubs, a comprehensive guide to cultivation and identification*. Reed Publishing, Auckland.

Nature Heritage Fund. 2004. *Protecting Natural Areas Guide, design guide.* Wellington.

Wilson, H. 2005. *Food for tui on Banks Peninsula, a botanical assessment.* Department of Conservation, Christchurch.

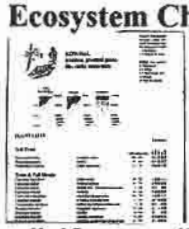
www.bush.org.nz NZ Ecological Restoration Ecological Network, has a monitoring package (Eco Track)
www.ecan.govt.nz
www.onlinegroups.co.nz/biodiversity/groups/titoki (PDF copies available for download)
www.niwa.org.nz
www.nzila.co.nz NZ Institute of Landscape Architects

Hot Tips for Greening the Harbour Basin

How to Use the Ecosystem Plant Charts for Your Patch

The first step is to **find your place** - both in the **broad sweeping ecosystems** depicted in the Basin panoramas, cross-section and block diagrams (refer previous pages), but also at the **micro-level** - the place you put the spade in the ground. The mapping units shown on the panoramic photo mosaics place you in a **generalised terrain or ecosystem** - as we have defined them. Many places in the area will be like the typical environment described. But because of all the minute variations that are too small to map, there will be some places that are atypical and you have to learn how to recognise those - they may be more important to you than the broad pattern. The **spade test** will help. If you can easily dig out a hole as deep as the spade (say 40 cm) and the ground is free-draining and crumbly (friable) with only a few stones, then you have a good versatile soil that is likely to support the full potential for the 'ecosystem'. If, on the other hand, you strike lots of large stones or bed rock (or sand) then you should be looking at species that are known to tolerate dry conditions (less water-holding capacity in this type of soil) - and you should use smaller plant stock and prune excess, soft foliage back before planting. Each planting position must be individually assessed in hilly terrain since soils can vary considerably over the space of just a few metres.

Ecosystem Charts



Once you have located your planting area within a general ecosystem and determined if it is typical or different from the norm in some way (usually drier, wetter or more exposed) then consult the coloured **species charts for that ecosystem**. The plants are divided into growth form categories (tall trees, smaller trees, shrubs, vines, tussocks, herbs and grasses, and ferns) so you can tell if you will be shading out your neighbour in 500 years time! The species that are highlighted in **bold type are those which are likely to grow best**, provide quickest cover, and therefore beat the weeds. They will provide the main **structural components** for the future habitat and also give shelter to more delicate plants and forest floor species that can be planted in later. **Note** that manuka was once one of the important early successional species throughout New Zealand. But it is almost useless planting manuka now in Canterbury because of the 'manuka blight' - a combined attack of scale insect and sooty mould. It may be because the low rainfall here allows a build up of scale insect exudate which is then a wonderful substrate for the sooty mould, and prevents light getting to the photosynthetic apparatus in the leaves.

The choice of **appropriate species can be refined** by looking at the overall ecosystem list (on the charts and the full list at back of book), considering the natural elevational range (indicated for each species - except for those in the coastal ecosystem), and environmental tolerances (the chequer board on the right hand side of the panel). Note that generally species will reach their lowest limits on shady slopes or where there are deep, seepy soils, and their highest limits on sunny slopes - other factors being equal. This is because moisture is the limiting factor at low elevations and temperature at high elevations.

NOTE. There is no ecosystem plant chart for the sub-alpine ecosystem because revegetation work in the high tops is not anticipated. With weed control and suitable conditions for revegetation, natural dispersal from habitat remnants is the preferred technique. Species belonging in this ecosystem are in the full list on pages 32 - 42.

Full species lists (at back of book) have all the indigenous vascular plant species known for the Harbour Basin based on our observations and the substantial knowledge of Hugh Wilson (Wilson, 1992). For each species the natural occurrences are grouped according to the principal ecosystems and constituent habitats.

Tolerances

The dry-tolerant species should be used if the soil is more rocky than the norm, shallower, or on slopes of convex shape (that is, moisture is inclined to drain away). The less drought-tolerant species will do well on deeper soils especially if the land is concave which funnels or concentrates available water. Species with "½ wet" indications prefer moist, but well-drained soils (not water-logged).

Low growing plants that are shown as liking sun, but are intolerant of shade, will be the species of extreme environments (cold, exposure, salinity, wet) or early successional species that can be maintained against over-topping by taller plants only by controlled disturbance (grazing, weeding or gardening).

Species will naturally occur in other places, but our recommendations are the preferred species for planting in their optimal sites. Planting is always more stressful than natural establishment because seeds germinate, grow and produce exactly the right balance of roots and shoots to match the conditions of the site. Planted, nursery-grown specimens have to readjust to the field conditions. This is why planting must be conservative. This is why it is worth pruning large specimens when planting on dry or windy sites. The comprehensive list of species at the back contains many additional species. Some of these can be planted, but the majority will have to find their own way from protected environments or remnants. Restoration can do much to mitigate the effects of past decimation of our natural heritage, but **protection of remnants is also crucial** to the overall rebuilding of viable natural ecosystems.

Vegetation is not static. It changes over time - unless there is some 'force' being applied to hold it more or less in a stable state. Examples of such 'force' or disturbance are constant weeding, cutting, harvesting, grazing, burning etc. In the normal course of events, low herbaceous vegetation is displaced by tall tussocks and shrubs, then small and eventually large trees grow through and come to dominate - a process called **plant succession**. In New Zealand's evergreen forest environment, the species that prosper in the end are long-lived and/or shade tolerant. So, unless there is some periodic disturbance that would maintain a short herbaceous (light-demanding) turf, there will be little point planting very small, light-requiring species. The only exception in the Basin is when there is some extreme environmental stress such as high salinity (near the sea) or cold, arid or exposed conditions, such as near the top of Mt. Herbert or on bare rock. But these habitats are best able to look after themselves provided there is management of hardy, shrubby weeds such as gorse and broom. Most other places are able to support bush or tall forest - eventually, unless there is managed disturbance like the weeding activities in your garden. Thus you may be able to **grow salt marsh or alpine rock species in a rock garden**. After-all, most plants will grow best on deep, friable, moist soil, but the 'weeds' will grow even faster because they are adapted to these good conditions, whereas the alpine and salt marsh species are adapted to

high stresses by huddling down and trying not to expose themselves. They put their energy into huddling and survival rather than into exuberant growth that will get plucked off by the next tide, frost, wind, or errant grazing mouth.

Species that are shown in the chequer board as intolerant of sun but like the shade are understorey, tender species that cannot hack the serious competition from tall exotic grasses (e.g. cocksfoot) and dense growth of woody weeds (gorse/broom). It doesn't necessarily mean that they won't grow in full sun, but, except in a garden, they will be unlikely to survive the weed competition because of their relatively slow growth adapted to low light conditions.

The **predominant forest environment of the Basin** can support indigenous, fruit and nectar bearing plants (matai, pigeonwood, kowhai, harakeke) that feed our native birds. Or, it can support introduced, dry-seeded trees (macrocarpa, oak, sycamore) almost useless to our native birds, or woody weeds with bird-dispersed fruit (such as cotoneaster, ivy, spindleberry, barberry). There are some exotic species that are both useful to native birds (protea, banksia, flowering gum) and relatively benign as far as weediness is concerned. We have provided the information that will assist with the first option - increasing the dominance of native vegetation. The importance of the native plants to our own wildlife can be appreciated by referring to the **food resource** information on the far right of each ecosystem chart, and the **Floral & Food Calendar**. Toward the back of the book there is a list of serious **weed species** that potentially threaten the ecological integrity of the Basin. These species should be assiduously removed, controlled and certainly not propagated or introduced.

Eco-source Your Plants!

Nurseries, planners and the public can select and grow plants that nature intended for each part of the Basin. These plants should be eco-sourced, i.e. propagated from seed from the vicinity of the Harbour Basin, to protect the genetic identity and adaptation of the vegetation that has evolved here. Further to the planting information included here, for guidance in revegetation, refer *"Native Forest Restoration. A Practical guide for Landowners"* Tim Porteous. 1993. QEII National Trust (P. O. Box 3341, Wellington), and for streams, the CCC *"Streamside Planting Guide"* (see references inside back cover).

Plant Identification

For assistance in identification of woody plants, refer to:

Poole, A.L.; Adams, Nancy M. 1994. *Trees & Shrubs of New Zealand.* Manaaki Whenua Press, Lincoln.

Salmon, J.T. 1980. *The Native Trees of New Zealand.* A.H.&A.W. Reed, Wellington.

Wilson, Hugh; Galloway, Tim. 1993. *Small-leaved Shrubs of New Zealand.* Manuka Press, Christchurch.

and, for some herbaceous species:

Wilson, Hugh D. 1978. *Wild Plants of Mount Cook National Park.* Field Guide Publication, Whitcoulls, Christchurch.

Predominant Ecosystems & Habitats for the Vascular Flora of the Lyttelton Harbour Basin

"Here are all the plants of the Basin."

Landform / Habitat Key

Coastal:

Rock (R): l = lower herbaceous & low shrub zone; u = upper shrub & bush zone

Dune (D): f = fore dune sand binders; m = mid dune shrubs & tussocks; b = backdune bush, tussocks & shrubs; h = dune hollows & flats

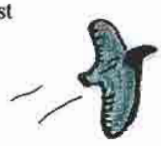
Marsh (M): a = aquatic / brackish; l = lower turf; m = mid reeds; u = upper shrubs

Moist - Wet: B = stream bank; a = aquatic / pond margins

* a species that is not known to currently occur naturally in the Harbour Basin, but occurs in adjacent Ecological Districts or was a very early introduction

Trees & Tall Shrubs	Coastal: Rock	Coastal: Dune	Coastal: Marsh	Rocky: Dry	Rocky: Humid	Deep: Open Forest	Deep: Forest	Moist-Wet: Gully Forest	Moist-Wet: Forest	Moist-Wet: Swamp	Moist-Wet: Bank	Subalpine: Open Forest	Subalpine: Forest
Alectryon excelsus							F	G	F				
Aristotelia serrata					H		F	G					
Carpodetus serratus							F	G					F
Coprosma linariifolia					H		F	G	F				
Coprosma lucida				D	H		F	G	F				
*Coprosma repens**	Ru	Dmb		D									
Coprosma robusta	Ru	Db			H		F	G	F				
Coprosma rotundifolia					H		F	G	F				
Cordyline australis	Ru	Dbh		D	H	O	F			S			
Cordyline indivisa							F						
Coriaria arborea								G		S			
*Corynocarpus laevigatus**	Ru	Db		D				G					
Dacrycarpus dacrydioides								G	F				
*Dacrydium cupressinum**								G	F				
*Dodonaea viscosa**	Ru	Db		D									
*Elaeocarpus hookerianus**								G	F				
Fuchsia excorticata					H		F	G	F				F
Griselinia littoralis	Ru	Db		D	H		F	G	F				F
*Griselinia lucida**	Ru						F	G					
Hedycarya arborea							F	G	F				
Hoheria angustifolia					H		F		F				
*Hoheria populnea**					H		F						
Kunzea ericoides				D		O							
Leptospermum scoparium		Dbh		D	H	O				S			
Libocedrus bidwillii													F
Lophomyrtus obcordata					H		F	G	F				
Macropiper excelsum								G					
Melicytus ramiflorus							F	G	F				
Myoporum laetum	Ru	Db		D			F						
Myrsine australis		Db			H		F		F				
Olearia avicenniifolia	Ru			D	H	O							
Olearia fragrantissima					H	O							
Olearia paniculata	Ru	Db		D	H	O							
Pennantia corymbosa							F	G	F				
Pittosporum eugenioides		Db			H		F	G	F				F
Pittosporum tenuifolium		Db			H		F		F	S			F
Plagianthus regius							F		F	S			

Trees & Tall Shrubs	Coastal: Rock	Coastal: Dune	Coastal: Marsh	Rocky: Dry	Rocky: Humid	Deep: Open	Deep: Forest	Moist-Wet: Gully	Moist-Wet: Forest	Moist-Wet: Swamp	Moist-Wet: Bank	Subalpine: Open	Subalpine: Forest
Podocarpus hallii					H		F	G					F
Podocarpus totara					H		F	G	F				
*Prumnopitys ferruginea**							F	G	F				
Prumnopitys taxifolia					H		F	G	F				
Pseudopanax arboreus	Ru	Db		D	H		F	G	F				
Pseudopanax colensoi					H								F
Pseudopanax crassifolius					H		F	G	F				
Pseudopanax ferox				D	H								F
Pseudowintera colorata					H		F	G	F				F
Schefflera digitata								G					
Solanum aviculare	Ru	Db		D		O							
Solanum laciniatum	Ru	Db		D		O							
Sophora microphylla				D		O							
Streblus heterophyllus							F						

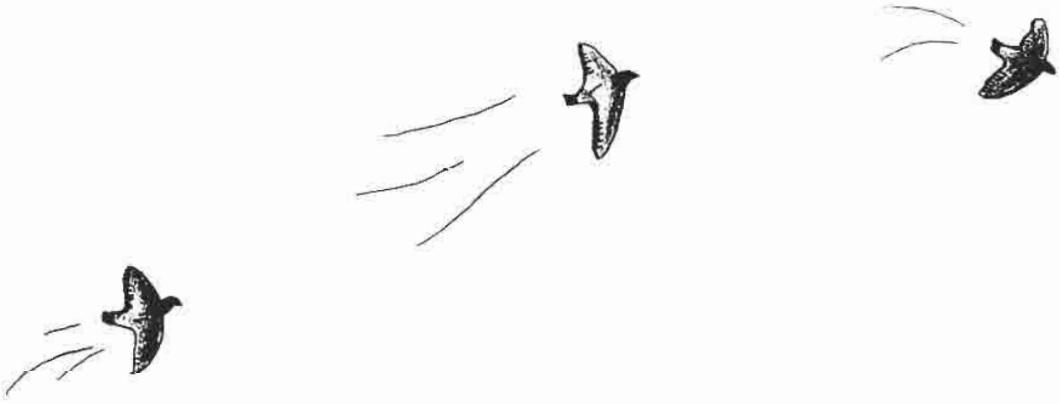


Shrubs & Vines	Coastal Rock	Coastal Dune	Coastal Marsh	Rocky Dry	Rocky Humid	Deep Open	Deep Forest	Moist-Wet Gully	Moist-Wet Forest	Moist-Wet Swamp	Moist-Wet Bank	Subalpine Open	Subalpine Forest
*Aristotelia fruticosa**					H							O	
Brachyglottis sciadophila					H								
Calystegia tuguriorum				D		O							
Carmichaelia australis	Ru	Dm		D		O							
*Carmichaelia kirkii**	Ru			D					F				
Cassinia leptophylla		Dm		D								O	
Clematis afoliata		Dm		D	H								
Clematis foetida							F	G					
Clematis marata				D	H							O	
Clematis paniculata							F	G	F				
Convolvulus verecundus				D	H	O							
Coprosma acerosa *		Dm											
Coprosma areolata							F	G	F				
Coprosma crassifolia		Dm		D	H	O							
Coprosma propinqua	Ru	Dm		D	H	O				S	B	O	
Coprosma rhamnoides					H		F		F			O	
Coprosma rigida					H	O						O	
Coprosma rubra					H		F	G	F				
Coprosma sp. t					H	O				S	B	O	
Coprosma virescens				D	H	O							
Coprosma wallii					H	O						O	
Corokia cotoneaster		Dm		D	H	O						O	
Cyathodes juniperina					H	O	F					O	
Discaria toumatou		Dmb		D	H	O							
Dracophyllum acerosum												O	
Fuchsia perscandens					H	O		G				O	F
Gaultheria antipoda						O	F						
Gaultheria depressa												O	
Heliohebe lavaudiana					H								
*Hebe odora**												O	
Hebe salicifolia						O		G			B		
Hebe strictissima					H								
Helichrysum lanceolatum				D	H	O	F						
Ileostylus micranthus							F		F				
Korthalsella lindsayi							F		F				
Korthalsella salicornioides							F		F				
Leucopogon fasciculatus					H		F						
Leucopogon fraseri				D		O						O	
Melicope simplex					H		F	G	F				
Melicytus alpinus	Ru	Dm		D	H	O						O	
Melicytus micranthus								G	F				
Metrosideros diffusa					H			G					
*Muehlenbeckia astonii**	Ru	Dmb		D									
Muehlenbeckia australis							F	G	F				
Muehlenbeckia axillaris				D		O							
Muehlenbeckia complexa	Rl	Dmbh		D	H	O							
Myrsine divaricata							F		F	S		O	F
Neomyrtus pedunculata					H			G	F				F
Olearia arborescens					H			G				O	
Olearia ilicifolia						O							
Olearia nummulariifolia						O							
Parsonsia sp.				D	H			G	F				F
Passiflora tetrandra							F	G	F				
*Pimelea arenaria**		Df											
Plagianthus divaricatus			Mu										
Pseudopanax anomalus							F		F				
Ripogonum scandens								G	F				
Rubus cissoides					H		F	G	F				F
Rubus schmidelioides	Ru	Dmb		D	H	O	F		F				F
Rubus squarrosus		Db		D			F						



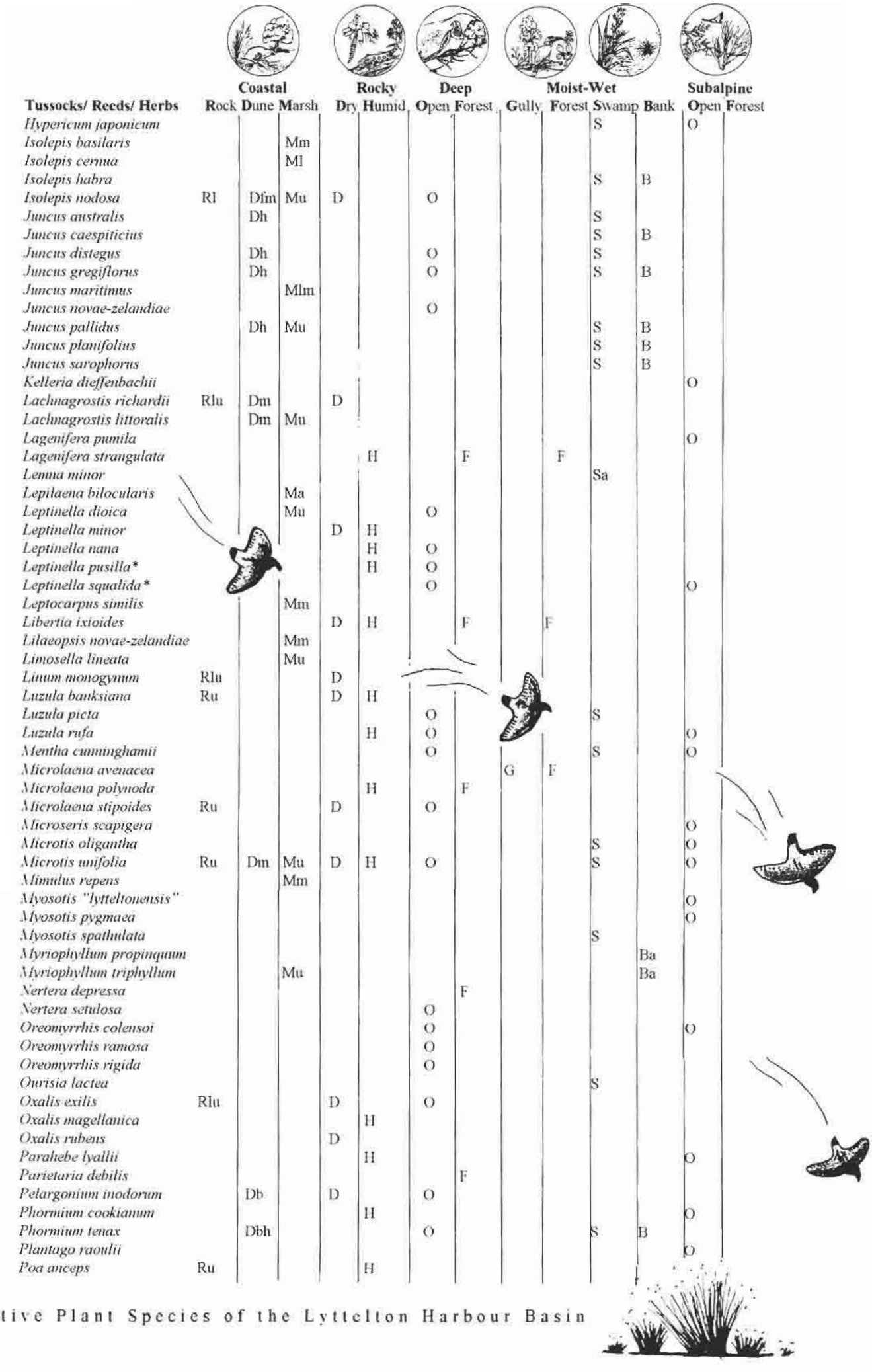



Shrubs & Vines	Coastal Rock	Coastal Dune	Coastal Marsh	Rocky Dry	Rocky Humid	Deep Open	Deep Forest	Moist-Wet Gully	Moist-Wet Forest	Moist-Wet Swamp	Moist-Wet Bank	Subalpine Open	Subalpine Forest
Scandia geniculata				D	H	O							
Sophora prostrata	Rl	Dm		D	H								
Teucridium parvifolium				D	H	O							
Tupeia antarctica							F		F				
Urtica ferox						O	F	G					



Tussocks/ Reeds/ Herbs	Coastal Rock	Coastal Dune	Coastal Marsh	Rocky Dry	Rocky Humid	Deep Open	Deep Forest	Moist-Wet Gully Forest	Moist-Wet Swamp	Moist-Wet Bank	Subalpine Open	Subalpine Forest
Acaena anserinifolia						O						
Acaena caesiiglauca											O	
Acaena dumicola							F				O	F
Acaena juvenca							F	G	F			
Acaena novae-zelandiae	Ru	Db		D	H	O						
Aciphylla aurea											O	
Aciphylla subflabellata						O						
*Anemanthele lessoniana**							F	G	F			
Anisotome aromatica											O	
Apium prostratum			Mmu									
Arthropodium candidum					H							
Astelia fragrans							F	G	F			
Australina pusilla							F	G	F			
*Austrofestuca littoralis**		Df										
Baumea rubiginosa									S			
Bolboschoenus caldwellii			Ma									
Brachyglottis bellidioides						O						
Brachyglottis lagopus					H							
Brachyscome radicata					H	O						
*Bulbinella angustifolia**											O	
Caladenia aff. carnea						O	F					
Calystegia soldanella		Df										
Cardamine corymbosa					H						O	
Cardamine debilis							F	G	F			
Carex appressa									S			
Carex breviculmis											O	
Carex buchananii										B		
Carex colensoi						O						
Carex dissita							F	G	F			
Carex flagellifera									S	B		
Carex flaviformis									S			
Carex forsteri							F	G	F			
Carex geminata									S	B		
Carex litorosa			Mm									
Carex raoulii									S			
Carex resectans				D			F					
Carex secta									S	B		
Carex sinclairii									S			
Carex solandri							F	G	F			
Carex virgata									S	B		
Carex wakatipu											O	
Celmisia gracilenta						O					O	
Celmisia sp. *'rhizomatous'*											O	
Centella uniflora						O			S			
Chenopodium glaucum			Mm									
Chiloglottis cornuta												F
Chionochloa conspicua					H						O	
Chionochloa rigida					H						O	
Colobanthus brevisepalus											O	
Colobanthus strictus											O	
Coriaria sarmentosa		Db				O						
Cortaderia richardii		Db	Mu							B		
Corybas trilobus							F	G	F			
Cotula australis				D		O						
Cotula coronopifolia			Mmu									
Craspedia minor											O	
Crassula sieberiana				D								
Crassula sinclairii			Mu									
Cyperus ustulatus		Db										
Daucus glochidiatus				D		O						
Deschampsia novae-zelandiae											O	
Deschampsia tenella								?			O	
*Desmoschoenus spiralis**		Df										

Tussocks/ Reeds/ Herbs	Coastal Rock	Coastal Dune	Coastal Marsh	Rocky Dry	Rocky Humid	Deep Open Forest	Deep Forest	Moist-Wet Gully	Moist-Wet Forest	Moist-Wet Swamp	Moist-Wet Bank	Subalpine Open Forest
Deyeuxia avenoides					H							O
Deyeuxia billardierei	Rl	Dm										
Deyeuxia youngii												O
Dianella nigra					H							
Dichelachne crinita	Rlu	Dm		D	H	O						O
Dichondra repens	Ru			D	H	O	F					
Disphyma australe	Rl											
Earina autumnalis					H							
Echinopogon ovatus				D	H							
Einadia allanii	Rlu			D								
Einadia triandra	Rlu											
Eleocharis acuta										S	B	
Eleocharis gracilis										S		
Elymus solandri	Rlu			D	H	O						O
Epilobium atriplicifolium					H	O						O
Epilobium billardiereanum										S		
Epilobium brunnescens						O				S		O
Epilobium cinereum				D								
Epilobium insulare										S		
Epilobium komarovianum												O
Epilobium macropus										S	B	
Epilobium pallidiflorum										S		
Epilobium pedunculare												O
Epilobium pubens				D	H							
Epilobium rotundifolium					H	O						
Epilobium tenuipes												O
*Eryngium vesiculosum**		Df										
Euphrasia zelandica												O
*Euphorbia glauca**		Df										
Festuca 'blue tussock'	Ru			D	H							O?
Festuca novae-zelandiae	Rlu			D	H	O						O
Forstera tenella												O
Galium propinquum					H	O						O
Galium trilobum					H	O						
Gastrodia cunninghamii							F		F			
Gastrodia sesamoides							F		F			
Geranium microphyllum					H	O						O
Geranium retrorsum				D		O						
Geranium sessiliflorum					H	O						O
Geranium solanderi				D		O						
*Geum parviflorum (cockaynei)**												O
Gingidia enysii					H							
Gingidia montana				D	H							O
Gnaphalium audax				D	H	O						
Gnaphalium involucratum		Db		D		O						
Gnaphalium traversii												O
Gnaphalium limosum										S		
Gnaphalium polylepis												O
Gnaphalium sphaericum		Db		D		O						
Gonocarpus incanus												O
Gunnera monoica		Dh								S		
Haloragis erecta	Rlu			D								
Helichrysum bellidioides					H	O						O
Helichrysum filicaule				D	H	O						
Hierochloe redolens		Dh	Mu		H	O				S	B	O
Hydrocotyle elongata						O	F					
Hydrocotyle heteromeria					H	O						
Hydrocotyle microphylla						O						
Hydrocotyle "montana"						O						O
Hydrocotyle moschata					H	O	F		F			
Hydrocotyle novae-zelandiae						O			F	S		
Hypericum gramineum				D		O						



Tussocks/ Reeds/ Herbs	Coastal Rock	Coastal Dune	Coastal Marsh	Rocky Dry	Rocky Humid	Deep Open Forest	Moist-Wet Gully Forest	Moist-Wet Swamp	Moist-Wet Bank	Subalpine Open Forest
Hypericum japonicum								S		O
Isolepis basilaris			Mm							
Isolepis cernua			Ml							
Isolepis habra								S	B	
Isolepis nodosa	Rl	Dfm	Mu	D		O				
Juncus australis		Dh						S		
Juncus caespiticius								S	B	
Juncus distegus		Dh				O		S		
Juncus gregiflorus		Dh				O		S	B	
Juncus maritimus			Mlm							
Juncus novae-zelandiae						O				
Juncus pallidus		Dh	Mu					S	B	
Juncus planifolius								S	B	
Juncus sarophorus								S	B	
Kelleria dieffenbachii										O
Lachnagrostis richardii	Rlu	Dm		D						
Lachnagrostis littoralis		Dm	Mu							
Lagenifera pumila										O
Lagenifera strangulata					H		F	F		
Lemna minor								Sa		
Lepilaena bilocularis			Ma							
Leptinella dioica			Mu			O				
Leptinella minor				D	H					
Leptinella nana					H	O				
*Leptinella pusilla**					H	O				
*Leptinella squalida**						O				O
Leptocarpus similis			Mm							
Libertia ixioides				D	H		F	F		
Lilaeopsis novae-zelandiae			Mm							
Limosella lineata			Mu							
Linum monogynum	Rlu			D						
Luzula banksiana	Ru			D	H					
Luzula picta						O		S		
Luzula rufa					H	O				O
Mentha cunninghamii						O		S		O
Microlaena avenacea							G	F		
Microlaena polynoda					H		F			
Microlaena stipoides	Ru			D		O				
Microseris scapigera										O
Microtis oligantha								S		O
Microtis unifolia	Ru	Dm	Mu	D	H	O		S		O
Mimulus repens			Mm							
Myosotis "lytteltonensis"										O
Myosotis pygmaea										O
Myosotis spathulata								S		
Myriophyllum propinquum									Ba	
Myriophyllum triphyllum			Mu						Ba	
Nertera depressa							F			
Nertera setulosa						O				
Oreomyrrhis colensoi						O				O
Oreomyrrhis ramosa						O				
Oreomyrrhis rigida						O				
Ourisia lactea								S		
Oxalis exilis	Rlu			D		O				
Oxalis magellanica					H					
Oxalis rubens				D						
Parahebe lyallii					H					O
Parietaria debilis							F			
Pelargonium inodorum		Db		D		O				
Phormium cookianum					H					O
Phormium tenax		Dbh				O		S	B	
Plantago raoulii										O
Poa anceps	Ru				H					

Native Plant Species of the Lyttelton Harbour Basin






Tussocks/ Reeds/ Herbs	Coastal Rock	Coastal Dune	Coastal Marsh	Rocky Dry	Rocky Humid	Deep Open	Deep Forest	Moist-Wet Gully	Moist-Wet Forest	Moist-Wet Swamp	Moist-Wet Bank	Subalpine Open	Subalpine Forest
Poa cita	Rlu	Dm		D	H	O							
Poa colensoi					H	O						O	
Poa imbecilla							F	G	F				
Poa matthewsii							F		F			O	
*Poa pusilla**							F	G	F				
Polygonum salicifolium										Sa	B		
Potamogeton cheesemanii											Ba		
Potamogeton pectinatus											Ba		
*Potentilla anserinoides**										S			
Prasophyllum colensoi						O				S		O	
Pratia angulata						O				S	B		
Pseudognaphalium luteoalbum		Dmb		D		O							
Pterostylis areolata						O	F						
Pterostylis australis						O	F		F				
*Pterostylis cycnocephala**						O							
Pterostylis foliata						O	F		F				
Pterostylis graminea						O	F		F				
Pterostylis montana						O	F		F				
Pterostylis mutica (tristis)							O						
Puccinellia novae-zelandiae			Mm										
Puccinellia stricta			Ml										
Ranunculus foliosus												O	
Ranunculus glabrifolius										S			
Ranunculus limosella			Mu										
Ranunculus macropus										S			
Ranunculus multiscapus						O						O	
Ranunculus reflexus							F	G	F				
Raoulia australis		Db		D		O							
Raoulia glabra					H	O							
Raoulia monroi				D		O							
Raoulia subsericea						O						O	
Raoulia tenuicaulis				D		O							
Rumex flexuosus						O				S			
Ruppia megacarpa			Ma										
Ruppia polycarpa			Ma										
Rytidosperma buchananii					H	O						O	
Rytidosperma clavatum	Rlu			D		O							
Rytidosperma corinum					H	O						O	
Rytidosperma gracile					H	O							
Rytidosperma thomsonii						O						O	
Rytidosperma unarede	Ru			D		O							
Samolus repens			Mlm										
Sarcocornia quinqueflora			Ml										
Schizeilema trifoliatum							F		F				
Schoenoplectus pungens			Mlm										
Schoenoplectus validus			Ma										
Schoenus pauciflorus										S	B	O	
Scleranthus biflorus				D								O	
Scleranthus brockiei												O	
Scleranthus uniflorus				D		O						O	
Selliera radicans			Mm										
Senecio carnosulus	Ru												
Senecio glaucophyllus				D	H								
Senecio glomeratus	Ru	Db		D		O							
Senecio lautus	Ru			?									
Senecio minimus		Db		D	H	O							
Senecio quadridentatus	Rlu			D		O							
Senecio wairauensis					H								
Sonchus kirkii		Dm											
Spergularia media			Mmu										
*Spinifex hirsutus**		Df											
Stackhousia minima						O						O	
Stellaria decipiens					H		F	G	F				

Tussocks/ Reeds/ Herbs	Coastal			Rocky		Deep		Moist-Wet				Subalpine	
	Rock	Dune	Marsh	Dry	Humid	Open	Forest	Gully	Forest	Swamp	Bank	Open	Forest
Suaeda novae-zelandiae			Mn										
Tetragonia trigyna	Rlu	Dmb		D									
Thelymitra decora						O						O	
Thelymitra hatchii						O							
Thelymitra longifolia						O						O	
Triglochin striatum			Mmu										
*Trisetum "slender" **												O	
Typha orientalis										Sa	B		
*Uncinia banksii**							F	G	F				
Uncinia clavata							F		F				
*Uncinia ferruginea **							F		F				
Uncinia leptostachya							F						
Uncinia rubra						O						O	F
Uncinia scabra												O	
*Uncinia silvestris**							F		F				
Uncinia uncinata							F		F				
Urtica incisa							F		F				
Viola cunninghamii												O	
Viola filicaulis							F		F				
Vittadinia australis				D									
Wahlenbergia albomarginata						O						O	
Wahlenbergia gracilis					H		F						
Wolffia australiana										S			
Zannichellia palustris			Ma										
Zostera muelleri			Ml										

Ferns	Coastal: Rock	Coastal: Dune	Coastal: Marsh	Rocky: Dry	Rocky: Humid	Deep: Open	Deep: Forest	Moist-Wet: Gully	Moist-Wet: Forest	Moist-Wet: Swamp	Moist-Wet: Bank	Subalpine: Open	Subalpine: Forest
Adiantum cunninghamii					H								
Anogramma leptophylla				D									
Asplenium appendiculatum							F	G	F				
Asplenium bulbiferum								G	F				
Asplenium flabellifolium				D	H		F						
Asplenium flaccidum								G					
Asplenium hookerianum					H		F						
Asplenium oblongifolium								G					
Asplenium obtusatum	Rl												
Asplenium richardii					H		F						F
Asplenium trichomanes					H							O	
Azolla filiculoides										Sa			
Blechnum chambersii								G					
Blechnum colensoi								G					
Blechnum discolor								G	F				
Blechnum fluviatile								G					
Blechnum minus										S	B		
Blechnum penna-marina						O	F		F	S		O	
Blechnum procerum					H		F		F				
Blechnum novae-zelandiae								G	F	S	B		
Blechnum montanum									F				
Blechnum vulcanicum								G					
Botrychium biforme					H	O						O	
Cheilanthes distans				D									
Cheilanthes humilis				D									
Ctenopteris heterophylla								G	F				F
Cyathea colensoi													F
Cyathea dealbata							F	G	F				
Cyathea smithii								G	F				
*Dicksonia fibrosa**								G	F				
Dicksonia squarrosa							F	G	F				
Grammitis ciliata								G	F				
Grammitis poeppigiana					H							O	
Histiopteris incisa								G	F				
Hymenophyllum atrovirens								G					
*Hymenophyllum bivalve**								G					
Hymenophyllum cupressiforme					H								
Hymenophyllum demissum					H			G					
Hymenophyllum dilatatum					H			G					
*Hymenophyllum flabellatum**					H			G					
Hymenophyllum multifidum					H			G					F
Hymenophyllum peltatum					H			G					
Hymenophyllum rarum					H			G					F
Hymenophyllum sanguinolentum					H			G					F
Hymenophyllum villosum												O	F
Hypolepis ambigua							F	G	F				
Hypolepis millefolium												O	
Hypolepis rufobarbata								G	F				
Lastreopsis glabella								G					
Lastreopsis velutina								G					
Leptolepia novae-zelandiae								G					
Leptopteris hymenophylloides								G					
*Lycopodium australianum**					H							O	
Lycopodium fastigiatum												O	
Lycopodium scariosum						O	F					O	
Lycopodium varium					H			G	F				
Lycopodium volubile						O	F						
Ophioglossum coriaceum						O						O	
Paesia scaberula		D		D	H	O							
Pellaea calidirupium		D		D									
Pellaea rotundifolia		D		D			F		F				
Microsorum pustulatus (*Phymatosorus*)		D		D	H		F	G	F				
Pleurosorus rutifolius				D									

Ferns	Coastal Rock	Coastal Dune	Coastal Marsh	Rocky Dry	Rocky Humid	Deep Open	Deep Forest	Moist-Wet Gully	Moist-Wet Forest	Moist-Wet Swamp	Moist-Wet Bank	Subalpine Open Forest
Pneumatopteris pennigera								G				
Polystichum richardii					H		F					
Polystichum vestitum								G	F		B	
Pteridium esculentum		Db		D		O						
Pteris macilenta								G				
Pyrrosia eleagnifolia	Rlu			D								
Rumohra adiantiformis								G				
Sticherus cunninghamii												F
Tmesipteris tannensis								G	F			
*Trichomanes venosum**								G	F			

Weed & Surveillance Plants

The following invasive species are especially relevant to biodiversity and habitat protection, and revegetation projects. They are already a problem in the Basin, or are a problem elsewhere and potentially will become invasive weeds for natural areas. You should also be aware of the ' Control' and ' Surveillance' plant pest lists available from the Canterbury Regional Council.

Common Name	Scientific Name
agapanthus	*Agapanthus orientalis* (spread by seed)
aluminium plant	*Galeobdolon luteum*
aeonium	*Aeonium* spp.
ash	*Fraxinus excelsior*
banana passionfruit	*Passiflora molissima, Passiflora mixta, Passiflora pinnatistipula*
barberry	*Berberis glaucocarpa, Berberis darwinii*
blackberry (wild aggregates)	*Rubus fruticosus agg.*
Boneseed	*Chrysanthemoides monilifera*
boxthorn	*Lycium ferocissimum*
broom	*Cytisus scoparius*
buddleia	*Buddleia davidii* (excluding hybrids)
cape honey flower	*Melianthus major*
cape ivy	*Senecio angulatus*
cotoneaster	*Cotoneaster* spp.
elephant's ear	*Alocasia brisbanensis*
german ivy	*Senecio mikanioides*
gorse	*Ulex europaeus*
grey willow	*Salix cinerea*
hawthorn	*Crataegus monogyna*
Himalayan honeysuckle	*Leycesteria formosa*
ivy	*Hedera helix*
Japanese honeysuckle	*Lonicera japonica* (including cultivars but not hybrids)
Japanese spindle tree	*Euonymus japonicus*
marguerite daisy	*Argyranthemum frutescens* (spread by seed)
monterey pine	*Pinus radiata*
nassella tussock	*Nasella trichotoma*
old man's beard	*Clematis vitalba*
pampas grass	*Cortaderia selloana, C. jubata*
periwinkle	*Vinca major / minor*
sycamore	*Acer pseudoplatanus*
smilax	*Asparagus asparagoides*
spartina	*Spartina* spp.
spindle tree	*Euonymus europaeuis*
spiny Broom	*Calicotome spinosa*
spur valerian	*Centranthus ruber*
St Johns wort	*Hypericum perforatum*
tutsan	*Hypericum androsaemun*
wandering willy	*Tradescantia fluminensis*

Methodology

Data sources to establish the indigenous ecosystems included published and unpublished scientific papers, geological and soil maps at various scales, topographic maps, Protected Natural Area Programme surveys and the Register of Protected Natural Areas, joint earth sciences societies inventories of important soil and geological sites, and landforms, and the knowledge of expert scientists.

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