Native plant communities of the Canterbury Plains

Department of Conservation
Te Papa Atawhai

Native plant communities of the Canterbury Plains

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In memory of Katherine Jane Carman

1967 – 2003

May Katherine's love of New Zealand
and its native plants shine on through all
who use this booklet

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Indigenous vegetation cover of the Canterbury Plains

Introduction

The Canterbury Plains area covered in this booklet is bordered by the Waimakariri River to the north and the Rakaia River to the south.

Who is this booklet for?

This booklet is designed to help people on the Canterbury Plains protect and restore the native plant communities once thriving in the area. It aims to improve awareness of the different native plant communities once dominating the plains and of the important remnants. Included are inspirational examples of restoration work that has been carried out in the region.

Why are the native plant communities of Canterbury so important?

Many New Zealand species are found nowhere else in the world because these islands have been isolated for millions of years. Canterbury is recognised as one of only 25 places of global importance, or biodiversity hotspots, because of its wide, unique range of native species. The Canterbury Plains has a surprisingly diverse range of habitats as a result of volcanoes, rivers, ocean, winds and other powerful natural forces continuing to shape it. The native flora and fauna in these habitats have had many thousands of years to adapt. From the sand dune communities near the coast, to the magnificent kahikatea forests and dry grasslands of the plains, Canterbury once supported rich and varied communities of native plants and animals and provided the tāngata whenua with an abundance of resources.

Since human settlement, widespread burning of native vegetation has occurred. Over the last 150 years, the introduction of modern farming methods has dramatically changed the natural habitats of the Canterbury Plains. Sadly, it is now one of the most depleted New Zealand regions, in terms of loss of native flora and fauna. Less than 0.5% of the plains still supports native vegetation (Meurk, C., 2004). The loss of these native plant communities has reached a point where habitats for our native wildlife have been reduced to a level where they are now insufficient for continued survival (Christchurch City Council, 2004).

Many of these native remnants exist now only as non-regenerating ageing populations that will be lost when the current plants die. Yet Canterbury is an extremely important place for native plants and associated wildlife, with almost 25% of New Zealand's threatened flowering native plants species and 15% of threatened animal species occurring here.

Plants to attract native birds

five-finger/whauwhaupaku *Pseudopanax arboreus*
kānuka *Kunzea ericoides*
lancewood/horoeka *Pseudopanax crassifolius*
whiteywood/māhoe *Melicytus ramiflorus*
wineberry/makomako *Aristotelia serrata*
black matipo/kōhūhū *Pittosporum tenuifolium*
pōkākā *Elaeocarpus hookerianus*
lemonwood/tarata *Pittosporum eugenioides*
South Island kōwhai *Sophora microphylla*
Coprosma species
tōtara *Podocarpus totara*
broadleaf/pāpāuma/kāpuka *Griselinia littoralis*
cabbage tree/ti kōuka *Cordyline australis*
poroporo *Solanum aviculare/S. laciniatum*
fuchsia, tree fuchsia/kōtukutuku *Fuchsia excorticata*
harakeke/New Zealand flax *Phormium tenax*

Hardy natives (suitable for most sites)

cabbage tree/ti kōuka *Cordyline australis*
kānuka *Kunzea ericoides*
karamū *Coprosma robusta*
black matipo/kōhūhū *Pittosporum tenuifolium*
lowland ribbonwood/mānatu *Plagianthus regius*
narrow-leafed lacebark/houhi, puruhi *Hoheria angustifolia*

plant communities

Native plant communities of the Canterbury Plains

The plant communities are grouped here according to soil type and the native plant communities associated with that soil type (see soil map). You can check these by examining remaining native plant communities and the types of soils they grow in. Generally, moister, less free-draining soils suit tall, structured, lush plant communities, while in drier more recent soils open lower-growing plant communities are more common.

Use this section as a practical guide for selecting species you can expect to grow reasonably well in your area. Remember this is a fairly general guide and it will still be important to check the conditions specific to your site.

(O) used after a plant indicates a hardy species which can or should be planted initially in open, exposed sites.

Swamp/wetland

Freshwater swamps/wetlands occur where soils retain high water levels throughout the year. Either the water table is permanently above ground level or only centimetres below it. These areas have organic peaty soils (Waimairi soil type).

Past vegetation

Swamp/wetland vegetation consists of water-tolerant species such as raupō, New Zealand flax, tussock sedges, rushes and cabbage trees. In the drier areas broad-leaved plants, as well as moisture-loving podocarps such as kahikatea, would have flourished. This list focuses on the smaller ground-cover plants suitable for sites where the soil is saturated year-round. Refer to the kahikatea/mataī podocarp forest list for further plants which may be suitable for drier areas or for later stages of vegetation development.

Suitable plants

Groundcovers, rushes, tussocks, ferns, flax

jointed wire rush/oīoī *Apodasmia similis*
twig rush/baumea *Baumea rubiginosa*
swamp kiokio (fern) *Blechnum minus*
Māori onion/bog lily *Bulbinella angustifolia*
Glen Murray tussock/cutty grass *Carex flagellifera, C. geminata*
sedge/pūrei *Carex maorica*

tussock sedges/pūkio *Carex secta, C. virgata*
toetoe *Cortaderia richardii*
sundew *Drosera binata*
thousand-leaved fern *Hypolepis ambigua*
water fern *Histiopteris incisa*
tussock rushes/wīwī *Juncus gregiflorus, J. pallidus*
harakeke/New Zealand flax *Phormium tenax*
prickly shield fern *Polystichum vestitum*
lake clubrush *Schoenoplectus tabernaemontani*
sedge tussock/bog rush *Schoenus pauciflorus*
raupō/bulrush *Typha orientalis*
swamp or creeping nettle/narrow-leafed ongaonga *Urtica linearifolia*

Kahikatea/matai podocarp forest

The soils in these zones are gley soils occurring mostly on low-lying swampy land, with rich brown to black topsoil and a permanently high water table. They include Taitapu and Temuka soils.

Past vegetation

The past vegetation would have been dominated by podocarp forest of kahikatea and mataī, an under-storey of smaller trees and shrubs, with dense clusters of New Zealand flax, sedges, rushes and cabbage trees in swampy areas.

Suitable plants

Tall trees

kahikatea/white pine *Dacrycarpus dacrydioides*
hinau/pōkākā *Elaeocarpus dentatus, E. hookerianus*
mataī/black pine *Prumnopitys taxifolia*

Trees and large shrubs

wineberry/makomako *Aristotelia serrata*
marble leaf/putaputāwetā *Carpodetus serratus*
karamū *Coprosma lucida, C. robusta* (O)
cabbage tree/ti kōuka *Cordyline australis* (O)
tree fuchsia/kōtukutuku *Fuchsia excorticata*
broadleaf/pāpāuma, kāpuka *Griselinia littoralis*
pigeon wood *Hedycarya arborea*

narrow-leafed lacebark/houhi, puruhi *Hoheria angustifolia* (O)
mānuka/tea tree *Leptospermum scoparium* (O)
New Zealand myrtle/rōhutu *Lophomyrtus obcordata*
poataniwha *Melicope simplex*
kaikōmako *Pennantia corymbosa*
lemonwood/tarata *Pittosporum eugenioides* (O)
kōhūhū/black matipo *Pittosporum tenuifolium* (O)
mānatu/lowland ribbonwood (deciduous)
Plagianthus regius (O)
lancewood/horoeka *Pseudopanax crassifolius*
milk tree/tūrepo *Streblus heterophyllus*

Shrubs

mikimiki, mingimingi *Coprosma propinqua* (O)
red-stemmed Coprosma *Coprosma rubra* (O)
round-leaved Coprosma *Coprosma rotundifolia*
koromiko *Hebe salicifolia* (O)
weeping māpou/matipo *Myrsine divaricata*

Groundcovers, grasses, ferns, flax

bidibidi/piripiri *Acaena novae-zealandiae*
bamboo grass/wind grass *Anemanthele lessoniana*
toetoe *Cortaderia richardii* (O)
bush rice grass *Microlaena avenacea*
harakeke/New Zealand flax *Phormium tenax* (O)
hounds tongue fern/ kōwaowao, maratata
Microsorum pustulatum
bracken fern/rahurahu *Pteridium esculentum*

Climbers

clematis/puawānanga *Clematis paniculata*
native passion flower/kōhia *Passiflora tetrandra*
supplejack *Ripogonum scandens*
bush lawyer/tātarāmoa *Rubus cissoides*
bush lawyer, white-leaved lawyer *Rubus schmidelioides*

Tōtara/mataī podocarp forest

K. Smith

This plant community occurs on the moist, loamy Waimakariri, Wakanui, Templeton and Kaiapoi soil types.
These soils are more free-draining than Taitapu soils, hence the absence of kahikatea except in moist gullies or hollows.

Past vegetation

The past vegetation would have been dominated by podocarp forest of tōtara and mataī, with an under-storey of smaller trees, shrubs and ground covers/grasses.

Suitable plants

Tall trees

tōtara *Podocarpus totara*
hīnau *Elaeocarpus dentatus*
mataī/black pine *Prumnopitys taxifolia*

Trees and large shrubs

karamū *Coprosma lucida*
karamū *Coprosma robusta* (O)
cabbage tree/ti kōuka *Cordyline australis* (O)
broadleaf/pāpāuma, kāpuka *Griselinia littoralis*
narrow-leafed lacebark/puruhi, houhi *Hoheria angustifolia* (O)
kānuka *Kunzea ericoides* (O)
mānuka/tea tree *Leptospermum scoparium*
New Zealand myrtle/rōhutu *Lophomyrtus obcordata*
golden akeake/akiraho *Olearia paniculata* (O)
lemonwood/tarata *Pittosporum eugenioides* (O)
black matipo/kōhūhū *Pittosporum tenuifolium* (O)
lowland ribbonwood/mānatu *Plagianthus regius* (deciduous) (O)
lancewood/horoeka *Pseudopanax crassifolius*
South Island kōwhai *Sophora microphylla* (O)

Shrubs

thick-leaved mikimiki *Coprosma crassifolia* (O)
mikimiki, mingimingi *Coprosma propinqua* (O)
red-stemmed Coprosma *Coprosma rubra* (O)
pale green Coprosma/mikimiki *Coprosma virescens* (O)
koromiko *Hebe salicifolia* (O)

niniao *Helichrysum lanceolatum*

New Zealand verbena *Teucridium parvifolium* (O)

Groundcovers, grasses, ferns, flax

bidibidi/piripiri *Acaena novae-zealandiae*

bamboo grass/wind grass *Anemanthele lessoniana*

hen and chicken fern *Asplenium bulbiferum*

hard fern *Blechnum penna-marima*

toetoe *Cortaderia richardii* (O)

harakeke/New Zealand flax *Phormium tenax* (O)

hounds tongue fern/ kōwaowao, maratata *Microsorum pustulatum*

common shield fern *Polystichum neozelandicum*

crown fern *Blechnum discolor*

bracken fern/rahurahu *Pteridium esculentum*

Climbers

clematis/puawānanga *Clematis paniculata*

native passion flower/kōhia *Passiflora tetrandra*

supplejack *Ripogonum scandens*

bush lawyer/tātarāmoa *Rubus cissoides*

bush lawyer, white-leaved lawyer *Rubus schmidelioides*

Beech and podocarp forest

C. Rudge

This vegetation type occurs on the more humid high terraces and foothills near Springfield, Whitecliffs and Glenroy.
Associated soil types include Ashley, Glenroy, Lyndhurst, Staveley, Mayfield and Gorge, and are moist for most of the year.

Past vegetation

Most of this area would have been a mix of podocarps, such as mataī and tōtara, with beech and very localised kahikatea, rimu and miro in swampy areas and gullies. Beech (black and mountain) would have been more dominant at higher elevation. Such forests would also have had a dense under-storey of broad-leaved hardwoods such as Fuchsia, Hoheria, and Pittosporum, particularly in lower, moister areas.

Suitable plants

Tall trees

hinau *Elaeocarpus hookerianus*
black beech/tawhairauriki *Nothofagus solandri* var. *solandri*
mountain beech/tawhairauriki *Nothofagus solandri* var. *cliffortioides*
tōtara *Podocarpus totara*
mataī/black pine *Prumnopitys taxifolia*

For moist conditions

kahikatea *Dacrycarpus dacrydioides*
rimu *Dacrydium cupressinum*
miro/brown pine *Prumnopitys ferruginea*

Trees and large shrubs

makomako/wineberry *Aristotelia serrata*
karamū *Coprosma lucida, C. robusta* (O)
ti kōuka/cabbage tree *Cordyline australis* (O)
tree fuchsia/kōtukutuku *Fuchsia excorticata* (deciduous)
broadleaf/pāpāuma, kāpuka *Griselinia littoralis*
mānuka/tea tree *Leptospermum scorparium* (O)
New Zealand myrtle/rōhutu *Lophomyrtus obcordata*
red matipo/māpou *Myrsine australis*
weeping matipo/māpou *Myrsine divaricata*
lemonwood/tarata *Pittosporum eugenioides*
kōhūhū/black matipo *Pittosporum tenuifolium* (O)
five-finger/whauwhaupaku *Pseudopanax arboreus*
peppertree/horopito *Pseudowintera colorata*
lancewood/horoeka *Pseudopanax crassifolius*

Shrubs, grass, flax

mikimiki *Coprosma rhamnoides*
mikimiki/small-seeded Coprosma *Coprosma microcarpa*
mikimiki, mingimingi *Coprosma propinqua* (O)
red-stemmed Coprosma *Coprosma rubra* (O)
toetoe *Cortaderia richardii* (O)
harakeke/New Zealand flax *Phormium tenax* (O)

Climbers

bush lawyer/tātarāmoa *Rubus cissoides*

bush lawyer, white-leaved lawyer *Rubus schmidelioides*
clematis/puawānanga *Clematis paniculata*
native jasmine/kaihua *Parsonsia heterophylla*

Dry woodland

C. Jensen

Much of the Canterbury Plains consists of dry shallow soils, very prone to drought during the summer months.
These include shallow Waimakariri soils as well as stony and shallow Chertsey, Lismore and Eyre soils. However there is a range of hardy native plants that have adapted to these conditions and such communities play an important role in conditioning the soil.
This process creates a more hospitable environment for less robust native species and eventually the giant podocarps such as tōtara.

Past vegetation

The past vegetation would have been a mosaic of dry woodland shrubs and broadleaf/podocarp forest of tōtara and mataī in the more stable areas, free from more recent flooding and fire. However, since the area is now predominantly farmed, with sparse native vegetation cover, the conditions are not favourable for immediately planting in broadleaf/podocarp forest. It is best to establish the following dry woodland plants first.

Suitable plants

Trees

cabbage tree/ti kōuka *Cordyline australis* (O)
kānuka *Kunzea ericoides* (O)
golden akeake/akiraho *Olearia paniculata* (O)
kōhūhu/black matipo *Pittosporum tenuifolium* (O)
South Island kōwhai *Sophora microphylla* (O)

Shrubs

mountain wineberry *Aristotelia fruticosa*
New Zealand broom/mākaka *Carmichaelia australis* (O)
small scrambling clematis *Clematis marata*
thick-leaved mikimiki *Coprosma crassifolia* (O)
mikimiki, mingimingi *Coprosma propinqua* (O)
mikimiki *Coprosma intertexta* (O)
korokio *Corokia cotoneaster* (O)
matagouri/tūmatakuru *Discaria toumatou* (O)

niniao *Helichrysum lanceolatum*

porcupine shrub *Melicytus alpinus* (O)

shrub pōhuehue, shrubby tororaro *Muehlenbeckia astonii* (O)

plains Oearia *Olearia adenocarpa* (O)

tauhinu/golden cottonwood
Ozothamnus leptophylla (*Cassinia*) (O)

prostrate kōwhai *Sophora prostrata* (O)

Groundcovers, tussocks, sedge

tussock sedge/maurea *Carex comans, C. breviculmis* (O)

blue wheat grass *Elymus solandri* (O)

hard tussock, fescue tussock *Festuca novae-zelandiae* (O)

mat pōhuehue *Muehlenbeckia axillaris* (O)

silver tussock/wīwī *Poa cita* (O)

slender button daisy *Leptinella filiformis*

Grassland/shrubland

R. Morris

This zone is characterised by very shallow, stony or sandy soils subject to severe drought throughout the year. These soil types occur predominantly along river beds and alluvial fans and include Selwyn, Paparua, Eyre, and the very shallow and stony Waimakariri and Mayfield soils. Suitable plants for these areas are even more hardy than those in the dry woodland communities, although after establishing, the environmental conditions may be moderated to allow for a greater range of plants to be successfully grown.

Past vegetation

Harsh soil and climatic conditions, as well as regular disturbance from such events as floods and fires, would have permitted only the hardiest grasses, shrubs, mosses and lichens to grow.

Suitable plants

Small trees

ti kōuka/cabbage tree *Cordyline australis*

kānuka *Kunzea ericoides*

Shrubs

New Zealand broom/mākaka *Carmichaelia australis*

matagouri/tūmatakuru *Discaria toumatou*

plains Olearia *Olearia adenocarpa*

porcupine shrub *Melicytus alpinus*

shrub pōhuehue, shrubby tororaro
Muehlenbeckia astonii, M. complexa

cottonwood/tauhinu *Ozothamnus leptophylla (Cassinia)*

prostrate kōwhai *Sophora prostrata*

Groundcovers, grasses, tussocks, sedge

(some may require special management)

fine speargrass/taramea *Aciphylla subflabellata*

tussock sedge/maurea *Carex breviculmis, Carex comans*

New Zealand dwarf broom *Carmichaelia corrugata, C. monroi*

sand Coprosma *Coprosma acerosa*

hard tussock, fescue tussock *Festuca novae zelandiae*

mat pōhuehue *Muehlenbeckia axillaris*

leafless pōhuehue *Muehlenbeckia ephedroides*

silver tussock/wīwī *Poa cita*

blue tussock *Poa colensoi*

dryland grassland daisy *Leptinella serrulata*

Coastal salt marsh

N. Head

Coastal salt marshes occur where the underlying soils are wet and brackish such as on Motukarara soils.

Past vegetation

The past vegetation would have been dominated by salt- and water-tolerant shrubs, tussock sedges, rushes, grasses, flax and various ground covers.

Suitable plants

Shrubs

mikimiki, mingimingi *Coprosma propinqua*

mānuka/tea tree *Leptospermum scoparium*

pōhuehue *Muehlenbeckia complexa*

saltmarsh ribbonwood/mākaka *Plagianthus divaricatus*

Rushes, sedges, grass, flax

toetoe *Cortaderia richardii*

giant umbrella sedge/upokotangata *Cyperus ustulatus*

wīwī/sea rush *Juncus kraussii*

jointed wire rush/oīoī *Apodasmia similis*
harakeke/New Zealand flax *Phormium tenax*
three-square *Schoenoplectus pungens*
kāpūngāwhā/lake clubrush *Schoenoplectus tabernaemontani*
sea sedge, delta sedge *Carex litorosa*

Groundcovers, grasses

shore cotula *Leptinella dioica*
New Zealand mudwort *Limosella lineata*
carpet musk *Mazus novaezeelandiae* subsp. *impolitus*
remuremu *Selliera radicans*
sea primrose, shore pimpernel *Samolus repens*
Māori musk *Mimulus repens*
batchelor's button *Cotula coronopifolia*
glasswort *Sarcocornia quinqueflora*

Coastal sand dune

G. Lind

The coastal sand dunes typically have droughty and young sandy soils such as Kairaki, Waikuku and Taumutu.

Past vegetation

The past vegetation on the dunes varies depending on the age and stability of the dunes. Older dunes support a greater range of broad-leaved shrubs and trees than the younger dunes. Generally, the climatic extremes and young, droughty nature of the soil mean that only the hardy shrubs, tussock grasses, flaxes and ground cover thrive.

The plants below are best suited to specific parts of the dune system as indicated by the following letters:

(F) fore-dune (M) mid-dune (B) back-dune (S) sand flats (H) swampy hollow

Suitable plants

Trees and large shrubs suitable for older dunes

karamū *Coprosma robusta* (M, B)
akeake *Dodonaea viscosa* (M, B)

broadleaf/pāpāuma *Griselinia littoralis* (M, B)
houhere/narrow-leafed lacebark *Hoheria angustifolia* (M, B)
ngaio *Myoporum laetum (M, B)*
tarata/lemonwood *Pittosporum eugenioides* (M, B)
kōhūhū/black matipo *Pittosporum tenuifolium* (M, B)
South Island kōwhai *Sophora microphylla* (M, B)
tōtara *Podocarpus totara (B)*

Trees and shrubs suitable for young and old dunes

New Zealand broom *Carmichaelia australis* (M, S)
small scrambling clematis *Clematis marata* (M, S)
cabbage tree/ti kōuka *Cordyline australis* (B, S)
thick-leaved mikimiki *Coprosma crassifolia* (M, S)
korokio *Corokia cotoneaster* (M)
matagouri/tūmatakuru *Discaria toumatou* (M, S)
niniao *Helichrysum lanceolatum* (M)
kānuka *Kunzea ericoides* (B)
mānuka/tea tree *Leptospermum scoparium* (B, S)
porcupine shrub *Melicytus alpinus* (M)
shrub pōhuehue, shrubby tororaro *Muehlenbeckia astonii* (M,
pōhuehue *Muehlenbeckia complexa* (M, S)
mountain akeake, tree daisy/akiraho *Olearia avicenniaefolia* (M, B)
golden akeake/akiraho *Olearia paniculata* (M, B)
cottonwood/tauhinu *Ozothamnus leptophylla (Cassinia)* (F)

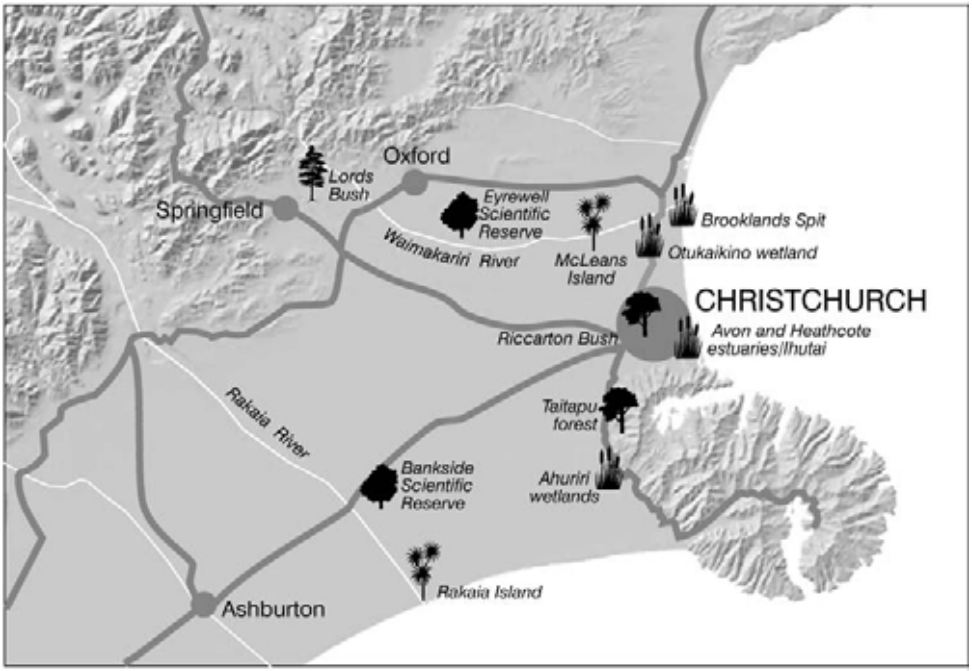
Groundcovers, grass, sedge, fern

sand convolvulus/wihiwihi *Calystegia soldanella* (F, M*)*
leafless scrambling clematis *Clematis afoliata* (M, S)
toetoe *Cortaderia richardii* (S)
pīngao/golden sand sedge *Desmoschoenus spiralis* (F)
Māori ice plant/horokaka *Disphyma australe* (F)
New Zealand flax/harakeke *Phormium tenax (S)*
bracken fern/rahurahu *Pteridium esculentum* (M, B)
spinifex *Spinifex hirsutus (F)*
New Zealand spinach/kokihi *Tetragonia trigyna* (F, M)
shore spurge/waiū-o-kahukura *Euphorbia glauca*

our remnants

Our remnants

This section provides examples of some of the few native plant remnants left on the Canterbury Plains. At least one remnant for each of the plant communities described in the first section has been included to provide as wide a range of examples as possible. These remnants also provide a good idea of what a restoration project may look like at maturity.



N. Head

Ahuriri wetlands

Over 90% of wetlands in New Zealand have been drained or degraded, much within the first century of European settlement (New Zealand Biodiversity Strategy, 1998). The draining of freshwater swamps and wetlands was once seen as a way of turning the land into something more productive. But in return for gaining agricultural land, important wetland habitats once filled with a huge diversity of amazing native plants and animals were lost. Māori used and valued these ecosystems and their species and still do.

The Ahuriri wetlands at Motukarara are a valuable reminder of the extensive wetland systems once widespread over the lower coastal parts of the plains. They were once part of the Ahuriri Lagoon which extended along the Halswell River from Taitapu to Motukarara. The Ahuriri remnants consist of six separate wetlands totalling approximately 35 hectares. Most are spring-fed and eventually flow into the Halswell River. The largest wetland area, Ahuriri rushland, is 26 hectares and primarily supports rushes/wīwī (*Juncus sarophorus* and *Juncus gregiflorus)*, while the other wetland remnants, ranging in size from 0.2 – 2.2 hectares, are dominated by lake clubrush *(Schoenoplectus tabernaemontani)* and raupō *(Typha orientalis)*. However, there are numerous other native plants including umbrella sedge (*Cyperus ustulatus),* which is rare in Canterbury, pūkio (Carex spp.*)* and silverweed *(Potentilla anserinoides)*.

Invasive weeds, especially willow and grasses like Yorkshire fog and tall fescue, threaten the smaller herbs of the wetlands and are ongoing management issues for Environment Canterbury. Luckily, draining can be reversed and some landowners are now choosing to restore areas that were once key wetland habitats for our native plants and wildlife.

Did you know?

Once habitats such as these Ahuriri wetlands were probably home to the elusive Canterbury mudfish *(Neochanna)*. These creatures have small eyes, probably relying on smell rather than sight to find food, and their fins are shaped like an eel's to allow them to slither amongst swampy vegetation. As swamps dry out in summer the mudfish bury into the mud, or moist logs, where they enter an inactive state know as aestivation. They are able to absorb enough oxygen through their moist skin, and only become active again when the swamp refills several weeks later. Unfortunately there are only a small number of sites around the Canterbury Plains where mudfish are still known to survive. (Bishop, N., 1992)

Access

Public access to the Ahuriri wetlands is currently not possible, although they can be viewed from State Highway 75, on route to Akaroa.

Further information

Contact Environment Canterbury.

Riccarton Bush / Pūtaringamotu

Riccarton Bush is one of Canterbury's best kept secrets and arguably its oldest protected natural area (Molloy, B., 1995). This 7.8-hectare reserve is an excellent example of Canterbury coastal floodplain forest. Kahikatea is the dominant podocarp along with regenerating tōtara and mataī. Riccarton Bush represents the end point in the slow successional transformation of swampy soils – accommodating plants such as reeds, tussocks and cabbage trees – to drier red soils supporting broad-leaved shrubs and eventually podocarp forest.

Of all the giant podocarps, the kahikatea is especially impressive. It is New Zealand's tallest native tree, towering as high as 65 metres in optimum conditions (Cave, Y.; Paddison, V. 2002). Although only reaching 30 metres, some trees in Riccarton Bush are estimated to be over 600 years old. However, since the arrival of people on the Canterbury Plains, podocarp forests have been decimated. Nationally Riccarton Bush is one of only about 2% of the original kahikatea forests to have survived to the present day (Molloy, B., 1995).

Beneath the emergent canopy of kahikatea, pōkākā and hīnau is a sub-canopy of ribbonwood, lemonwood, narrow-leaved lacebark, broadleaf, kōwhai, and lancewoods. An under-storey of small trees,

Kahikatea roots

shrubs and groundcovers such as five-finger, Coprosma, Pittosporum, mahoe, ferns, grasses and sedges grow vigorously beneath the larger trees.

These plants are part of a community that provides important habitats for a multitude of birds and insects. In turn, the plants rely on the birds and insects for important processes such as pollination and seed dispersal. Resident birds at Riccarton Bush include the fantail/pīwakawaka, grey warbler/riroriro and waxeye/tauhou. Visiting regulars include the bellbird/korimako and woodpigeon/kererū.

Restoration of kahikatea/mataī forest is extremely important if we are to preserve this magnificent plant community which once dominated the moist lowland parts of the Canterbury Plains. Increasing the number and size of these habitats is vital if we are to see the return of native wildlife, such as the bellbird and tui.

Access

16 Kahu Road, Riccarton. Open year-round to the public during daylight hours and is free of charge.

Further information

Riccarton Bush Trust, phone (03) 348 4277,
P O Box 11011, Sockburn, Christchurch.

Taitapu forest

Located on the lower Port Hills near Taitapu, this forest is the only known remnant of its kind at low altitude. A seven-hectare block, it is the only substantial example of the lowland mataī/tōtara bush once common on the deeper, well drained soils of the plains and foothills. The remnant contains significant numbers of regenerating tōtara and mataī, as well as an abundance of other native trees and shrubs including

Ahuriri bush – one of the few mataī/tōtara remnants on the Port Hills

New Zealand myrtle *(Lophomyrtus obcordata)*, narrow-leaved lacebark, ribbonwood, cabbage trees, native passion flower *(Passiflora tetrandra)* and shrubby māhoe *(Melicytus lanceolatus)* (Wilson, H., 1992).

Access

This remnant is privately owned and not available for public viewing. The block has not been grazed for some time now and is reported to be in reasonably good condition.

Other remnants at higher altitude on the Port Hills are the Ahuriri Reserve, Kennedys Bush and Omahu Bush.

Lords Bush

Lords Bush is an important remnant of lowland beech/podocarp hardwood forest located at the base of the Torlesse Range (near Kowhai Bush). This is one of the very last remnants of its type on the Canterbury Plains currently managed by the Department of Conservation. There are also old remnant podocarps in the paddocks adjacent to Lords Bush.

The reserve contains numerous black beech/tauwhairauriki *(Nothofagus solandri* var. *solandri)* which thrive in the more humid conditions and rich yellow-brown earth of the lower foothills. Further up, the forests are almost completely dominated by black beech, and in higher zones, mountain beech. Because Lords Bush is located at the base of the foothills, the conditions enable a transitional zone between beech and other podocarp species, such as mataī, kahikatea and pōkākā, indicating wet soils for most of the year.

Old remnant podocarps in the paddocks adjacent to Lords Bush

As well as an impressive collection of beech and podocarps, Lords Bush has a rich under-storey of broad-leaved species. In particular it contains a valuable collection of a rare Coprosma species (Meurk, C., unpublished survey of the Plains Ecological Region), such as *Coprosma pedicellata*. Some interesting native plants such as mistletoe (*Alepis flavida* and *Peraxilla tetrapetala)* can be seen growing in the beech trees.

Access

The reserve is open to the public.

For further information

Contact Department of Conservation.

Bankside Scientific Reserve

Bankside Scientific Reserve is located between the Selwyn and Rakaia Rivers (off State Highway One on Knyvetts Road, via Frasers Road). This 2.6-hectare block lies on free-draining shallow and stony Eyre soils which cover a large proportion of the Canterbury Plains.

The reserve was purchased by the Crown in 1971 and remains today as one of the few uncultivated areas on the Eyre–Paparua soil complex. Almost all the other areas of this soil have been cultivated, topdressed or cropped. Bankside is fairly similar to Eyrewell Scientific Reserve near Oxford. However, Bankside is situated closer to the sea, with lower rainfall and younger soils. This difference emphasises the important comparative role the two reserves provide.

C. Jensen

Together they provide a precious example of what much of the Canterbury Plains was like in pre-European times (Davies, E., 1980).

The reserve is dominated by open kānuka scrub, up to three metres tall. There are also small areas of fescue short tussock grassland, danthonia, native broom and matagouri (Davies, E., 1980).

Ongoing management issues include the removal of exotic species such as gorse, and the control of rabbits and hares. Fire too, poses a threat. Perhaps the biggest threat to the condition of the reserve is the largely unknown impact of intensive farming immediately beside it. This small reserve remains extremely vulnerable to outside influences such as spray drift, exotic seed, irrigation and fertiliser runoff. Some people have reported that the kānuka may benefit from the irrigation seepage from neighbouring farmland but generally such practices have had a detrimental impact on the overall plant community (Head, N., 2004).

Did you know?

One easy way to tell the difference between kānuka and mānuka is to run your hand down a branch. Kānuka will be quite soft to touch while mānuka will be quite stiff and prickly.

Access

As this is a scientific reserve, public access is by permit only, which must be granted by the Department of Conservation.

Further information

Contact Department of Conservation.

Eyrewell Scientific Reserve

Like Bankside Scientific Reserve, Eyrewell contains a good cross-section of the plant communities that once dominated the drought-prone soils of the Canterbury Plains. This 2.3-hectare remnant is located due south of Oxford, about an hour's drive from Christchurch. Although it is north of the Waimakariri, it stands as an excellent example of kānuka scrubland. At Eyrewell the soil is very dry Lismore soil on a high terrace and swings between the extremes of mild sub-humid summers and harsh winters, where frosts as low as -14° C can occur over 120 days a year.

The Crown purchased and gave the site reserve status in 1971. It has not been grazed since this time. The reserve is home to over 73 native plant species and organised into three distinct plant communities – low kānuka forest, shrubland and grassland.

The kānuka is up to seven metres tall in places, ranging in age from young saplings to plants estimated to be 60–70 years old, while the shrub layer is restricted to prickly heaths. The shrubland communities have a range of important species including *Pomaderris phylicifolia,* which is at its southern limit*,* native broom, cottonwood, Coprosma species and matagouri. The grassland areas are rich in small

regenerating kānuka seedlings, as well as small colonies of silver tussock and fescue.

Removal of invasive exotic plants like gorse and broom has been a challenge, but is now under control and the benefits to the regenerating bush of removing competition is evident. Management of possums and rabbits within the reserve continues to be an ongoing task.

As at Bankside, the impact of intensive farming from neighbouring blocks poses major challenges. Issues such as this make Eyrewell an important site for further scientific and conservation study.

Access

As this is a scientific reserve, public access is by permit only, which must be granted by the Department of Conservation.

Further information

Contact Department of Conservation.

Did you know?

Plants that can withstand droughty soils are referred to as xeromorphic. Some of the adaptations these plants have developed to withstand drought include reduced leaf size, divaricating leaves, smaller pores on the leaves, a thicker cuticle (outer waxy layer on a leaf) and hairs (called tomentum) which help reduce water loss from transpiration.

C. Jensen

Rakaia Island

This large island near the mouth of the Rakaia River has been created by layers of shallow stony and sandy Waimakariri and Selwyn soil types deposited by the river. The edges of the island are constantly being eroded and sculpted by the water so the plant communities are more similar to grassland/shrubland areas. At the northern end of Rakaia Island is the largest remnant of dry woodland forest on the Canterbury Plains (approximately 70 hectares). However the slightly older, more stable soil closer to the centre of the island supports an extensive woodland area dominated by kānuka forest. The kānuka ranges in size and age from young newly regenerated saplings, to trees over 10 metres tall and approximately 35 years old. The dense kānuka woodlands have a thick cover of meadow rice grass *(Microlaena stipoides*) and walking fern (*Asplenium flabellifolium)* competing with other plants for space and nutrients.

Although kānuka is the dominant native species, there are also numerous kōwhai. Many of these are hundreds of years old and have developed a distinctive, open irregular form, as can be seen at McLeans Island. As the tree canopy is relatively open, exotic grass growth underneath is prolific. This growth makes it difficult for native seeds to germinate and compete with other plants for light and nutrients. At Rakaia Island there are also abundant cabbage trees, *Muehlenbeckia australis* (a climber), bracken and black matipo. Problem weeds include exotic grasses, broom, gorse, blackberry and male fern.

Rakaia Island is an outstanding example of kānuka-dominated dry woodlands. It remains as an important example of the native plant communities which grew in these harsh, rapidly changing environments.

Access

Environment Canterbury administers the land and has fenced off significant woodland areas. The remaining area is leased for dairying, although certain management restraints have been placed on the land including the condition that remaining isolated native plants must not be removed. Because much of the land is leased, public access to the area is not possible.

Further information

Contact Environment Canterbury.

McLeans Island

This island located on the south bank of the Waimakariri River, three kilometres west of Christchurch airport, is one of the last remnants of the dry plains grassland communities unique to the Canterbury Plains. A combined total area of over 5000 hectares is managed by the Christchurch City Council and Environment Canterbury.

The grasslands have developed on the young stony soils and sands deposited by the Waimakariri River. Such soils are exceptionally free-draining so the plant communities that have adapted to these conditions are very hardy. The dry barren appearance of this

Ancient kōwhai stand out in the savannah-like landscape

landscape has meant it has often been mistakenly assumed to have little value either aesthetically or ecologically. Thousands of hectares have been lost in converting it to more intensive farming units. However, the grasslands are home to a diverse range of native flora and fauna, many of which are found in few other places because they have adapted to survive only in this special ecological niche.

At least 150 indigenous insect species have been identified in the McLeans Island grasslands. It is thought that four of these insect species, plus a number of moths are scarce in the region (Macfarlane, R.; Patrick, B.; and Vink, C. 1999).

Native vegetation in the McLeans Island grassland includes *Discaria toumatou* (matagouri)*, Carex comans* (longwood tussock)*, Carmichaelia australis (*broom)*, Coprosma petriei* (mat coprosma)*, Melicytus alpinus* (porcupine shrub)*, Sophora prostrata (*prostrate kōwhai) and *Poa cita* (silver tussock) (Meurk, C.; and McCombs, K. 1994). McLeans Island grassland also provides sanctuary for some of New Zealand's threatened species such as *Olearia adenocarpa* (plains Olearia), *Raoulia monroi* (Raoul's mat daisy) and *Muehlenbeckia ephedroides* (leafless pōhuehue) (McCombs, K. 2003).

Grazing and competition from exotic plants poses an ongoing threat to the balance of the indigenous grassland community. The Christchurch City Council proposes to direct future efforts towards public education, protection and restoration of these important grassland remnants (Meurk, C.; and McCombs, K. 1994).

Access

This is administered by the Christchurch City Council.

There is public access to McLeans Island recreation area at the end of Intake Road (off the Old West Coast Road, opposite the Belfast Gun Club). Chattertons Road also provides an excellent vantage point from which to view grassland areas.

Further information

Contact Environment Canterbury or Christchurch City Council.

N. Head

The estuaries of the Heathcote and Avon Rivers / Ihutai

This combined estuary of about 880 hectares is located 12 kilometres to the east of the city centre. It was probably formed only some 450 years ago (Owen, S. J., 1992) which makes it a very young ecosystem by comparison with some of the kahikatea at Riccarton Bush which are well over this age.

N. Head

Estuaries are formed when fresh water mixes with salt water in a semi-enclosed basin. This estuary is enclosed by a sand bar deposited by the Avon, Heathcote and Waimakariri Rivers. The enclosure offers protection from shore currents and breaking waves, as well as causing a large build-up of sediment flushed down from the rivers or washed in with the tide. This unique combination of rich sediment, shelter, and mix of salt and fresh water, has a profound effect on the types and distribution of animals and plants in the estuary (Owen, S. J., 1992).

Mid-tide is an important ecological boundary. Below mid-tide eel grass is the only flowering native plant that can withstand the conditions. Above mid-tide is the salt marsh plant community, where vegetation must be able to cope with extreme changes in salinity. (The plant list for this zone can be found in the front part of this booklet.) Immediately above mid-tide zone the salinity is highest and only a few species such as the sea rush can grow here. Further from the mid-tide zone, in the upper marsh, plants such as jointed wire rush, coastal ribbonwood and flax are able to survive. (Owen, S. J., 1992).

Estuaries such as the Heathcote and Avon Rivers/Ihutai are very important habitats for many invertebrates such as crabs, mudflat snails, and various polychaete worms. However, the estuary's most remarkable claim to fame is its internationally significant bird population. It supports between 5–6% of the world's population of South Island pied oystercatchers/tōrea and about 3% of scaup/pāpango, as well as other important migratory bird species (Crossland, A. 1992). This emphasises just how important it is to protect and restore these estuarine and salt marsh communities.

Did you know?

Estuaries are extremely productive. Annually, each square metre of estuary is four times more productive than an equivalent sized area of good pasture. Plants that can grow in the salt marsh zone are called halophytes, a name derived from the Greek word for salt. Salt marsh plants have various strategies for dealing with the extreme salty conditions. Glassworts store water in their fleshy stems to dilute the salt, while cord grass secretes salt through special glands on its leaves. (Owen, S. J., 1992).

Further information

The Avon-Heathcote Estuary Ihutahi Trust, P. O. Box 2657 Christchurch.

Recommended reading

The Estuary, edited by S. J. Owen, Parks Unit, Christchurch City Council, 1992. (Available from the council and public libraries).

Other important salt marsh remnants

Brooklands Lagoon located at the mouth of the Waimakariri River.

N. Head

Brooklands Spit

The spit is an excellent example of the complex sequence of native plant communities occurring along the coast of the Canterbury Plains. A native remnant on the elongated sandbar at the mouth of the Waimakariri River, it contains a unique sequence of dune and inter-dune wetland communities that eventually merge into the Brooklands Lagoon (Head, N., 2004). Brooklands Spit is currently managed by the Christchurch City Council.

A major threat for plant communities on the spit is the instability of the dunes. The power of wind and water to modify the shape and distribution of the sand is quite phenomenal. Every year, wind and wave action shift around one million cubic metres of sand up and down the beaches between the Waimakariri River and Banks Peninsula; storms alone can cause up to 100,000 cubic metres of sand to be lost for each kilometre of beach (Christchurch City Council, 2000).

Despite these extreme conditions, numerous native plants have adapted to the special niches created by these natural processes, although most thrive only on the more stable back-dunes. Significant plant communities on Brooklands Spit include cottonwoods

N. Head

N. Head

(Ozothamnus leptophylla), New Zealand iris, sand Coprosma and pīngao, as well as some impressive old akeake and ngaio trees with canopies spanning almost 10 metres.

Duneland communities such as these are vulnerable to disturbance from vehicles, grazing and recreational use. Measures to protect and restore dune remnants like Brooklands Spit are an important priority if we are to ensure such unique communities are still around for future generations to appreciate.

There is considerable variation in environmental conditions on the sand dunes, depending on their age (which affects stability) and position. This is an important factor to remember when selecting plants for restoration work. See sketch in sand dune community plant list.

Further information

Christchurch City Council Coastal Ranger at Bottle Lake Headquarters.

restoration projects

Restoration projects

This section contains a range of restoration projects that have been undertaken/are being undertaken around the Canterbury Plains. A wide range of examples has been included to demonstrate how restoration can occur at a range of scales, even with limited knowledge and funding. You need not be an expert to successfully be involved in restoration work; mostly all it takes is some determination, commitment and a large dose of enthusiasm! For further guidance and sources of inspiration, check out the contact details at the end of each project, as well as the more extensive list at the back of the booklet.

Good examples of Canterbury habitat associations can also be observed at the display gardens at the Department of Conservation Motukarara Conservation Nursery.

Ōtukaikino

Ōtukaikino, or Wilsons Swamp, is a freshwater wetland reserve north of Christchurch close to the Belfast end of the northern motorway. The wetland luckily escaped complete drainage, although, by 1992 when the restoration began, almost all the native vegetation around the wetland had gone. The area is significant for Ngāi Tahu as the water on the site was originally used by tohunga (priests) for embalming purposes. It is currently being restored in a partnership between the Department of Conservation and Lamb and Hayward

N. Head

Funeral Directors, supported by Ngāi Tuahuriri Rūnanga, as a living memorial to those who have died. Lamb and Hayward donates a sum of money to DOC for every funeral it conducts, which is then used to restore the reserve, through purchasing plants, weed control, building tracks, paths and bridges and installing signs.

The native plantings are attracting back a range of wildlife including pūkeko, shoveller/kuruwhengu, grey teal/pohoriki, eels/tuna, native snails and many native insects (Christchurch City Council, 2000).

Project details

N. Head

Aim: To restore the wetland community as closely as possible to its original natural state, and to be a fitting memorial for those who have passed away.

Project started: 1992

Area: 13 hectares

Funding: Department of Conservation and Lamb and Hayward Ltd. Also private donations.

Plants: Natives, either sourced from existing plants on site or from the closest original sources. Exotic species are gradually being removed. Initially hardy wetland species such as toetoe, tussock sedges, swamp kiokio, cabbage trees and flaxes were planted. As these became established and weeds were suppressed, longer-term plants such as kahikatea and mataī were added.

Maintenance: Department of Conservation manages the reserve. Over the years there has also been help from Task Force Green workers, Periodic Detention workers, Conservation Corps, school students, volunteers, the local rūnanga, prison inmates and work experience students. Regular maintenance tasks include clearing weeds to prevent them from smothering young native plantings, removing and cutting back willows, and mowing (there is an extensive lawn area).

Accessibility: Public access daily.

Further information:

Contact Department of Conservation.

Or, for further information about the Living Memorial programme, contact Lamb and Hayward, phone (03) 359 9018.

Travis Wetland is another excellent example of a wetland restoration project.

Riccarton Bush / Pūtaringamotu

Riccarton Bush was officially opened to the public as a reserve in 1917, however, in the early stages management practices were rather dubious. The reserve, which had become rife with exotic grasses, was regularly mown.
This caused significant damage to tree roots; some of the scars can still be seen to this day. Also, for some time there was no fence around the reserve so people trampled a network of tracks throughout the bush. To make matters worse, when restorative planting was attempted, native plants were sourced from places as far away as the West Coast, Southland and the Central North Island. This resulted in the introduction of native plants which had never grown naturally in this area such as *Sophora tetraptera, Hoheria sextylosa*, black beech, and mountain beech. The results in some cases were disruptive. For instance, the North Island lacebark was aggressive and quickly spread throughout the bush, hybridising with local species.

Since 1975 management practices have changed considerably. Thousands of natives have been planted since this time, all propagated in the Trust's nursery from seed collected within the reserve. Natural regeneration is now occurring extensively throughout the bush and its long-term future looks fairly optimistic. In 2004 a predator-proof fence was installed around the entire Riccarton Bush boundary. All possums, rats and cats have since been removed and the aim is to also complete the eradication of mice. Ranger John

Moore hopes an increase in the number of native wildlife will soon follow.

Urban development has probably had some negative effects on the reserve; the water table is now lower than it used to be (Moore, J., 2004). In 2000 the decision was made to irrigate the bush to restore moisture conditions and as a fire precaution. The bush has responded well, with evidence of greater regeneration close to water sources.

Project details

Aim: To enhance the reserve for the ongoing enjoyment of the people of Canterbury.

Project started: 1917

Area: 7.8 hectares

Funding: The Riccarton Bush Trust administers Riccarton House, its 4.9-hectare grounds and the 7.8-hectare bush. Funding for the whole heritage site is by way of a levy on the Christchurch City Council. Funding from other sources is often sought for projects such as the predator-proof fence, primarily funded by the Gama Foundation with contributions from Christchurch City Council, Department of Conservation, the Biodiversity Condition Fund, World Wide Fund for Nature and the New Zealand Lottery Grants Board.

Plants: Numerous species including matipo, lemonwood, karamū, narrow-leaved lacebark, māpou, māhoe, broadleaf, five-finger and kahikatea.

Maintenance: Ongoing surveillance for animal pests and eradication of exotic weeds, whose seeds arrive in bird droppings or are wind-borne. Ongoing planting, track and signage maintenance, and keeping clear a four-metre corridor alongside the new predator fence.

Accessibility: Riccarton Bush is open year-round to the public during daylight hours and is free of charge.

Further information:

John Moore, Ranger, phone (03) 348 4277, 027 412 4944 or Riccarton Bush Trust.

Addington Bush

When residents in the Christchurch suburb of Addington identified an empty back section as the next target for residential development, they banded together and made their own plans for the site. They proposed that it should become a reserve, an urban oasis of native plants. Many residents neighbouring the section were keen to extend the planting into their own backyards, and where possible use simple wire fences to improve visual continuity between sections.

The resulting restoration project testifies to just what can be achieved with determination, co-operation, and only a small drop of cash. Mike Peters has been involved with the project since it first started and admits it has been a real hands-on learning experience. "We did almost everything we should not have done". For instance, Mike recalls trees being planted, milk carton and all, and of course they died because the roots had nowhere to grow!

Persistence however was the key to success, and according to Mike, the bush is currently growing very well, attracting back birds such as fantails, waxeyes and the odd tui. The group has grown all the trees itself, which has drastically reduced costs. Seeds have been sourced from genetically appropriate local native seed sources and now seed and seedlings are sourced from Addington Bush itself.

Mike's top three tips:

1. Learn as much as you can about the practical aspects of restoration work i.e. how and when to plant, pest management etc. The publication *Protecting and restoring our natural heritage – a practical guide* (available from DOC) is an excellent start.

2. Planting takes 5% of the work but maintenance is 95% of the effort. Minimise work by mulching, leaving large trees and shrubs (even if exotic, at least initially) as they prevent light reaching the ground – and that means less weeding! These exotic trees/shrubs can easily be removed later when the native trees have grown up enough to shade out weeds.

3. Do not try to plant all the plants you eventually want to include in the planting. Some of the species we tried to plant straight off, such as tōtara, died. The hardy species should be planted first.
The others should only be added once the bush is well established and there is ample shelter and moisture and no competition from weeds.

Project details

Aim: To develop a community-driven native plant reserve, eventually tōtara-mataī bush, in an empty back section.

Project started: 1994

Area: 850 square metres

Funding: The Addington Bush Society receives some funding from Community Trusts, but all trees have been grown by the group and maintenance is done on a voluntary basis.

Plants: The five hardy natives that grew most successfully were flax, cabbage trees, Pittosporum, *Coprosma robusta* and ribbonwood. The bush is protected by a QEII covenant.

Maintenance: Ongoing eradication of weeds, especially grass, and exotic trees. Techniques have included chemical control, hand removing and mulching. Working bees are held about once a month. Assistance and practical advice from council rangers has also been helpful.

Further information:

Contact Mike Peters, Addington Bush Society, phone (03) 338 5451. Tours (preferably groups) by arrangement are welcomed.

Tawhai Bush

The restoration work at Tawhai Bush is truly inspirational. When owner Anthony Holcroft took over the 19-hectare property in 1976 only a quarter was covered in mature or regenerating beech/podocarp forest. Grazing had left the forest floor devoid of native vegetation and in places badly eroded. Some 28 years on, nearly half of the area is covered by regenerated or mature native plants.

The bush is located 10 kilometres north-west of Oxford and consists of a mix of black beech, mountain beech and podocarps such as kahikatea and a small number of rimu. Stock were removed as soon as the property had been fenced off, allowing a rich under-storey of shrubs, ferns (including *Asplenium* and *Blechnum* spp.), and groundcovers (*Astelia fragrans* and Carex) to regenerate.

Although much planting has been successfully carried out, the natural regeneration that has occurred is exceptional. Thousands of natural grasses, mānuka and beech have colonised the site, as well as some kahikatea and pōkākā. Apparently, the swampy parts of the site were once dominated by a grove of giant kahikatea. Anthony's long term vision is to see the return of these amazing podocarps to the moister parts of the property.

He notes, "When beginning a restoration project such as this it is important to check out what plants naturally grow well on the site. This gives a good clue as to what you can expect to survive if you do planting yourself."

"On exposed sites quick shelter can be established with hardy colonising species such as flax but sometimes it is better to let nature take its own course, particularly if there is good seed source nearby. At Tawhai Bush some difficult sites have actually regenerated very successfully without any help from us."

Project details

Aim: To allow the whole block to revert to its original state and in time to link up with adjacent native bush.

Project started: 1976

Area: 19 hectares

Funding: The block is privately owned (with a QE II covenant) and has mostly been funded by the owners. Grants this year from Environment Canterbury and the Department of Conservation will enable further riparian work to be completed.

Plants: A number of locally-sourced species have been trialled over the years, though much of the progress has actually been through facilitating natural regeneration. Species include, podocarps (kahikatea and tōtara), broad-leaved species (such as five-finger, ribbonwood and Coprosma), and shrubs, groundcovers and climbers such as Muehlenbeckia and clematis.

Maintenance: Controlling weeds, mainly willows, broom, blackberry and gorse. Methods include chemical control, hand-weeding, pruning and slashing. From time to time maintenance has been carried out by Periodic Detention workers.

Accessibility: This is private land so access is by arrangement with the owner.

Further information:

Contact Anthony Holcroft.
Phone (03) 3137223
or email
holcrofts@paradise.net.nz

McLeans Island trials

McLeans Island is a very important example of some of the last grassland/shrubland habitat left on the Canterbury Plains. Two different restoration planting projects have been undertaken here. The first one was in a paddock alongside Chattertons Road where grazing stock was removed and a variety of tussock and woodland species were trialled. This project has proven partly unsuccessful as seven years later only a few kōwhai, matagouri, kānuka, silver tussock and the shrub *Pomaderris ericifolia* have survived. Pest herbivores such as rabbits and initial severe drought seem to have contributed most to this outcome.

The details which follow refer to a second, recent project which was instigated after an Olearia shrub was discovered that was found to be very rare and confined to the Canterbury Plains. It is now named *Olearia adenocarpa*.

Philip Grove and some of the Olearia planted at McLeans Island.

Project details

Aim: To restore the native dry shrubland community, particularly to protect and promote the regeneration of existing *Olearia adenocarpa* and supplement numbers by planting more.

Project started: Autumn 2004; planted spring.

Area: 15- and 9-hectare blocks.

Funding: Environment Canterbury, plus a grant from the Biodiversity Condition Fund. Expenses: rabbit-proof fencing and plants.

Plants: *Olearia adenocarpa*, 120 planted. Plants obtained through Motukarara Conservation Nursery. The seed was sourced from existing plants around McLeans Island.

Maintenance: The entire area was fenced with rabbit-proof netting, rabbits were poisoned and stock removed. Grazing to control grass competition with the smaller tussocks and herbs on McLeans Island will be necessary in the future.

Accessibility: No public access at this stage.

Further information:

Contact Environment Canterbury.

Bexley Wetland

In 1992, 12.5 hectares were set aside as part of an ecological heritage site north of the estuaries of the Heathcote and Avon Rivers/Ihutai. It is amazing to think this site was once grazed by dairy cows and food was grown here to help with the World War II effort. Part of the area was also once used as a scrap metal yard, which contaminated some of the site. Recent excavation has buried and sealed these contaminated areas, topsoil has been added and mass native plantings now blanket the mounds. Bexley is currently managed by the Christchurch City Council and the Bexley Wetland Trust.

This is an unusual wetland as it is a mix of salt marsh and freshwater plant communities, with five springs bubbling up from underground aquifers.

Restoration has involved the eradication of invasive exotic species such as willow, gorse and broom. Initially a shredder was hired for a few hours which made light work of demolishing these problem plants, roots and all. Once weeds were controlled salt marsh communities naturally regenerated. Most planting has been along riparian corridors and as buffers behind the housing. Species planted include cabbage trees, New Zealand flax, grasses, saltmarsh ribbonwood, black matipo and toetoe.

Bexley now provides an important habitat for numerous birds, including banded dotterel/turiwhatu, grey duck/pārera, grey teal/tete, gulls/tara, harrier/kāhu, mallard, marsh crake, kingfisher/kōtare, scaup, shoveller/kuruwhengu, paradise shelduck/pūtakitaki, pied stilt/poaka, pūkeko, shag/kōau, cormorant/kawau, spur-winged plover, welcome swallow, and white-faced heron/matukumoana.

Project details

K. McCombs

Aim: To protect and restore the saline and freshwater habitat at Bexley Wetland.

Project started: 1998

Area: 12.5 hectares

Funding: Partnership between the Bexley Wetland Trust (formed 1999) and the Christchurch City Council. The Council has contributed $150,000 over the past five years. Wai-ora Trust, Project Employment and Environmental Enhancement Projects, Lions Club, Trees for Canterbury and Riccarton Bush have also contributed significantly by way of plant donations or providing labour over the years.

Plants: A hardy mix of natives as described.

Maintenance: Total eradication of willows, gorse and broom has been achieved. Control of weeds such as exotic grasses is an ongoing maintenance task. Methods include use of mulch, mowing, grubbing, hand-removing, and chemical control for persistent or particularly invasive weeds. Trapping of pests such as stoats, rats and ferrets is also an important ongoing task.

Accessibility: Public access year round. There are various tracks around the site and seating to allow for quiet reflection.

Further information:

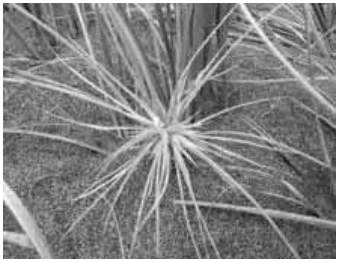
There is a brochure available from the Christchurch City Council. For more information contact the City Council.

Taylors Mistake

This sheltered inlet south of Sumner is home to a very successful sand-dune restoration project. The small, isolated nature of the site means long-term goals to completely eradicate marram grass and other exotic plants from the foreshore are achievable. Boneseed *(Chrysanthemoides monilifera)*, a notorious weed in the wider Canterbury area, has been eradicated from Taylors Mistake.
Much energy has also gone into replanting the dunes with appropriate native plants. Spinifex, previously extinct from Canterbury, has been successfully reintroduced from the nearest surviving population in Marlborough and now dominates the fore-dunes. The biggest triumph, however, is a group of *Euphorbia glauca* which have now survived for over a year. Jason Roberts (Coastal Ranger) attributes this success to the sheltered nature of the bay and possibly the higher rainfall. This restoration project shows just how quickly restoration can occur when the right plants are selected for the right location, even at a coastal site.

Top twelve hardy species for coastal locations

New Zealand flax/harakeke
ti kōuka/cabbage tree
ngaio
kōhūhū/tarata
akeake
pīngao
sand Coprosma
tauhinu/golden cottonwood
sea spurge
five-finger
scrambling pōhuehue
mikimiki



Project details

Aim: To re-establish the original native sand-dune community existing before it was displaced by exotics such as marram grass and lupins.

Project started: 2000

Area: An approximately 50-metre strip of fore-dunes, with plantings also on mid- and back-dunes.

Funding: Christchurch City Council with help from Wai-ora Trust, as well as willing volunteers and community members.

Plants: Fore-dune to back-dune – spinifex, *Euphorbia glauca, Ozothamnus leptophylla,* toetoe, akeake, ngaio, shrub and scrambling pōhuehue*,* sea spurge, five-finger, New Zealand flax, cabbage trees and kōhūhū among others. Plants are grown by the Christchurch City Council nursery, sourced from local, or nearest original seed and cutting sources.

Maintenance: Taylors Mistake is managed by the Christchurch City Council. Periodically it holds work days, and also has help from Periodic Detention workers, Wai-ora Trust workers, school students, and volunteers. Regular maintenance tasks include clearing weeds and mulching around the base of trees, removing marram grass, and planting.

Accessibility: Open to the public all year round.

Further information:

Contact Christchurch City Council Coastal Ranger.

Cam River riparian project

Although north of the Waimakariri, this project is an excellent example of restoration involving streamside planting. Waterways provide an ideal opportunity for restoration work, which is often overlooked by landowners. Waterways are often fenced off to keep out stock and have great potential to be important wildlife corridors for fish and birds, as well as stabilising banks and reducing contaminant runoff into waterways.

J. Gardiner

This project has been undertaken by Anthony and Julia Holcroft on their private property just out of Rangiora. The Holcrofts began the project around 40 years ago so the plant community is reasonably mature. More recently the long-term natives such as kahikatea have been planted. They appear to have quickly settled into their sheltered environment free of competitive grasses and are growing well. It is also encouraging to see the bush floor covered in hundreds of small native seedlings including matipo, kōwhai and Coprosma, indicating the excellent condition and vigour of the bush.

Project details

Aim: To restore a section of native streamside vegetation.

Project started: 1961.

Area: 50 x 15 metres, approximately.

Funding: The block is privately owned and has been entirely funded and maintained by the owners.

Plants: Initially the hardiest native plants were used such as flaxes, kōhūhū, Coprosma and cabbage trees. Some exotics like pampas and willow were initially left to give some shelter to the young native plants. In close proximity to the stream, moisture-tolerant plants such as flax and sedges were used. Less hardy species such as kōwhai and kahikatea were added once the other plants were well established.

Maintenance: When the plants were initially planted, regular hand-weeding was an important and reasonably demanding task. The young plants were also watered intermittently during the summer for the first few years or so. Maintenance now is very low, as the canopy is completely closed and few weeds can compete with the native species. Anthony is now continuing the planting on the other side of the stream as a contribution to the recently formed Cam River Restoration Scheme, a joint venture between the Waimakariri District Council and Environment Canterbury to improve the biodiversity and water quality in the Cam River catchment.

Accessibility: As it is private land access is only by arrangement with the owners.

Further information:

Contact Anthony Holcroft, phone (03) 313 7223. For more information about waterway enhancement projects that have occurred throughout the city, contact the Christchurch City Council.

Silverstream catchment

This is an example of what can be achieved when a farming community works together to resolve a common issue. Results from water quality monitoring at Coes Ford, Lower Selwyn River, in February 2000 identified faecal coliforms exceeding safe levels for recreational use. The likely cause was the extensive drain and creek system upstream in the Silverstream catchment, south west of Springston, near Ellesmere. These results prompted local farmers in the catchment to form the Silverstream Water Improvement Group who have successfully bid for grants to fence and plant Silverstream, a major spring-fed stream in the catchment.

Ongoing monitoring also revealed that as irrigation in the area increased, many of the springs that fed Silverstream completely dried up. This was the case during the summers of 2002/2003 and 2003/2004. Debbie Hasson, resident farmer and group co-ordinator, stresses the group's concern as to the seriousness of this predicament. "This has never been known to occur as long as the land here has been farmed and that's been at least the last one hundred years".

Areas of native plants were planted around the main springs area three years ago, and future plans are to extend plantings along the waterways. This is a good example of what can be done with some foresight, shared accountability and cooperation.

Project details

Aim: To improve water quality and flow of the natural springs and waterways in the area by fencing off from stock and developing streamside plantings.

Project started: 2002

Area: Extensive area fenced off along waterways and around freshwater springs.

Funding: The project runs through numerous privately owned farms. Farmers have funded about half of the fencing costs themselves and have received a 50% subsidy and some additional funding from the Environment Canterbury Enhancement Fund for native plants.

Plants: At present the main area of planting is centred on the Silverstream catchment where several of the most important springs in the area are. Hardy species that have survived include New Zealand flax, kōhūhū, cabbage trees, and broad-leaved shrubs.

Maintenance: Maintenance has purposely been kept to a minimum by planting only the hardiest shrubs.
The exotic grass has been allowed to grow freely, to promote bank stabilisation and some shade.
In several places sedges and rushes have spontaneously recovered. In very open places along the waterway poplars will be used as a nurse crop to provide quick shelter.

Accessibility: The waterway cuts across private land so access is only by arrangement with the owners.

Further information:

Contact Debbie Hasson, phone (03) 329 5445.

Wards' bush

This is a good example of the type of small-scale project that is ideal for anyone who has an area of land they wish to retire and return to native bush. The Wards had a small pond and ditch in the corner of a paddock on their Shands Road property and decided to retire it by fencing off and planting some suitable natives. Jonet Ward notes that apart from the wet areas in and around the pond, the soil is very free-draining and prone to drought in the summer. "An important part was selecting the right plants for the right spot", she noted. Ecologist Colin Meurk helped choose the plants. In all fifty-eight were planted, and there were only a few losses. "We didn't have any success with the kōwhai, although we thought they would grow well . . . so you have to be prepared to experiment a bit, take some risks," advised Jonet.

Some ten years on, the block is maturing well, although it is interesting to note there is quite a variation in the size of plants even though they were all planted at the same time. Plants in moister spots have grown quickly, while others in drier places have been fairly slow to take off.

Project details

Aim: To create a small block of native planting and habitat in the corner of a paddock.

Project started: 1994

Area: Approximately 20 x 8 metres.

Funding: The block is privately owned by Jonet and Tony Ward and has been entirely funded and maintained by them.

Plants: The block has a small pond and ditch running through it. In close proximity to these wet areas plants such as mikimiki, Coprosma, hebes, flax, ribbonwood, mānuka and cabbage trees were planted. Dry areas were successfully planted in kānuka, *Coprosma propinqua*, cabbage trees, cottonwood and korokio. Black matipo grew well in both areas. Kōwhai was unsuccessful, but once established is very hardy.

Maintenance: When the plants were young, a couple of times a year weeds were moved from around the base of the plants. The young plants were also watered during the summer for the first five years or so. There is very little maintenance required now; periodically broom and any other robust weeds are removed.

Accessibility: As it is private land access is only by arrangement with the owners.

Further information:

Contact Jonet Ward,
phone (03) 325 2628.

Useful information

Organisations

Avon-Heathcote Estuary Ihutahi Trust:
C/- P O Box 2657, Christchurch, www.estuary.org.nz

Canterbury Botanical Society: P O Box 8212, Christchurch

Christchurch City Council: Phone 941 8999, P O Box 237, Christchurch, info@ccc.govt.nz, www.ccc.govt.nz

Christchurch Environment Centre: Phone 379 2257, PO Box 2657, 64 Kilmore St, Christchurch, info@environment.org.nz

Department of Conservation: Motukarara Conservation Nursery, phone 329 7846, RD 2, Christchurch, motukarara@doc.govt.nz, www.doc.govt.nz

Environment Canterbury (Canterbury Regional Council): botanist, phone 365 3828, P O Box 345, Christchurch, www.ecan.govt.nz

Guardians of the Styx River: P O Box 20311, Christchurch

Isaac Centre for Nature Conservation, Lincoln University: Professor Ian Spellerberg, phone 325 3838 ext. 8730, P O Box 84, Lincoln University, spelleri@lincoln.ac.nz, www.lincoln.ac.nz/nature

Landcare Research NZ Ltd: Colin Meurk or Judy Grindell, phone 325 6700, P O Box 69, Lincoln 8152, grindellj@landcare.cri.nz, www.landcare.cri.nz

Ministry for the Environment: P O Box 1345, Christchurch, library@mfe.govt.nz, www.mfe.govt.nz

New Zealand Ecological Restoration Network (NZERN): Mike Peters, phone 021 367 733, P O Box 9000, Christchurch, office@bush.org.nz, www.bush.org.nz

New Zealand Institute of Landscape Architects: P O Box 3764 Christchurch, canwest@nzila.co.nz, www.nzila.co.nz

New Zealand Landcare Trust: Shelley Washington, phone 962 9555, or free phone 0508 526 322, P O Box 39-141,Christchurch, shelley.washington@landcare.org.nz, www.landcare.org.nz

New Zealand Plant Conservation Network: info@nzpcn.org.nz, www.nzpcn.org.nz

WEA (Workers Education Association): Phone 366 0285, P O Box 1796, Christchurch, cwea@cyberxpress.co.nz

Waihora Ellesmere Trust (W.E.T): P O Box 116, Lincoln, www.wet.org.nz

For a more detailed list refer to the *Canterbury-Waitaha Ecological Restoration Directory which* can be obtained from NZERN. This publication also has a more extensive list of care groups (e.g. Amberley Coast Care), consultancy firms, community boards, volunteer centres, iwi, rūnanga, marae, bookshops and other relevant contacts.

Native plant nurseries

When buying native plants always check where your plants are sourced from. We recommend using locally sourced or eco-sourced seeds and plants. Introducing a native plant to an area where it does not naturally occur can cause serious problems such as disrupting existing native plant communities, reducing genetic diversity by cross-pollinating with other native species, or even out-competing established native plants. Be aware that some nurseries sell plants as local native species when they are actually not local.

Do check the plants you get are eco-sourced.

Restoration projects

Refer to the NZERN *Canterbury-Waitaha Ecological Restoration Directory* for a detailed list. Check out their website: www.bush.org.nz.

Useful reading

General interest

Attracting Native Wetland Birds Back to Christchurch. Pamphlet available from Christchurch City Council.

Bexley Wetland. Pamphlet available from Christchurch City Council, or see www.ccc.govt.nz/parks

Beyond the Waimakariri: A regional history. D.N Hawkins. (1957).

Biodiversity on Farmland. Booklet produced by a range of organisations for farmers and other land owners to demonstrate how biodiversity can be enhanced to reap multiple benefits. Contact Selwyn Sustainable Agricultural Society Inc., Agriculture New Zealand, Wrightsons, Watties, Ministry for the Environment or Lincoln University.

Caring for the Streams of the Canterbury Plains: A guide to riparian management. Lucas Associates (2001). Pamphlet available from Environment Canterbury.

Catchment Assessment Methodology. How to Assess the health of your local stream. Available from Environment Canterbury.

Christchurch Naturally: discovering the city's wild side. Christchurch City Council. (2000).

Christchurch Naturally: the biodiversity strategy. Christchurch City Council. (July 2004).

Fact Sheets on various natural areas of Christchurch. Christchurch City Council.

From Rain Drops to River Flows. Pamphlet available from Environment Canterbury.

Going Native – Making use of New Zealand plants. Ian Spellerberg and David Given, Canterbury University Press, Christchurch. (2004).

Identifying Native Trees and Shrubs in the McLeans Grasslands. Kate McCombs, Christchurch City Council. (2002).

Lake Ellesmere -Te Waihora. Pamphlet available from Environment Canterbury.

Living Streams. Folder of information available from Environment Canterbury or at www.ecan.govt.nz

McLeans Grassland – a selection of photos of some of the species of McLeans grassland. Kate McCombs, Christchurch City Council. (2002).

New Zealand as Ecosystems. Geoff Park, DOC. (2000).

Pīkao (or Pīngao) Pamphlet available from Otago Regional Council.

Ōtukaikino. Pamphlet available from Department of Conservation.

Restoring Avoca Valley Stream: A community model. Lucas Associates (1998). See the Christchurch City Council.

Riccarton Bush. Edited by Brian Molloy. (1995). Available from public libraries.

Smacks Creek Esplanade Reserve. Reserve proposal. Christchurch City Council.

Streamside Planting Guide C. Meurk, Lucas Associates and Christchurch City Council. Pamphlet or at www.ccc.govt.nz/streamside

The Estuary: Where our rivers meet the sea. Christchurch's Avon-Heathcote Estuary and Brooklands Lagoon. Edited by S. J. Owen, Christchurch City Council. (1992). Available from Christchurch City Council.

The Natural History of Canterbury. Edited by G.A Knox. (1969). Available from public libraries.

The Natural Succession Option. Pamphlet available from Environment Canterbury.

The Styx River Newsletter. Christchurch City Council.

Wrightson Forestry Services. Sustainable Management Plan. (2004).

Choosing plants, planning, planting and maintenance guidance

Establishing shelter in Canterbury with nature conservation in mind. Pamphlet available from Environment Canterbury or the Isaac Centre for Nature Conservation, Lincoln University.

Flammability of Native Plant Species. A guide to reducing fire hazard around your home. Pamphlet available from either your local Fire Service, or Forest Research.

Indigenous Ecosystems of Otautahi Christchurch. Lucas Associates, I. Lynn and C. Meurk (1997). A set of three booklets identifying which native plants occurred naturally in the various suburbs of Christchurch. Available from the Christchurch City Council, council service centres and the public library.

Motukarara Conservation Nursery native garden guides. Also see their plant catalogue list. Motukarara Conservation Nursery. Ph (03) 329 7846, or email motukarara@doc.govt.nz or jsantos@doc.govt.nz

Natural History of New Zealand. N. Bishop. (1992).

Ecological Restoration. NZERN National Office, PO Box 9000, Christchurch. Ph (03) 338 5451, email: office@bush.org.nz or www.bush.org.nz/planterguide.

Native Plants. Y. Cave and V. Paddison. (1999).

Protecting and Restoring our Natural Heritage – a practical guide. M. Davis and C. Meurk (2001). Available from the Department of Conservation.

Streamside Planting Guide. Available from the Christchurch City Council. www.cc.govt.nz/streamside

Weedbusting: A guide to controlling and recognising invasive weeds. Available from the Department of Conservation, Landcare Research NZ Ltd and New Zealand Landcare Trust.

Using Native Plants in Canterbury. Pamphlet available from Environment Canterbury.

Protecting restoration work/special native areas

Conservation Covenants. Pamphlet. Available from Christchurch City Council.

Helping you protect the special nature of your land. The Queen Elizabeth II National Trust. Phone (04) 472 6626. www. nationaltrust.org.nz

Kura Tāwhiti: treasure from afar. Pamphlet produced by the Department of Conservation. (2000).

Protecting Natural Areas. Design Guide. Natural Heritage Fund. (2004).

Tane's Tree Trust. Pamphlet. Contact Forest Research or see www.tanestrees.org.nz

Voluntary Protection of Nature on Private Property. Pamphlet on various options, available from the Department of Conservation.

Funding and support

Environment Enhancement Fund. Pamphlet available from Environment Canterbury.

Envirofunz. See www.envirofunz.org.nz, or phone (04) 449 4090.

The Grant Seeker's Guide to Successful Funding Applications. The Waikato Community Trust (Inc.). See www.trustwaikato.co.nz

Transpower Landcare Trust Grants Programme. (03) 962 9555.

Educational resources

Project Stream Care: An education kit for year seven and eight students. Developed by Kim Morland. Christchurch City Council. (1997).

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Moore, John. 2004. Personal communication.

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I also wish to extend a special thanks to Graham and Janet Carman who initiated and provided sponsorship for my work on this booklet.

Most importantly, I wish to acknowledge the late Katherine Carman whose passion and love of ecology has endowed the project with special meaning and genuine purpose. May this project ensure that Katherine's love and concern for the natural environment will be perpetuated indefinitely.

The writing of this booklet has been an incredible journey. I am deeply moved by the inspirational projects I've witnessed and the equally wonderful people who made them happen.

Together let us nurture our regional treasures and ensure the Canterbury Plains once more embraces a multitude of important native plant communities and is once again filled with the enchanted call of the tui and kereru.

Katie Williams

December 2004

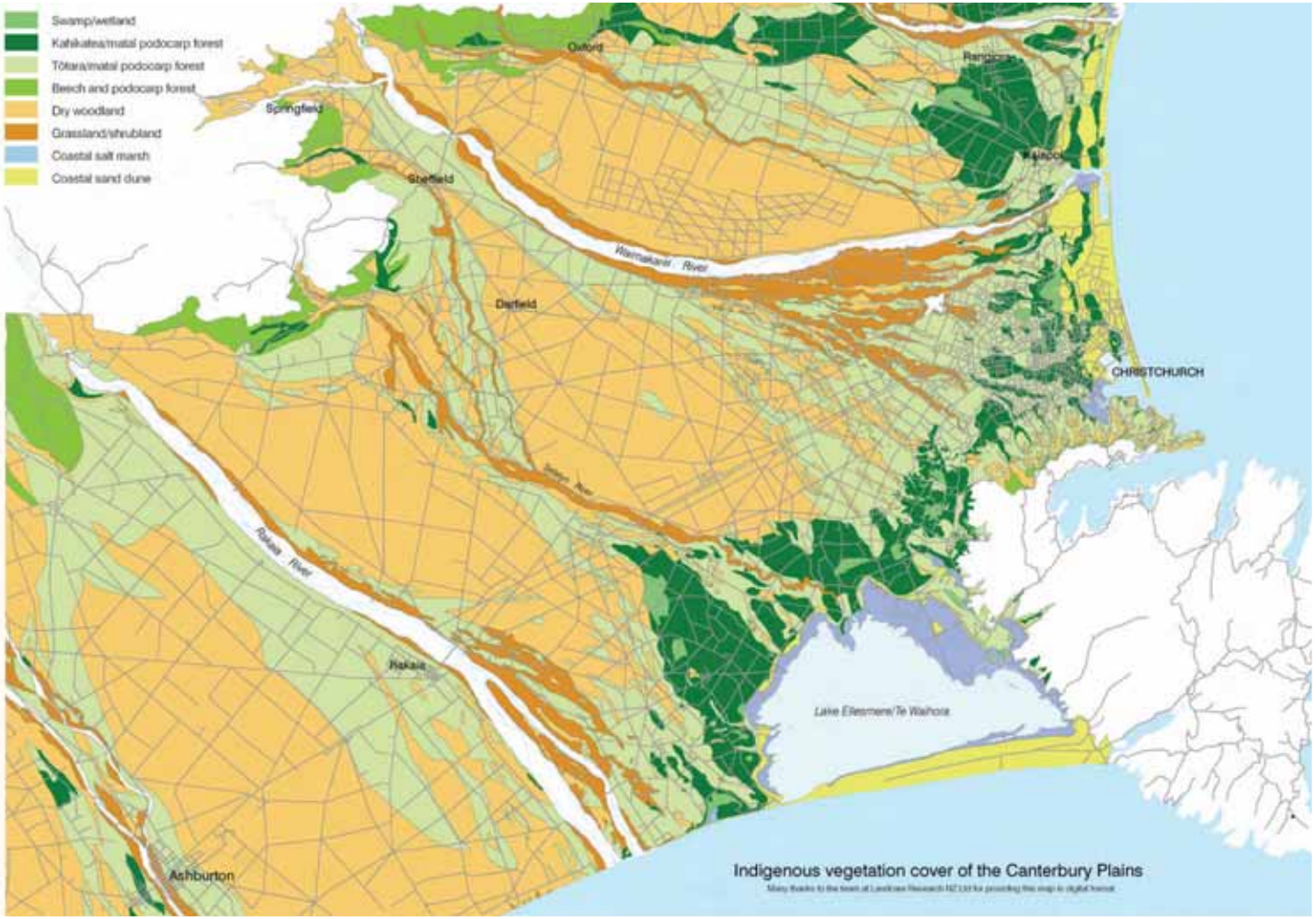
Appendix

Soil types

The geographically restricted soil series are classified into larger (nation-wide) groups with common characteristics of age, leaching, parent material and soil moisture. The old system based on presumed origins (genetic) has recently been superceded by a more modern system (the soil orders and their subdivisions) that better reflects international concepts of soils and their functionality or productivity. The table below provides a comparison of the soil names used in this booklet (left hand column) according to the higher level classification (middle two columns) and their key characteristic (moisture) that affects plant species and growth. The soils are ordered from dry (top) to wet and saline (bottom). Other factors being equal (such as shelter and frostiness), similar species should be able grow on similar soils. For further information refer to *The New Zealand Soil Classification*, DSIR Land Resources Scientific Report No. 19 by A. E. Hewitt (1992).

SOIL SERIES	SOIL GENETIC CLASSES	SOIL ORDER	MOISTURE/SUBSTRATE
Mapping unit	**Old classification**	**New classification**	**(without irrigation)**
Kairaki	Recent	Sandy Raw	very dry sand
Waikuku	Recent	Sandy Brown	dry sand
Selwyn	Recent	Recent-Raw	very dry stony mineral
Taumutu	Yellow Brown Earth	Recent	dry stony mineral
Eyre	Recent	Recent	dry stony mineral
Waimakariri	Recent	Recent	dry mineral
Kaiapoi	Recent	Recent Mottled	summer dry mineral
Paparua	Yellow Grey Earth	Pallic	summer dry mineral
Wakanui	Yellow Grey Earth	Pallic	summer dry mineral
Templeton	Yellow Grey Earth	Pallic	summer dry mineral
Mayfield	Yellow Grey Earth	Pallic	summer dry mineral
Ashley	Yellow Grey Earth	Pallic	summer dry mineral
Lismore	Stony Intergade	Pallic-Brown	summer dry stony mineral
Chertsey	Intergrade	Pallic-Brown	moist mineral

Glenroy	Yellow Brown Earth	Brown	moist mineral
Lyndhurst	Yellow Brown Earth	Brown	moist mineral
Staveley	Yellow Brown Earth	Brown	moist mineral
Gorge	Yellow Brown Earth	Brown	moist mineral
Taitapu	Recent	Gley-Recent	wet mineral
Temuka	Gley	Gley	wet mineral
Waimairi	Gley Recent	Organic	wet peat
Motukarara	Recent	Saline Gley-Recent	wet saline mineral


Swamp/wetland
Kahikatea/matai podocarp forest
Tōtara/matai podocarp forest
Beech and podocarp forest
Dry woodland
Grassland/shrubland
Coastal salt marsh
Coastal sand dune
Oxford
Springfield
Sheffield
Rangiora
Kaiapoi
Waimakariri River
Darfield
CHRISTCHURCH
Selwyn River
Rakaia River
Rakaia
Lake Ellesmere/Te Waihora
Ashburton
Indigenous vegetation cover of the Canterbury Plains