



Part 3: Planting and maintenance



LIVING STREAMS Handbook



Living Streams

Community involvement in improving the health of Canterbury waterways

What is Living Streams?

Living Streams is an Environment Canterbury programme designed to improve practices that have an impact on water quality and maintain the health of waterways.

The programme is based on building working partnerships with the community and involves identifying issues, collating local knowledge and developing practical steps to improve the health of our waterways.

Through the programme, individuals and groups are eligible for help and support to restore their streams, including:

- ▶ An assessment of the current stream health
- ▶ Advice on actions and plans to improve stream health
- ▶ Advice on funding and assistance with resource consents if necessary
- ▶ Encouragement and facilitation of wider community involvement in projects.

Although not everyone can be part of the formal Living Streams programme, Environment Canterbury's Resource Care staff will assist landowners with any projects relating to sustainable land and stream management.

This handbook was created as part of the Living Streams programme to help you to restore the streams you care about. The practical tips listed are from people experienced in stream restoration, such as landscape architects, nursery owners and community group leaders. As with all the best advice, it has been gained through practical experience.

The team at Environment Canterbury wish you the best of success for your project.

Stream definition: In this handbook we have included all of the smaller waterways under the term 'stream'. This includes farm drains.



LIVING STREAMS Handbook

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The following sections are supplied separately and available from Environment Canterbury:

Part 1: Investigations and planning

Part 2: Improving the stream environment



“Start off with a small patch so you can handle the maintenance”

Case study: Lessons learned over forty years

ANTHONY HOLCROFT (LEFT) HAS LEARNT A THING OR TWO ABOUT streamside planting. For the last 40 years, he has been restoring a section of the Cam River that runs along his property boundary. His other project is the restoration of a wetland and stream on a property in the Oxford foothills.

Anthony wanted the bush to look like it had grown there originally, rather than been planted. Similar to a stand of riverside kahikatea he remembered from his childhood which formed a canopy above a dense understory of Coprosma. He began his project 40 years ago and has learnt some tough lessons along the way.

“Start off with a small patch so you can handle the maintenance,” says Anthony. “It is best to use plants grown from locally sourced seed; these are best suited to the local environment and most likely to survive.”

Anthony sources plants from a local nursery and also grows his own from seed collected on or near the property, making sure the plants he sources have good stock (are not root bound). After fencing stock out, Anthony planted hardy natives such as flax, cabbage tree and toitoi. Sedges (such as *Carex secta*) were planted close to the stream edge.

Some exotics, like pampas and willow, were left initially to give shelter to other plants. Later, when his initial plantings were established, he went back and planted species that require more shelter, such as kahikatea and kowhai.

“Avoid planting flax on flood-prone banks,” says Anthony. “Flax can get pulled out along with parts of the bank during flooding and is better planted on the upper banks. Instead plant sedges, such as *Carex secta*, which bounce back after flooding. I find it best to plant riverside sedges later in the season in Oxford – October or November, to avoid flash floods in that can occur in spring.”

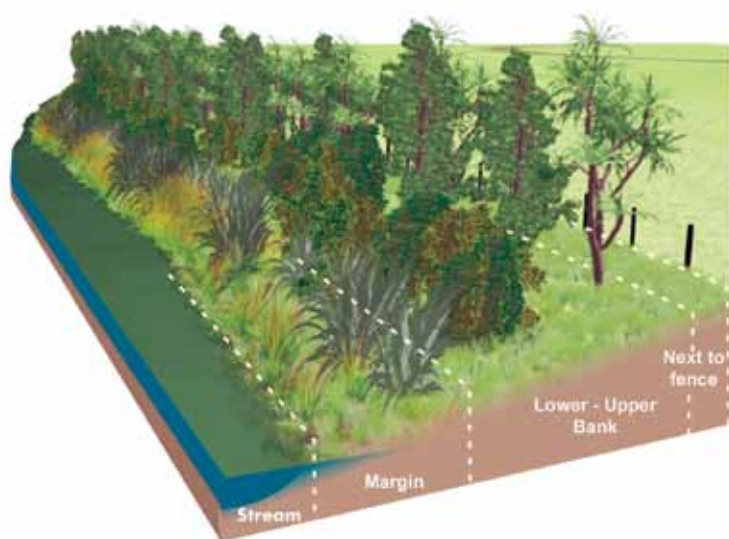
Choosing the right plants for the site

This section will help you to save time and money by choosing the right plants for the right site. Plants in the wrong site will grow poorly, are likely to die, or may contribute to the risk of flooding.

The focus of the section is on plants for bare sites. Depending on your goals for the project, you may wish to come back and plant other species once the initial plants are established and there is more shelter. This will increase the biodiversity.

How to use this section

1. Use the guide on page 6 to help you distinguish the different zones in the riparian margin. Zones determine what can be planted where.
2. Refer to the guide on page 10 for a list of hardy plants and advice on where to plant them.
3. Refer to page 12 for tips on where to source your plants.
4. Refer to page 13 for tips on how to work out how many plants you will need for your project.



Only plant what you have the time to maintain:

If you are planning on planting a section of your stream – congratulations you have made a great decision!

Before you start, however, think about how much maintenance you can manage each year. If you plan to plant 1000 plants, that's 1000 plants you will have to keep clear of weeds for at least three years.

Once the plantings are at the point where they do not require much maintenance the project can be extended further along the stream.

Nature knows best:

If there are existing native plants on the riparian margin of your stream it is usually best to leave them, regardless of whether they fit with the suggested planting zones in this book.

The 'zones' to be planted

Look at the land beside your stream. Can you divide it up into 'zones', as described below? If you can, the table on page 11 will help you choose plants for each zone.

- ▶ **Margin:** this zone includes frequently submerged stream banks and wetlands next to the waterway. In the margin zone avoid trees or shrubs that will grow and form a closed canopy. This will shade out undergrowth and therefore reduce the zone's ability to filter runoff.
- ▶ **Lower bank:** This zone is less frequently submerged but is subject to regular (at least once a year) flood flows.
- ▶ **Upper bank:** This zone is above all but the largest flood flows.
- ▶ **Wetlands:** Temporarily or permanently wet areas that support plants tolerant of these conditions. May occur on the margin of a waterway or elsewhere in the riparian zone where topography and drainage results in a high water table.

U-shaped stream planting zones



- A** Margin
- B** Lower bank
- C** Upper bank

V-shaped stream planting zones



- A** Margin
- B** Lower bank
- C** Upper bank

Lowland plains stream planting zones



- A** Margin
- B** Lower bank
- C** Upper bank

Inland basin stream planting zones



- A** Margin
- B** Lower bank
- C** Upper bank
- D** Wetland

Hardy plant guide

The Hardy Four

The Hardy Four are hardy plants that require less maintenance than others if you:

- ▶ Carry out effective weed control prior to planting (refer to page 13)
- ▶ Have good root stock and plants 30cm tall or bigger (refer to page 12)
- ▶ Plant them properly (see page 16).

Harakeke, NZ Flax, *Phormium tenax*

- ▶ Flax can grow pretty much anywhere, but are best planted above frequent flood levels as they resist flood waters and can be torn out of the bank.
- ▶ Flax grow big – do not plant within 2m of a fence or 2m of a small stream. They may close over a small stream, reducing how much water it can carry.



Flax that is planted too close to stream breaking off during a flood.

Toitoi, *Cortaderia richardii*

- ▶ Plant on the lower or upper banks.
- ▶ Native toitoi is often confused with introduced pampas grass, which is a troublesome weed in many places.



Ti kouka, Cabbage tree, *Cordyline australis*

- ▶ Cabbage trees are extremely good at getting established, even in open pasture. They can develop substantial root spread and root depth giving them good soil holding ability
- ▶ Plant on the lower or upper banks
- ▶ Grow to 20m tall/ width 3m (at crown)
- ▶ Can be planted within 1.5m of the fence as they grow straight up, rather than out sideways.



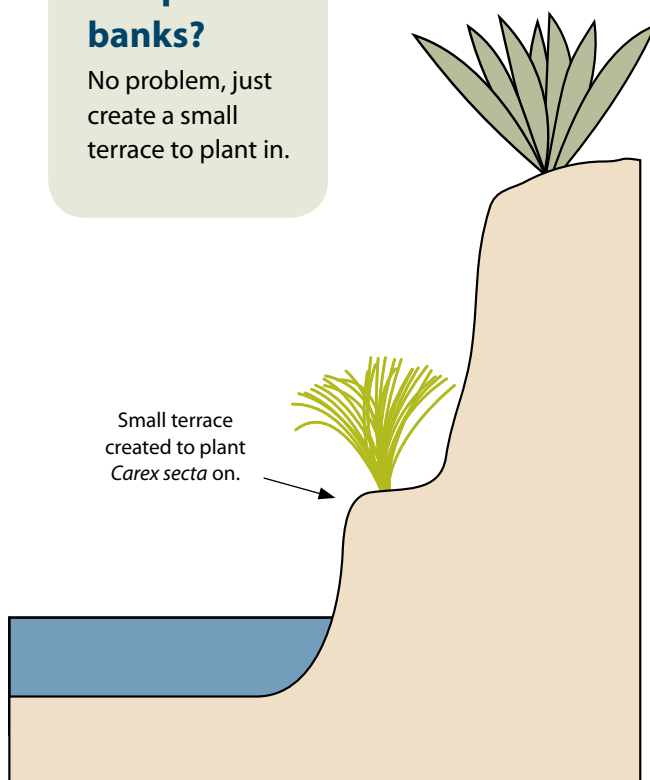
Pukio, Tussock-sedge, *Carex secta*

- ▶ *Carex* can be planted right up to the water's edge; they can handle getting their feet wet and will bounce back after flooding.
- ▶ *Carex* planted so they overhang the stream will provide cover for fish and hinder waterweeds.



Steep banks?

No problem, just create a small terrace to plant in.



Hardy plant table

The following pages provide a list of hardy species best suited to initial riparian plantings on open, exposed sites in Canterbury. Most are readily available from local native plant nurseries, although a few will be found only at specialist nurseries.

Plant table key

PLANTING CONDITIONS:

Planting region






















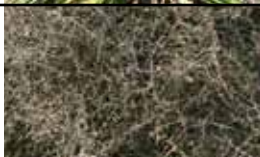




















- 1** Lowland plains
- 2** Coastal hill country
- 3** Inland hill and high country
- 4** Inland basins
- 5** Coastal

Planting zones

































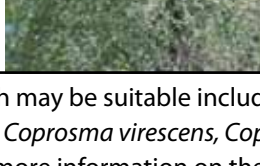



- A** Margin
- B** Lower bank
- C** Upper bank
- D** Wetland

Tolerance

- ☃ Light frost
- ☃☃ Heavy frosts
- ☼☼ Dry soils
- ☼ Boggy soils
- C** Flood currents
- P** Periodic flooding
- ▲ Under centre pivot

		Planting conditions		Tolerance of				
		Planting region	Planting zones	Frost	Dry soils	Boggy soils	Flooding	Under centre pivot
↑ Tussocks & Sedges		1 2 4 5	A				C P	
Carex <i>Carex secta</i>								
		2 3 4	A B D				C P	
Red tussock <i>Chionochloa rubra</i>								
↑ Shrubs, toitoi & flax		1 2 4 5	B C					
Toitoi * <i>Cortaderia richardii</i>								
		1 2 4 5	B C D				P	
Flax; Harakeke * <i>Phormium tenax</i>								
		1 2 4 5	B C				C P	
Mountain flax <i>Phormium cookianum</i>								
		1 2 4 5	B C D				P	
Mingimingi <i>Coprosma propinqua</i>								
		3 4	B C D				P	
Shrub daisy <i>Olearia bullata</i>								
		2 3	B C				P	
Fragrant shrub daisy <i>Olearia odorata</i>								
↑ Small trees		1 2 4 5	C					
Koromiko <i>Hebe salicifolia</i>								
		2 3 4	B C D				P	
Small leaved tree daisy <i>Olearia lineata</i>								

* Although these plants will grow on the lower bank, in small streams it is best to plant them on the upper bank to prevent them blocking the stream and flood flows.

		Planting conditions		Tolerance of				
		Planting region	Planting zones	Frost	Dry soils	Boggy soils	Flooding	Under centre pivot
Karamu <i>Coprosma robusta</i>		1 3 5	C					
Cabbage tree <i>Cordyline australis</i>		1 2 4 5	B D	 				
Manuka <i>Leptospermum scorparium</i>		1 2 4 5	B C D	 				
Ngaio <i>Myoporum laetum</i>		5	C	very frost tender				
Kohuhu <i>Pittosporum tenuifolium</i>		1 2 4 5	C	 				
Kanuka <i>Kunzea ericoides</i>		1 2 4 5	C	 				
Large trees								
Lemonwood <i>Pittosporum eugenioides</i>		1 2 5	C					
Lowland ribbonwood <i>Plagianthus regius</i>		1 2	C	 				
Narrow-leaved lacebark <i>Hoheria angustifolia</i>		1 2	C	 				

Other plants which may be suitable include: *Muehlenbeckia astonii*, *Sophora microphylla*, *Sophora prostrata*, *Coprosma virescens*, *Coprosma crassifolia*, *Grisilinia littoralis* and *Carex virgata*. For more information on these, including where they grow best, contact your local native plant nursery.

Attracting birds

The top four native plants for tūī and bellbirds are fuchsia, flax, five finger, and kōwhai (see *Appendix, Reference 3*).

NZERN PlanterGuide

The NZERN website, www.bush.org.nz, has a tool in its 'toolbox' for working out what species naturally occur in the different regions based on the soil type.

Exotics

In general, species such as eucalyptus, poplars, tree willows and most conifers should not be planted within 5 to 10 metres of small, spring fed streams. This is because they grow large and take large quantities of water which can reduce stream flows.

Refer to *Getting Stock out of the Stream booklet*, page 6, for tips on removal of willows.

Choosing locally sourced plants

Think local

Plants that are grown from seeds collected from original vegetation in an area and planted in the same region are called eco-sourced plants.

These eco-sourced plants are well adapted for the climate and soils of your area; they're more likely to survive than outside plant stock, making a more sound investment.

It's often not possible to buy eco-sourced plants 'off the shelf'; especially from garden centres and retail nurseries, so you may need to plan well ahead. However, there are a number of specialist native nurseries that do supply eco-sourced plants.

It is worth considering entering into a contract with a specialist native nursery to supply all the plants for the duration of your project. While this takes planning, it often reduces the unit cost per plant. You can either supply the nursery with the seeds of the plants you want, or often the nursery can handle the seed collection aspect as well.

Whatever plant sourcing method you use, you will need 12-18 months lead time before your plants are ready to plant.

Think tough

Hardening off is where plants are left outside for a while to toughen up before they are planted. If plants are not hardened off, the shock of the conditions of your site may kill some. Ask your nursery their plants are hardened off

Think quality

Good root structure is critical; avoid root-bound plants – they may die, or just sit in the ground for a year before they start growing, giving you an extra year of maintenance. Also root bound plants can have trouble growing roots down and end up shallow rooters; at a later stage they can blow over in strong winds.

Check out the nursery before ordering to see if they produce good quality plants. Check the root mass for tangled and distorted roots. Is the plant a lot bigger above ground than below? This can indicate the plant does not have good root structure and will grow poorly.

Plant size

Experts differ on the best sized plants to use, but most agree that good root structure is critical.

Frost sensitive species have a higher chance of survival if they are a reasonable size when planted. Larger plants are also less susceptible to browsing by hares (not rabbits). If hares are a problem in your area choose plants 50-100cm tall and consider carrying out pest control. Refer to page 23.

How many plants will I need?

Planting density:

It is crucial that plants are placed close together so that they quickly form a canopy and shade out weeds. Otherwise you will be weeding forever! Many weed species are light demanding and will not invade into the shade once the plants form a canopy.

Plant spacings	Tussocks	0.5 - 0.75m
	Sedges	0.75 - 1.5m
	Shrubs, toitoi & flax	1 - 1.5m
	Small trees	1.5 - 2m
	Large trees	3 - 5m

Calculating the number of plants for your project:

A simple way to calculate the number of plants you will need is to visit the site and spray where you want the plants. Use a different symbol or colour for each species, and then count the spray marks. Otherwise, use the following calculation to work out roughly how many plants you will need.

$$\frac{\text{Width of area x length of area}}{\text{Plant spacing x plant spacing}} = \text{number of plants required}$$

for example:

$$\frac{5\text{m (wide) x 127m (long)}}{1.5 \times 1.5} = \frac{635\text{m}}{2.25}$$

= 282 plants required



Weed control prior to planting

When it comes to stream restoration projects there are three levels of weed control:

- ▶ Some weeds are in the way of sensible fence lines and need to be removed prior to any other work. Information on this can be found in *Getting Stock out of the Stream* booklet, pages 6-7.
- ▶ Weed control is also needed to prepare the specific sites where plants will be planted; otherwise there will be tough competition with your plants for water, nutrients and sunlight. This section covers such weed control.
- ▶ Finally weed control is an ongoing maintenance requirement. Information on this can be found on pages 20-23.

Weed control without herbicide

Skim off the surface vegetation, about 0.5-1m diameter for each planting site, with a sharp spade or grubber. Plant soon afterwards. Weedeaters are not recommended as they encourage weed growth.

Ring barking is a technique for killing trees. This involves completely removing a strip of bark around a tree's outer circumference. It is a good technique for weeds that do not re-sprout from the base or heal the wound in their bark. It will not work on willows, ash, sycamore and hawthorn.

Mulching, a technique for suppressing weeds, is a smart idea where you will not be using herbicide. Refer to page 19 on mulching.

Weed control using herbicides

One of the best ways to reduce competition from weeds is to carry out effective spraying before you plant. This has the added advantage of making the digging easier by the time you come to plant, as the roots have begun to break down.



Killing grass with spray limits evapotranspiration and allows moisture to build up in the soil. The darker, moisture rich soil is in the sprayed area.

When to spray

Spray healthy weeds on a dry, calm, frost free day.

For a good kill, spray when weeds are healthy and growing, typically spring and autumn. This way the weeds take up the herbicide more easily.

Spray in calm conditions: wind causes spray drift, which wastes spray and threatens any existing plants.

How many times should you spray before planting?

Pre-plant spray a herbicide such as glyphosate two or three months before planting and then spray again closer to planting time, ideally at least two weeks before planting

Planning on planting natives: avoid residual sprays

Residual sprays stay active for a period in the plant or soil, threatening plants that are planted during this period.

Spot spraying vs blanket spraying

On a stream margin and lower bank, where reasonable soil moisture levels are maintained throughout the year, spot spraying of herbicide is advisable. A small area of around 0.5 to 1 m in diameter is spot-sprayed with herbicide where individual seedlings will be planted. This leaves some of the original bank vegetation intact and reduces the potential for bank erosion while the native plants are getting established.

Away from the moist banks, moving onto flatter ground, are zones where the soil becomes drier in summer. Here soil moisture has the biggest effect on plant survival and performance. In these zones, the better the weed control around each seedling, the better it will perform. This is where spot spraying and/or blanket spraying can be undertaken. Blanket spraying is the spraying of a larger area than spot spraying. Note that blanket spraying can make an area more vulnerable to rabbit and hare browsing, as these pests hate long grass. Refer to the pest control section on page 23. Spraying around natives

It is easy to kill existing plants with spray drift. Refer to page 22-23 for advice on spraying around natives.



Checklist:

- ✓ Clear weeds 0.5 to 1 m around where you want to plant
- ✓ Spot spray rather than blanket spray on stream margins and lower banks
- ✓ Avoid sprays with long residual activity
- ✓ Spray healthy weeds on a calm, frost free day
- ✓ Spray 2-3 times prior to planting
- ✓ Apply herbicide at least two weeks before planting



Case study:

A low maintenance planting regime

JAMIE McFADDEN (ABOVE) AND HIS WIFE LINDA DODDS own a plant nursery in Cheviot where they sell plants grown from seeds collected from the North Canterbury area. They also restore streams for farmers who don't have the time to do their own preparation and planting.

Over the years Jamie has experimented with various planting methods and has come up with what he refers to as his 'low maintenance planting regime'.

"If I am going to be working on a harsh site, where I don't know how much maintenance will be going on, I stick to a few tried and true plants – *Carex secta* for the stream margin, and up higher toioi, flaxes and cabbage trees. Ribbonwoods and narrow leaved lacebarks are also quite reliable."

Jamie uses plants grown in planter bag five (PB5) in areas with pest problems. Most of the plants from his nursery are sold in PB2 or larger. His experience is that these plant sizes establish quickly and handle the dry summers.

"In North Canterbury, autumn is ideal for getting plants well established before the following summer." He plants the less frost hardy species in spring.

"I stick to a few tried and true plants."



Broadleaf in PB5 (planter bag 5).

Jamie plants the soaked plants in the areas he has previously spot sprayed to remove weeds. He makes sure the hole is twice the size of the plant and that the soil is placed firmly down the sides of the plant as well as on the top. In normal or dry areas, or on slopes, he positions the plant deep enough to leave a dish to trap water. Water is bucketed up from the stream to give plants an initial watering and then he sprays an egg repellent on the foliage to deter pests.

Planting tips

This section provides you with tips on planting technique, so your plants have the best chance of survival.

When to plant

- ▶ As there is so much variety in climate within Canterbury, use local knowledge to choose the right planting time.
- ▶ As a general rule: plant hardy, frost-tolerant species in autumn and frost-sensitive species in spring. Note, for inland Mid and South Canterbury, autumn planting is generally not advised.
- ▶ Coastal areas and land under centre pivot irrigators tends to be less susceptible to frosts, so there is more flexibility in planting time.
- ▶ Wet soils, including areas of shallow water: plant in summer when water levels are low.
- ▶ Bare rooted/ open ground stock. These need to be planted outside of the growing season: plant in late winter.

If you have the flexibility, pick the right conditions for planting

- ▶ Try to avoid planting on hot sunny days or very windy days. This increases the risk of plants drying out.
- ▶ Avoid planting before a frost.

Transporting and storing plants

1. Shelter plants from the wind and keep moist during transport in an open trailer or vehicle.
2. Store plants out of the sun – use shade cloth if necessary.
3. If plants are stored for an extended period, avoid excessively shady areas as plants will become leggy and soft.
4. Water stored plants regularly and thoroughly, every 2 days in hot weather, otherwise every 3-4 days.

5. Do not leave plants which have been taken out of root trainers in direct sunlight.
6. It is important to look after your plants during storage and transportation so they do not dry out or suffer damage.



Shade cloth protects stored plants

Plant it right

Step 1: Soak plants

Soak plant roots before planting



Step 2: Position plants

Refer to your planting plan and spray aerosol where you want the plants to go, or place the bagged plants in the right locations. Remember to place them where you have spot sprayed or grubbed.



Holes are dug in areas that have already been spot sprayed.

Step 3: Dig the hole



Dig a hole twice the size of the plant container.

Break up the soil at the bottom of the hole to assist drainage and root development. This is particularly important in clay soils. Repack soil firmly to prevent air gaps.

Step 4: Remove the plant



Remove the plant from the container.

Using bagged plants? Gently squeeze the bag and tip the plant upside down. Pull the bag from the plant rather than the other way around, otherwise you may damage the roots. If there are any long straggly roots cut them off.

Step 5: Place the plant



This plant has been planted deep enough to create a basin that traps water.

Place the plant in the hole so the base of the stem is at the correct depth.

Correct planting depth:

Position the base of the stem 1-2cm below the soil surface on sites with reasonable moisture and up to 5cm below the soil surface on dry sites.

On permanently wet sites place the base of the stem 2cm above the soil surface, with soil mounded up over the root ball. Otherwise the roots of woody plants will be drowned.

Step 6: Fill the hole



Putting some soil on top of the potting mix can prevent it drying out. You will still need to plant it at the correct planting depth (refer page 17).

Make sure the soil is packed in firmly around the sides of the plant as well as on top.



Use your toe to firm down the soil. Make sure you hold back the plant so you can see what you're doing and don't shear off any leaves or branches.



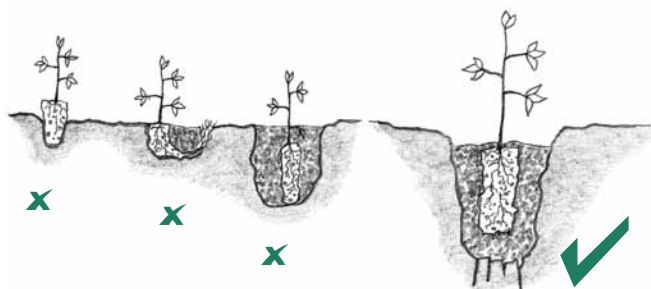
This plant has not been covered with enough soil, making it unstable – you can see some of the roots are showing.

Step 7: Water plants

Water plants if you have access to it. An easy way can be to use buckets from the stream.

Step 8: Protect from pests

Where necessary, apply animal repellents immediately before, or at planting time. In pest prone areas, it is also worth using an animal barrier (see pest control section, under Ongoing Maintenance, page 23).



This diagram shows the correct way of planting in planting in an average to dry site.

Planting tools



Trenching spades are great for digging holes in tough ground.



Crowbars are good for working out stones.

Marking out plants

After planting is completed you can mark plants with a bamboo stake to help locate them for later maintenance. Do not tie plants to the stakes as this may damage them as they grow.

Fertiliser

Generally you do not need to apply fertiliser at the time of planting. However, if you want increased growth rates incorporate slow release granules with the soil in the planting hole. Make sure the fertiliser does not touch the roots. Remember you will also get increased weed growth, so effective weed control is a must.

Mulching = less weeding!

Mulching is where a layer of material is placed around the plant. Mulch helps to retain moisture in the soil, reduces weeds growth and helps keep the soil warm.



Above: Hay and cardboard used as mulch.

Left: Wool mat can be used as mulch.

Caution

- ▶ Make sure you don't mulch naturally wet areas; this will deplete the soil of oxygen.
- ▶ It is not practical to use mulch on steep banks and the zones which get flooded.
- ▶ Use mulch sparingly on loess soils. Loess soils are dense and when they get wet can stay wet – starving the soil of oxygen: mulching makes this worse.

Organic mulches: use what's available

- ✓ **Straw**
- ✓ **Cardboard.** Make sure you have some way to stop it blowing away. For example, cut up wire and bend into pins to hold it down.
- ✓ **Fine bark chips** (10cm deep)
- ✓ **Wool mat or carpet underlay** (50-60cm squares)
Wool mat can be expensive, but the cost may be offset by the reduced maintenance costs.
- X **Avoid weed mat.** The soil can't breathe and goes rotten under the weed mat.

Checklist:

- ✓ Use local knowledge to choose the best time for planting
- ✓ Avoid planting just before a frost
- ✓ In dry or normal soils, plant deep enough to create a dish around the plant to trap water
- ✓ Pack soil firmly around and on top of plants
- ✓ Mark slow growing plants
- ✓ Mulch to slow weed growth and retain moisture

Case study: **Gunnar's maintenance tips**



“Once your plantings are up and running, you can’t turn your back on them.”

GUNNAR LUNDAHL HAS HAD A LOT OF EXPERIENCE working with community groups and landowners in the restoration of streams. He owns a nursery in Leeston and offers a consultation service to those wishing to fence and plant streams. Gunnar says the biggest bonus for him is when the birds come back to nest.

When it comes to maintaining sites, Gunnar says ongoing weed control is just a fact of life that planters need to accept. “Once your plantings are up and running you can’t turn your back on them.”

He recommends checking the plantings for competing weeds three times a growing season. “You should still be able to see the plants when you go to clear the weeds around them.”

Gunnar uses a sharp grubber* to clear any weeds close to the plants then sprays a square metre around each plant with glyphosate. To reduce the risk of killing the plant with spray drift he only sprays in calm conditions and uses a spray guard.

“Do not plant small grade or slow growing species. This will extend the weed control period by several years,” he says.

“Some species will require no further weed control if you spray once in autumn and once 3-4 weeks before planting in spring. These plants will disappear in weed growth the first 18 months but don’t panic – they will come through.”

These species are:

Species:	Plant size	Bag size
<i>Carex secta</i>	25-35cm	PB ¾
Cabbage tree	30-40cm	PB ¾
Toitoi	20-25cm	PB ¾
NZ flax	25-35cm	PB ¾
Lowland Ribbonwood	45-60cm	PB2



* When using a sharp grubber first make sure you know how to use it properly to avoid damaging the roots of the native plant.

Gunnar has found that drain maintenance can also threaten plants as the diggers can undercut the banks. He recommends asking the digger operator not to scrape the banks of drains and, on wide creeks, to stay 20-30cm away from the sides; otherwise over time the banks will collapse.

He has found that planting *Carex secta* along the drains at 1.3m spacings will eliminate the weed growth in narrow drains.



Carex secta planted at 1.3m spacings on the banks of a 1.4m drain. Shade is controlling water weed growth.



Carex secta doing a good job in keeping banks weed free. Please note, there are weeds where no *Carex* is growing, these weeds will later grow out into the creek.

Photo: Gunnar Lundahl

Photo: Gunnar Lundahl

Maintenance

Weed control around natives

Each plant lost is a waste of money!

It is essential that you maintain plantings. Where no weed control is carried out it is not uncommon to lose 80% of plants.

No time for weeding? – employ contractors

If you or your group do not have time for weed control, it is strongly recommended that you include the cost of hiring a contractor into the cost of the project.

Maintenance requirements



Regularly clear weeds from around your plants.

- ▶ Be prepared to free plants of competing weed growth three times a growing season for three years. There will be less maintenance after three years when the plants are above the grass. Clear weeds 0.5 to 1m around each plant.
- ▶ Control new weed infestations before they become established.
- ▶ Replace dead plants to maintain the right plant density.
- ▶ Add more mulch as needed.



Example of a plant lost in the weeds.

Weed control by hand

Hand weeding is time consuming, but can be the safest control method around native plants. Use sharp tools to grub vegetation (not plant roots) for about 0.5m radius around the plant. Grubbing involves chopping the weeds off just below ground level and is usually done with an adze or push hoe.

Weedeaters are not recommended as they can accidentally ring bark plants and cutting weeds tends to promote new growth.



Weed control using herbicide

Spraying around existing plants: be careful

- ▶ Some sprays only need to touch a part of the plant to kill it; the herbicide migrates from the point of contact through the plant. These sprays are called translocators, and include glyphosate (such as Roundup), one of the most common herbicides.



Spray guards help to prevent spray drift.

- ▶ If using a translocator, make sure you use a spray guard.
- Alternatively, place a bucket or plastic sheet over the plant before spraying. (Note good spray coverage of the weed is still important regardless of its ability to translocate.)
- ▶ Add an agent that reduces spray drift. For example, Codicide added to glyphosate will reduce the drift of the chemicals.
 - ▶ Don't over-pump the sprayer – it will produce too fine a mist that drifts widely.
 - ▶ If chemicals contact the plant, wash them off immediately.
 - ▶ Rather than using a translocator spray around natives, you can use a contact spray such as Buster. Contact sprays only kill the part of the plant that they touch, so if you accidentally spray your native plant, it should

not die (Buster is best on short, fresh weeds, and not so good on older, rank weeds. Buster works better in warm conditions, that is, more than 10°C).

- ▶ Spray in calm conditions, when weeds are healthy and growing (such as spring and autumn). For more information on weed control refer to page 13.

Animal pest control options

Rabbits, hares, possums, even pukeko can destroy your plantings. If there are problem pests in your area it is strongly recommended that you carry out pest control prior to planting and for at least the first two years afterwards.

- ▶ Rabbits and hares can kill plants by ring barking them. Hares are less likely to damage your plantings if they are larger when planted (see page 12) whereas rabbits will attack all young plants if hungry enough.
- ▶ Plastic sleeves placed on the bottom 25cm of plant stems are the most cost effective and efficient means of protection from rabbits. Another option is clipped gorse branches.
- ▶ Note: barriers are not always practical when planting lots of plants due to the time it takes to put them on, and in some cases take them off, the plants.



- ▶ Repellents, when sprayed on plants, can discourage browsing for up to three months depending on the rainfall during this time. Apply immediately after planting and monitor to check if re-application is needed. Egg based repellents are some of the most effective. Try Liquid Shotgun, Thiroprotect or Treepel. You can make your own repellent by mixing 5 fresh eggs, 150ml of acrylic white paint and 600ml of water.
- ▶ Shooting, trapping and poisoning are other options for pest control.

A technique for protecting young plants from rabbits and spray drift

The following technique was developed by Stephen Brailsford, a restoration consultant. The technique, which he calls "Combi-guard", comprises a wool mulch mat and a 300 mm high plastic sleeve supported by four bamboo stakes. Stephen also places two slow-release fertiliser tablets under the soil in the bottom of the planting hole.



Mobile gig for installing stakes . Useful on stony ground



Barrier provides protection from rabbits and acts as a spray guard. You can also lift up the plastic sleeve to pull out weeds that have grown underneath. Note the small square of wool mulch to control weeds within the barrier.



A rabbit prone hillside that has been established using Stephen Brailsford's method

Irrigation

If the soils are reasonably moist you should not need to water your plants. In fact, over-watering can cause excessive soft growth, and reduce a plant's hardiness.

As a general rule, water plants on dry sites during dry seasons until they are established. If plantings are close to a stream, bucketing in water is a simple option.



Checklist:

- ✓ Clear plants from competing weeds at least three times in the first year.
- ✓ Hire a contractor if you have no time for weeding.
- ✓ Take care when spraying around native plants
- ✓ Water plants on dry Banks during dry seasons until established
- ✓ Control problem pests

Appendix

Funding



Environment Enhancement Fund (EEF) and Honda TreeFund

Environment Canterbury has a contestable fund that can assist with individual or group project costs within the Canterbury region.

The fund is operated annually to encourage a range of biodiversity initiatives on private land.

Projects funded in the past have included fencing streams and riparian enhancement and planting. Grants up to a maximum of \$5000 per property are available, with financial assistance normally covering 50% of the plant and fencing material costs.

Criteria for EEF funding

Land ownership: Projects should generally be on private, customary or coastal land.

Project ownership: Group projects need identified leadership.

Geographic spread: The aim is to ensure a fair distribution of projects across the Canterbury region.

Representativeness: The extent to which an area represents a habitat type or ecosystem that is typical of the area concerned.

Ecological context: Projects must provide a benefit to indigenous biodiversity and play an important role in the health of the wider ecosystem over the long term.

Criteria for Honda TreeFund

To qualify, projects must use New Zealand native trees to support any of the following:

- ▶ Establishment of native tree populations
- ▶ Water run off control
- ▶ Erosion control
- ▶ Regional parks or other planting for beautification
- ▶ Biodiversity protection and restoration
- ▶ Urban stream enhancement
- ▶ Coastal protection and restoration planting
- ▶ The Cancer Society SunSmart Schools Accreditation Programme.

Characteristics of a successful application

Successful applications in previous years have included a wide variety of projects. Some characteristics of these applications you might like to consider when writing your application are:

- ▶ A clear description of the project and the works proposed
- ▶ A well prepared project management plan
- ▶ A realistic timeline over which the project would be complete
- ▶ An outline of the probable maintenance requirements and who would be responsible for these
- ▶ A realistic costing for the project.

Timeframe

June – EEF and Honda TreeFund opens

End of August – applications to the Fund close.

December – decisions announced and funds made available to successful projects early the following year.



How do I apply?

Funding applications must be made on the Environment Enhancement Fund form. For more information, or to request an application form, phone (03) 353 9007 or toll free on 0800 324 636. Applications may be downloaded from <http://www.ecan.govt.nz/About+Us/Awards/>

Other funding opportunities and advice

Below is a list of other funding opportunities for stream restoration projects.

For further information go to the Funding Information Service (FIS) website www.fis.org.nz.

Biodiversity Condition Fund

Department of Conservation/ Ministry for the Environment

Phone: 0800 862020

Email: biofunds@doc.govt.nz

The Pacific Development and Conservation Trust

Phone: (04) 495 9387

Email: trusts@dia.govt.nz

Habitat Protection Fund

Phone: (04) 499 2930

Email: info@wwf.org.nz

Lottery grants – Environment and Heritage

Phone: 0800 824 824

Email: grantsonline@dia.govt.nz

Nature Heritage Fund

Phone: (04) 471 0726

Email: NHF-Admin@doc.govt.nz

Sustainable Management Fund

Phone: (04) 437 7400

Email: funds@mfe.govt.nz

BOC Where There's Water Community Environmental Grants

Phone: 0800 111 333

Email: wtw@nzwwa.org.nz

District councils

Some district councils also have funding available.



Acknowledgments

Environment Canterbury would like to thank the following people and agencies for supplying material from their publications:

- ▶ Controlling problem weeds in riparian zones, and Restoration Planting: A guide to planning restoration planting projects in the Wellington region.
- ▶ Protecting and restoring our natural heritage: A practical guide. By Mark Davis and Colin Meurk, and published by Department of Conservation, Christchurch, 2001.
- ▶ Environmental considerations for clean streams. Published by the Otago Regional Council, 2005.
- ▶ Wetland restoration guide. Produced from the Bay of Plenty Wetlands forum.

Diagram on page 18 adapted from “Protecting and restoring our natural heritage: A practical guide” (see reference below).

We would also like to thank the following people for providing their tips on restoration and/or reviewing the document:

- ▶ Gunnar Lundaahl, Leeston
- ▶ Jamie McFadden, Hurunui Natives
- ▶ Ines Stager, Lucas Associates
- ▶ Jason Butt, Wai-ora Forest Landscapes Ltd
- ▶ Peter Chamberlain, Waihora Ellesmere Trust
- ▶ Jorge Santos, Department of Conservation
- ▶ Stephen Brailsford, Waihora Ellesmere Trust
- ▶ Anthony Holcroft
- ▶ Carol and Johnny Adams.

References

1. *Managing your bush block: A guide to looking after indigenous forest remnants in the Wellington region.* Greater Wellington Regional Council.
2. Baker, A. 1999. Food plants of Bellbird (*Anthornis melanura*), Tui (*Prothemadera novaeseelandiae*) and New Zealand Pigeon (*Hemiphaga novaeseelandiae*) in Dunedin. *Notornis* 46:270-272.
3. Davis, M and Meurk, C. 2001. *Protecting and restoring our natural heritage: A practical guide.* Department of Conservation

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