Shelter and nature conservation in Canterbury – a practical guide

Environment Canterbury
Regional Council
Kaunihera Taiao ki Waitaha

Lincoln University • Isaac Centre for Nature Conservation

Everything is connected

What can shelter do?

Shelterbelts are best known for providing protection for livestock, crops and soils from Canterbury's harsh winds. But hedges and shelterbelts are living windbreaks that can also protect and preserve nature, the environment and our cultural history. Well-designed shelter can:

- Help restore the natural variety of plants, animals and habitats which would once have been present in Canterbury.
- Create sanctuaries for beneficial insects and other wildlife.
- Enhance our clean, green image & demonstrate environmental stewardship to discerning markets.
- Provide attractive visual screening.
- Provide carbon sinks.
- Provide linear habitats and corridors for wildlife.
- Support rare plants and our natural treasures or taonga.
- Create mature, interesting and diverse landscapes.
- Encourage regional identity or sense of place.

Integrating nature and production

The indigenous plants and other wildlife that once characterised lowland Canterbury are mostly gone. The hedges and shelterbelts that bound our farmlands are a great practical opportunity to bring native plants back into these highly modified productive landscapes. Traditionally these shelterbelts have been solely exotic species, some of which have become weeds.

Mixtures of both native and exotic species may give optimal benefits of shelter, permeability, low maintenance, wildlife habitat and resistance to drought, frost and snow break.

Native shelter can be aesthetically pleasing, ideal as stock shelter under spray irrigation systems and requires less maintenance once established because of slower growth.

Black matipo/kohuhu and willow shelterbelt on heavy soil

How to create native friendly shelter

1. Protecting remnant plants and habitats

Tiny fragments of natural habitat do survive on the plains. The cheapest and most effective form of nature conservation is to fence out remnant trees, shrubs, streams or wetlands. This protects the vegetation as well as the habitat of their dependent microbes, insects, reptiles and birds – which are irreplaceable in your lifetime.

2. Enriching and enhancing existing plantings

Gorse hedges often have tangles of pohuehue *(Muehlenbeckia complexa)* which provide food for butterflies and birds. Such 'starters' can be further enhanced by plantings of a greater range of fruit and nectar-providing species.

3. Starting from scratch

Unfortunately, we now usually have to start from bare ground or grass – there is so little original vegetation left. You will need to prepare the ground well and incorporate creative design that helps to rebuild something of what used to be there (see the 'how to do it' section). Initially mixtures of indigenous and exotic species may provide the right combination of amenity, resilience and mutual, nursery-like protection.

Together the natural pohuehue hedge (Muehlenbeckia) and cabbage tree standard provide fruit and foliage for native birds, lizards and butterflies.

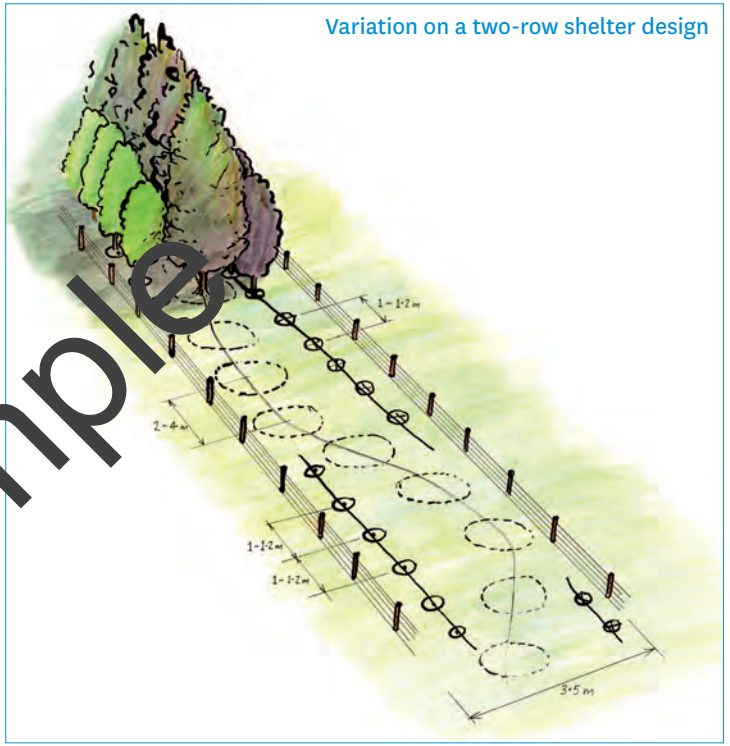
Design ideas

The simplest shelter design is a single row of equally spaced trees. The wider the space available for shelter planting the more variety that you can add. Wider shelter generally provides more wind protection, as well as increasing habitat and diversity for birds and insects, and visual amenity.

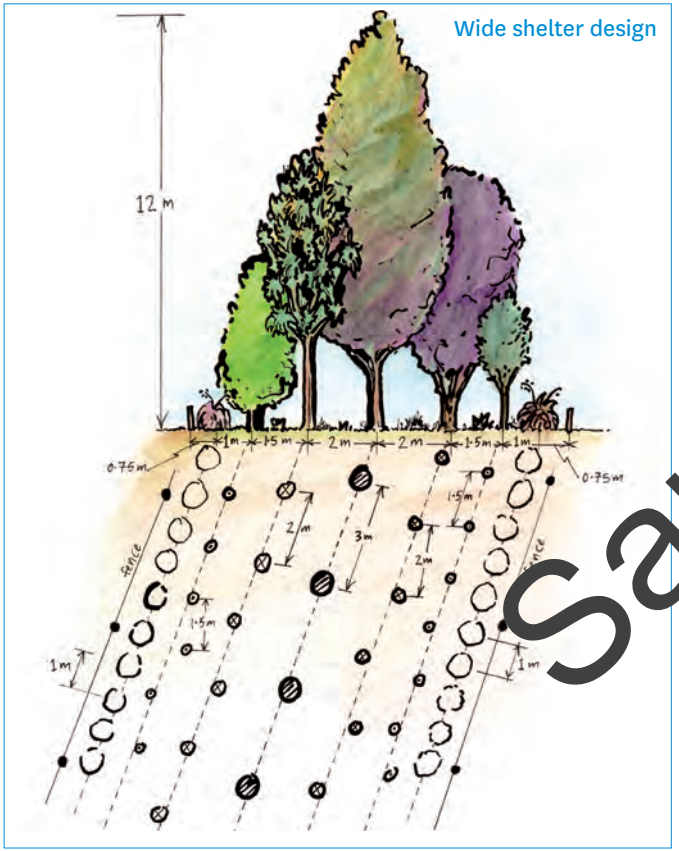
Below are a few ideas for shelter design which you can adapt to your situation. In general, aim for trees spaced 1-2m apart, with between two and seven rows (that will eventually form between two and four tiers in height, with a diverse array of species).

A two-row mixed shelter design; alder with an understorey of mixed native trees. Note: alder may seed into wetlands and along streams.

Variation on a two-row shelter design

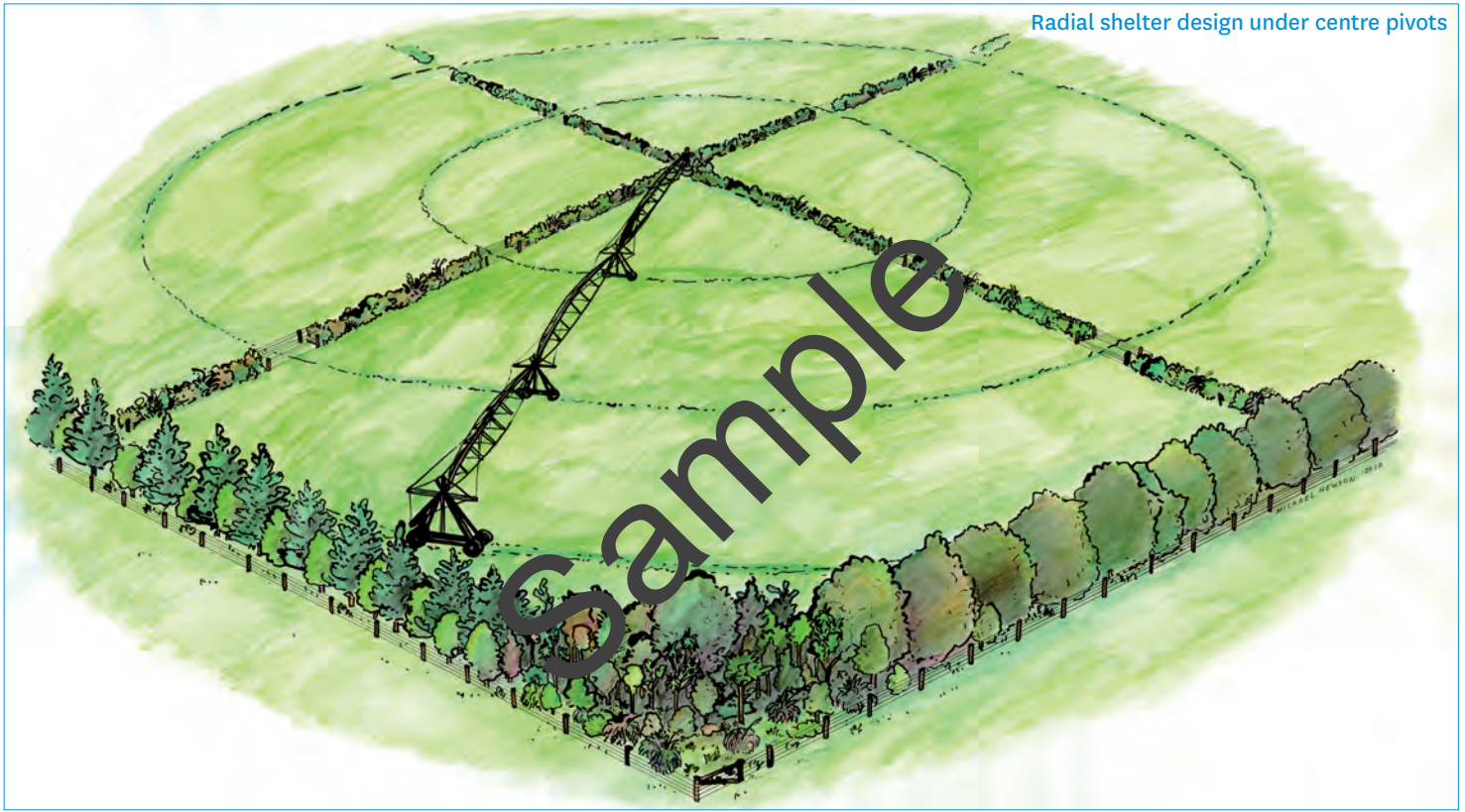


A variation of a two-row shelter design. Choose tall fast growing species as your 'backbone' species (such as lowland ribbonwood or kohuhu). If your shelter runs west-east be sure to choose shade-tolerant species for the southern side.



Once the canopy is partially established, shade-tolerant tussocks, ferns, lilies, and frost-tender trees can be underplanted. Avoid planting in dead straight lines. The same sequence can be used on a narrower, one sided shelter belt or hedge, in a field corner, or as a buffer for remnant bush.
Note: assumes electric outrigger to prevent stock reaching through.

An example of wide native shelter.



Radial hedging under a centre pivot with tall external shelter and bushy patches in dry corners. When selecting species for under centre pivots, choose species which have a mature height of less than 2-3 m (depending on the height of your pivot) and/or tolerate hedging. Low internal hedges provide excellent stock shelter. The tall external shelter is very important for protecting your soils and crops from wind.

How to do it – essential tips for planting and maintenance

1. Planning and design – don't bite off more then you can chew

Spend time considering the type of shelter you need (e.g. tall shelter for protection from nor'westers, dense low shelter to protect stock against winter southerlies), the width you have available for planting, opportunities for wider blocks in corners or along streams, and constraints (e.g. shading, height, stoniness, exposure, frostiness, etc.).

The most important thing is to start small, and learn from successes and mistakes before a major investment is risked. Or use a contractor who can show you his work. Once you have that experience then you can become more ambitious. It is demoralising to begin with grandiose plans and have first up losses because of frost, drought, stock, pests, grass competition, weed whackers or spray drift. The Canterbury Plains can be an unforgiving environment!

Your local native plant nursery should be able to give you a quote for plant costs based on certain length and width of planting area, but should advise density at 1 m spacing for shrubs, 1.5 m for NZ flax and small trees and 3-5 m for large trees like totara (from each other, as opposed to from nearest small tree).

Increasingly, native planting is using locally sourced species which are propagated from the nearest natural gene pool. This ensures that wild populations are not contaminated by, say, North Island forms or cultivars and thereby interfere with the natural stories in the plants. This is especially important with lace bark, kowhai and kohuhu. Another common trap is to get golden cultivars of totara which are sterile hybrids that will never produce any fruit for wildlife or maintenance of the population. Ask your nursery where they get their seeds from before you place your order.

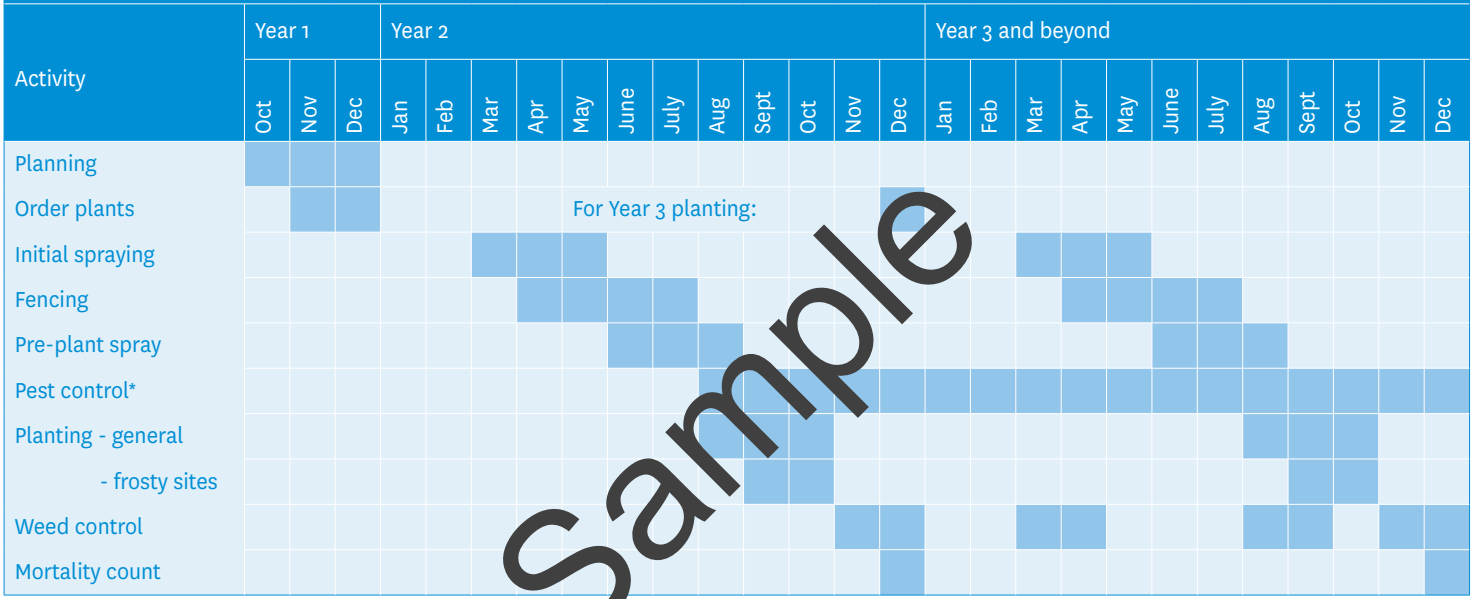
But don't just consider money when planning. Successful planting also takes time. **As a rule of thumb, for every 100 plants allow a half-day for preparation, half a day to plant, and two hours every three months for the first two years for maintenance.** The calendar of activities gives a guide to when, during the year, you will need to commit time to planting and maintenance.

Using mulch or plant-guards increases the initial planting costs, but can greatly reduce time needed for ongoing maintenance, and the cost involved with replacing dead plants.

There are also several business that offer contract planting and maintenance services. If you are concerned you may not have time to plant in the spring and/or do ongoing maintenance, using a contractor may give you the peace of mind that the money you have spent on plants will not go to waste.

Environment Canterbury's website provides an up-to-date list of nurseries and planting contractors at www.ecan.govt.nz/nurseries.

Calendar of activities (designed for spring plantings. On some sites it may be possible to plant frost-tolerant plants in the autumn).



** Before planting assess the numbers of rabbits and hares present. If necessary, undertake pre-planting pest control and do this regularly especially the moment any sign of browsing is seen. Delay could mean loss of an entire season's growth over night (see section 6 on maintenance).*

2. Get the right plants for the right place

All plants have their preferences for best growth. Are you planting on top of a dry ridge? Or in a wet gully? What is your soil type? Are you near the coast? Or on a frosty inland site? Are there other native plantings that are doing well, or not, in your area? Do you have any neighbours or local experts who might give you advice?

Once you know the conditions you are planting in, then you can use local knowledge and the species table in the back of this booklet to choose the most suitable species for your site. Initially mixes of indigenous and safe exotic species (for nursery shelter or nitrogen) may provide a good combination of attributes for site establishment. The immediate aim is to get dense shrubby growth established, that suppresses grass growth, as fast as possible.

3. Growing plants takes time

Ordering your plants early will ensure that you get th species and number of plants you need. Use healthy plants grown by good nurseries; don't accept pot-bound stock. We recommend the use of local species and provenances: specify from your nursery plants that have been propagated from local sources. Look on Environment Canterbury's website for an up-to-date list of native plant nurseries.

Reliable, hardy performers: this is a list of species that will grow well planted in open grass in a wide range of areas (excludes extreme inland, frosty & coastal environments). You might like to use these as your 'backbone' species, adding other more sensitive species once these are providing some shelter.

Lowland ribbonwood – *Plagianthis regi*

Kohuhu – *Pittosporum tenuifolium*

Broadleaf – *Griselinia litto*

Cabbage tree – *Cordyli austra is*

Golden akeake – *Olear pan ulata*

Narrow-leav lace ark – *Hoheria angustifolia*

NZ Flax – *Phorm m tenax*

Kowhai – *Sop ra microphylla*

ki – *Coprosma propinqua*

Karam – *Coprosma robusta*

Koromiko – *Hebe salicifolia*

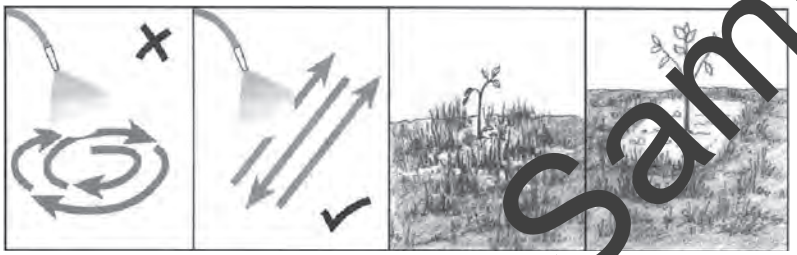
Shrub pohuehue – *Muehlenbeckia astonii*

Scrambling pohuehue – *Muehlenbeckia complexa*

Broadleaf in PB5 (planter bag 5). Discuss with your nursery the appropriate plant size/grade for your needs. It is a balance between plant and maintenance costs.

4. Preparing the site

- Control any existing shrubby weeds (e.g. gorse, blackberry) before you begin your planting programme.
- Fence the area to keep out all stock.
- Spray a 1 metre square of glyphosate for each plant (see diagram), 2-3 months before planting and then again 3-4 weeks before planting. Spray healthy weeds on a dry, calm, frost free day. Hand grubbing of planting spots is an alternative to spraying.
- If rabbits, hares or other pests are known to be a problem at the site, undertake control prior to planting and consider using a pest repellent when planting.



Circle pattern poor result

Side to side - better control

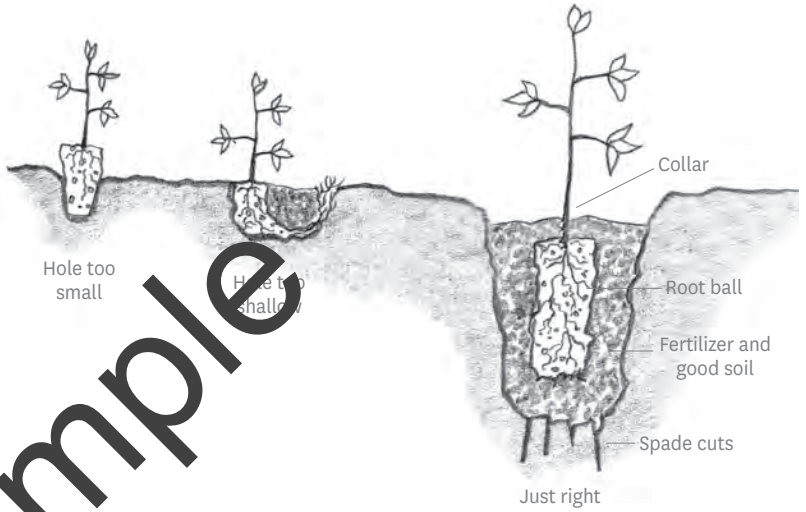
Mulch and protection on light soil with hare/rabbit risk.

5. Planting

- Don't leave plants out in direct sunlight before planting. Soak plant roots in a bucket or stream before planting.
- Dig a hole twice the size of the plant container and loosen the soil at the bottom. Keep all the soil together in a pile beside the hole.
- Keep as much soil as possible intact around the roots as you remove the plant from the pot. Be careful not to damage stem or bark.
- Cut off tangled and matted roots.
- Set the plant into worked soil at the bottom of the hole so the base of the stem is at the correct depth (as shown in diagram).
- Gradually pack crumbled soil around the root ball and gently firm to avoid air pockets. Use moist loamy soil from the pile first and stones can be used as mulch.
- Have at least 30mm of soil covering the potting mix.
- Apply mulch or plant guards around each plant.
- Watering soon after planting, if practical, is beneficial.
- Apply pest repellent if required; slow release fertiliser and water crystals may also be useful to help plants establish.

If you are inter- or under-planting an existing shelterbelt:

- *You may need to thin existing trees, or plant in gaps.*
- *Plant as far away from the trunk of existing trees as possible*
- *Dig out competing roots over at least a 50cm diameter before planting.*



It is crucial to plant well as plants have to fend for themselves more than in a home garden. Don't cram plants into holes too small. Make sure there is soil over the potting mix. Firm soil around plant as you refill the hole. Especially in dry situations, after planting and repacking soil, there should be a hollow around the stem so that any rain or watering preferentially flows to your tree while its roots are establishing.

6. Protecting your investment – weed and pest control

- Once the plants are in the ground you CAN'T just walk away.
- Don't let dense grass grow around young plants as grass competes for moisture and light. Keep them weeded or apply mulch or weed mats.
- Plants should still be clearly visible amongst any weed growth when you go back to do each maintenance round. Use this as a guide as to how often you should be weeding.
- A tiny amount of spray drift can destroy many hours worth of planting effort very quickly. Only spray grass around native plants if you really know what you are doing, and be careful. Use a spray guard with a contact-only or grass-specific herbicide.
- Regularly check your plants for any sign of pest damage. Re-apply pest repellent or undertake pest control as soon as you see any pest signs. Zero tolerance is required; a single bunny can wipe out a season's growth overnight.
- If practical, irrigation during the driest months will help the plants establish.
- If you are having trouble keeping up with maintenance, consider hiring a planting contractor to help you out and protect the time and money you have already spent on purchasing and planting.

There is a variety of mulch squares and plant guard sleeves available, which help reduce weed growth and protect plants from browsing and sprays. Although an added cost up front they can reduce the amount of maintenance required and greatly increase plant survival and growth rates.

The difference in soil colour shown here is due to moisture retained in the soil. The darker, moisture rich soil is under grass which has been sprayed off. The lighter soil has been dried out by the short grass growing on it. Allowing grass and other weeds to grow around your plants greatly increases competition for moisture, slowing growth and decreasing survival rates.

Appendix: Indigenous species for hedgerows and shelterbelts in Canterbury.

The species in **bold** are the hardiest and most vigorous for immediate results in their suitable zones. Others may be gradually introduced once some shelter and structure has been established. The green species are rare or threatened species, and inclusion of these is encouraged where appropriate.

Suitable zones:
Are the regions where the species are most likely to prosper, not the only places they will grow.

Mature height:
The height expected in ideal conditions for Canterbury. In dry environments the species may never reach this height.

Hedging tolerant:
Will tolerate trimming to form a hedge or under a centre pivot.

Light browsing tolerant:
Tolerant of some browsing once established.

Frost tolerant:
Young plants will tolerate frosts during establishmen

Drought tolerant:
Tolerant of drought and dry soils.

Needs full su :
Does not tolera shade; needs full sunlight or at least only partial shade.

Coastal tolerant:
Tolerant of salt spray and coastal exposure.

Needs initial shelter:
Needs some shelter from strong drying wind and frost; interplant for diversity and wildlife.

Wildlife value:
Indicates the production of fruits or nectar for birds and lizards. Most dry fruits are nevertheless associated with flowers that are visited by insects for pollen or nectar.

Formal plant name	Common name	Suitable zone				Mature height	Growth form	Hedging tolerant	Light browsing tolerant	Frost tolerant	Drought tolerant	Needs full sun	Coastal tolerant	Needs initial shelter	Wildlife value
		Banks Pen. & coastal hills	Inland foothills	Plains	High country										
Aristotelia fruticosa	**Mountain wineberry**					2m	Dense shrub								Berries
Aristotelia serrata	**Wineberry, makomako**					7m	Deciduous tree								Berries
Carmichaelia australis	NZ broom					2m	Open shrub								Nectar
Carmichaelia torulosa	Canterbury broom					3m	Open shrub								Nectar
Carpodetus serratus	Marbleleaf, putaputaweta					7m	Medium tree								Nectar/berries
Clematis foetida	Clematis						Vine								Nectar
Clematis marata agg.	Clematis					-	Vine								Nectar
Coprosmas acerosa	**Sand coprosma**					1m	Dense shrub								Blue berries
Coprosma crassifolia	**Mikimiki**					3m	Dense shrub								Berries
Coprosma intertexta	**Mikimiki**					2m	Open shrub								Blue berries
Coprosma linariifolia	Yellow wood					6m	Small tree								Berries
Coprosma lucida	Shining karamu					5m	Small tree								Berries
Coprosma pedicellata	Mikimiki					5m	Dense shrub								Berries
Coprosma propinqua	**Mikimiki**					4m	Dense shrub								Blue berries
Coprosma rigida	**Mikimiki**					3m	Dense shrub								Berries
Coprosmas robusta	**Karamu**					5m	Small tree								Berries
Coprosma rugosa	Karamu					3m	Dense shrub								Berries
Coprosma rubra	Mikimiki					4m	Open shrub								Berries

Formal plant name	Common name	Suitable zone				Mature height	Growth form	Hedging tolerant	Light browsing tolerant	Frost tolerant	Drought tolerant	Needs full sun	Coastal tolerant	Needs initial shelter	Wildlife value
		Banks Pen. & coastal hills	Inland foothills	Plains	High country										
Coprosma tayloriae	Mikimiki					3m	Dense shrub								Berries
Coprosma virescens	**Green mikimiki**					3m	Dense shrub								Berries
Coprosma wallii	Mikimiki					2m	Dense shrub								Berries
Cordyline australis	**Cabbage tree, ti kouka**					[illegible]	[illegible]								White berries
Corokia cotoneaster	**Korokio**					2m	Dense shrub								Berries
Dacrycarpus dacrydioides	Kahikatea					[illegible]m	Tall tree								Berries
Discaria toumatou	Matagouri					5m	Open small tree								Nectar/pollen
Dodonaea viscosa	**Akeake (green form)**					8m	Tree								Dry
Elaeocarpus hookerianus	Pokaka					12m	Tall tree								Berries
Griselinia littoralis	**Broadleaf, papumu**					10m	Tree								Berries
Hebe salicifolia	**Koromiko**					3m	Dense shrub								Nectar
Hebe strictissima	Banks Peninsula Korimiko					2m	Dense shrub								Nectar
Helichrysum lanceolatum	Niniao					2m	Open shrub								Nectar
Hoheria angustifolia	**Narrow-leaved lacebark**					10m	Tree								Nectar
Kunzea ericoides	**Kanuka**					12m	Tree								Nectar
Leptospermum scoparium	Manuka (subject to blight)					5m	Small tree								Nectar
Lophomyrtus obcordata	Rohutu					5m	Small tree								Berries
Melicytus ramiflorus	Mahoe					7m	Tree								Blue berries
Metrosideros umbellata	Southern rata					12m	Tree								Nectar

Formal plant name	Common name	Suitable zone				Mature height	Growth form	Hedging tolerant	Light browsing tolerant	Frost tolerant	Drought tolerant	Needs full sun	Coastal tolerant	Needs initial shelter	Wildlife value
		Banks Pen. & coastal hills	Inland foothills	Plains	High country										
Muehlenbeckia astonii	Shrub pohuehue	■	■	■		3m	Dense deciduous shrub	■	■	■	■	■	■		White berries
Muehlenbeckia complexa	**Scrambling pohuehue**	■	■	■	■	3m	Vine	■	■	■	■	■	■		White berries
Myoporum laetum	**Ngaio***	■		■		7m	Small tree	■	■		■	■	■		Berries
Myrsine australis	Mapau	■	■			5m	Small tree	■	■				■	■	Purple berries
Myrsine divaricata	weeping mapau	■	■	■	■	4m	Dense shrub	■	■	■	■	■		■	Blue berries
Nothofagus fusca	Red beech	■	■	■		25m	Tall tree	■	■	■		■		■	Dry
Nothofagus solandri	Black/mountain beech	■	■	■	■	18m	Tall tree	■	■	■		■		■	Honey dew
Olearia adenocarpa	Plains shrub daisy			■	■	3m	Open shrub	■		■	■	■			Nectar
Olearia avicenniifolia	mangrove leaved olearia			■	■	4m	Leafy shrub	■	■	■	■	■			Nectar
Olearia bullata	Shrub daisy			■	■	2m	Open shrub	■		■	■	■			Nectar
Olearia "dartonii"	**Shrub daisy****			■		5m	Small tree	■	■	■	■	■			Nectar
Olearia fragrantissima	Scented tree daisy	■	■	■		4m	Small deciduous tree	■	■	■	■	■			Nectar
Olearia hectori	Shrub daisy**				■	4m	Open deciduous shrub	■		■	■	■			Nectar
Olearia lineata	Shrub daisy		■	■	■	4m	Open shrub	■		■	■	■			Nectar
Olearia paniculata	**Golden akeake**	■	■	■		6m	Small tree	■	■	■	■	■	■		Nectar
Olearia solandri	Coastal shrub daisy**	■		■		3m	Dense shrub	■	■	■	■	■	■		Nectar
Olearia traversii	Chatham Island akeake**	■		■		6m	Small tree	■	■	■	■	■	■		Nectar
Ozothamnus leptophyllus	**Tauhinu (yellow form)**			■	■	2m	Dense shrub	■	■	■	■	■	■		Nectar

*may be poisonous to stock

** not local

Formal plant name	Common name	Suitable zone														
		Banks Pen. & coastal hills	Inland foothills	Plains	High country	Mature height	Growth form	Hedging tolerant	Light browsing tolerant	Frost tolerant	Drought tolerant	Needs full sun	Coastal tolerant	Needs initial shelter	Wildlife value
Parsonsia spp.	NZ jasmine	■	■	■	■	-	Vine	■	■	■	■	■	■	■	Nectar
Pennantia corymbosa	Kaikomako	■	■	■		10m	Tree		■					■	Berries
Pittosporum crassicaule	-				■	3m	Open shrub	■	■	■	■	■			Nectar
Pittosporum divaricatum	-				■	3m	Open shrub	■	■	■	■	■			Nectar
Pittosporum eugenioides	**Lemonwood, tarata**	■	■	■		12m	Tree	■	■					■	Resin
Pittosporum patulum	-					3m	Open shrub	■	■	■	■	■			Nectar
Pittosporum tenuifolium	**Kohuhu, black matipo**	■	■	■		10m	Tree	■	■	■	■		■		Resin
Plagianthus divaricatus	**Marsh ribbonwood**	■	■	■		3m	Dense shrub	■	■	■	■	■	■		Dry
Plagianthus regius	**Lowland ribbonwood, manatu**	■	■	■		15m	Deciduous tree			■	■	■	■		Dry
Podocarpus totara/hallii	**Totara/mountain totara**	■	■	■	■	20m	Tall tree	■	■	■	■			■	Berries
Pomaderris phylicifolia	-	■	■	■		1m	Small shrub	■	■	■	■	■			Dry
Pseudopanax arboreus	Five-finger, whauwhaupaku	■	■			7m	Small tree						■	■	Purple berries
Pseudopanax crassifolius	Lancewood, horoeka	■	■	■		12m	Tree			■	■			■	Berries
Pseudopanax ferox	Fierce lancewood	■	■	■		5m	Small tree			■	■	■			Berries
Rubus cissoides	Bush lawyer, tataramoa	■	■	■		-	Vine	■	■	■	■			■	Berries
Rubus schmidelioides	Bush lawyer, tataramoa	■	■	■	■	-	Vine	■	■	■	■				Berries
Solanum laciniatum	**Poroporo (short-lived nursery sp.)**	■	■	■		4m	Small tree*	■	■		■	■	■		Berries*

**may be poisonous to stock*

Formal plant name	Common name	Suitable zone				Mature height	Growth form	Hedging tolerant	Light browsing tolerant	Frost tolerant	Drought tolerant	Needs full sun	Coastal tolerant	Needs initial shelter	Wildlife value
		Banks Pen. & coastal hills	Inland foothills	Plains	High country										
Sophora microphylla	**Kowhai**					10m	Deciduous tree								Nectar
Sophora prostrata	Prostrata kowhai					2m	Dense shrub								Nectar
Tecuridium parvifolium	NZ verbena shrub					2m	Open shrub								Nectar
Tussocks and ferns															
Anemanthele lessoniana	Wind grass					1m	Medium tussock								Grain
Astelia fragrans	Bush lily, kakaha					1m	Tall tussock								Berries
Carex comans	Sedge tussock					0.5m	Short tussock sedge								Grain
Chionochloa rigida/rubra	Snowgrass/red tussock					1.2m	Tall tussock								Grain
Cortaderia richardii	**Toetoe**					2m	Tall tussock								Grain
Phormium tenax	**NZ flax, harakeke**					3m	Tall tussock								Nectar
Poa cita	Silver tussock					0.7m	Short tussock								Grain
Polystichum richardii	Shield fern					0.5m	Tussock fern								Dry
Pteridium esculentum	Bracken fern					1.5m	Open fern								Dry

*may be poisonous to stock

Save the roadside and streambank remnants first

An ounce of protection is worth a ton of restoration. These remnants are the models and seed sources for recovery; they are micro-ecosystems complete with their soils, microbes and native soil fauna. We can't afford to lose them.

*A locally rare small-leaved coprosma (*C. intertexta*), mid Canterbury*

Some of the last silver tussocks on the Plains, SH1 south of Chertsey

These kanuka remnants at Maronan make fine natural shelter

Environment Canterbury's website provides an up-to-date list of nurseries, planting contractors and other sources of information about shelter, native plants and biodiversity.

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Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Everything is connected

Promoting quality of life through balanced resource management

www.ecan.govt.nz

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Produced with assistance from:

Environment Canterbury
58 Kilmore Street
PO Box 345
Christchurch 8013
P: 03 365 3828
F: 03 365 3194

Isaac Centre for Nature Conservation
PO Box 84
Lincoln University
P: 03 325 2811 ext. 8730
F: 03 325 3841