

# Waterway Technote

# Planting

## Contents

<b>Benefits of planting</b>	<b>1</b>
<b>Planning your planting</b>	<b>2</b>
Step 1 – plan your waterway management first.	2
Step 2 – work out what type of planting is suitable for your waterway	2
Step 3 – follow the steps in the planting guide specific to your region	8
<b>Tips for doing the work</b>	<b>10</b>
<b>Secondary planting</b>	<b>11</b>
<b>Who can help/where to go for advice</b>	<b>11</b>
<b>Glossary</b>	<b>12</b>
<b>Links to more information</b>	<b>12</b>
<b>References</b>	<b>13</b>
<b>Appendix one – planting guides</b>	<b>13</b>
<b>Appendix two – what are you aiming for?</b>	<b>14</b>
<b>Appendix three – examples of well planted waterways</b>	<b>15</b>

## Benefits of planting

Planting around waterways has many benefits, including:

- Improving stream bank stability
- Filtering nutrients and sediment from overland flow
- Enhancing bird habitat and biodiversity
- Lowering stream temperature and reducing waterweed growth
- Improved habitat for aquatic life
- Improves aesthetics on farm.

Before



After



With good planning riparian planting can be very effective and simple to implement.

## Planning your planting

### Step 1 – plan your waterway management first

Before planting can occur you need to plan where fences and crossing will go, how much you intend to spend, how much time you have and where to start. To find out more see the planning section of this technical series.

### Step 2 – work out what type of planting is suitable for your waterway

Planting will be different depending on what type of waterway you have, e.g wetland, swamp, drain or stream, and what you want you're planning to achieve.

#### General planting options

##### Option 1



##### No planting (grass only)

- Pasture grass

**Requires:** Weed control in many cases (try to use selective broadleaf herbicide).

**1m+ width**

**Pros:** Inexpensive, will shade small streams and drains, filters overland flow, great for narrow riparian margins.

**Cons:** Not good for erosion prone sites, low biodiversity value.

##### Option 2



##### Native sedge/ rush only

- E.g *Carex*, *Juncus*

**Requires:** Some weed control (try to use selective broadleaf herbicide).

**1.5m+ zone width**

**Pros:** Works in small riparian areas, will shade small waterways, filters overland flow, stabilises bank more than grass.

**Cons:** Plant cost, not as much shade generated as tree planting, less habitat for birds.

### Option 3



#### Native monocot planting (grass like plants)

- E.g *Carex*, toetoe, flax, cabbage tree

**Requires:** Weed control in many cases (try to use selective broadleaf herbicide).

**Pros:** Works in small riparian areas, will shade small waterways, filters overland flow, stabilises bank more than grass. Can selectively spray broadleaf weeds without risk to native planting.

**Cons:** Plant cost, not as much shade generated as tree planting, less habitat for birds.

### Option 4



#### Full native planting

- General native species suitable to riparian sites

**Requires:** Weed control in many cases (try to use selective broadleaf herbicide).

**5m+ zone width**

**Pros:** Gives the stream shading, bank stability, generates seed bank of native plants, improved biodiversity benefits.

**Cons:** Plant cost, retirement area required. Not an ideal option in a large or steep catchment.

### Option 5



#### Willow and poplar erosion control

- A range of willow or poplar can be used

**Requires:** Regular maintenance; regional council input.

**3m+ zone width**

**Pros:** A very good erosion control option, provides some shading.

**Cons:** Lots of maintenance required. Can be an issue when fully grown if planted too close to the waterway.

### Option 6



#### Willow and poplar with native planting

- General native species with willow and poplar

**Requires:** Maintenance of willow and poplar, regular weed control.

**5m+ zone width**

**Pros:** A good erosion control option. This option also allows for native plants to replace willow and poplar in time.

**Cons:** Lots of maintenance required. Willows and poplar can be an issue when fully grown if planted too close to the waterway. This is costly and requires a lot of maintenance.

## Keep in mind:

- If you want to plant native plants that will grow greater than three metres in height, your planting area will need to be at least five metres wide (a five metre width will have room for a grassy strip next to the water edge and one or two rows of trees or shrubs)<sup>1</sup>
- Planting zone sizes will differ depending on the shape of your stream. There is no specific guide for the width of each planting zone.

## *Work out what function you want the planting to have*

### *Planting to:*

#### *Improve stream bank stability*

#### **Most suitable options: Three and four for moderate erosion; five and six for risk of severe erosion**

Plants will improve the stability of stream banks. Plants with flexible growth forms such as Carex grasses should be used on the margins at the waterway's normal flow level. Plant larger plants further back.

### *Planting to:*

#### *Filter nutrients and sediment from overland flow*

#### **Most suitable options: One and two; and three and four with filter strip on fenced side of riparian zone**

To adequately filter nutrients and sediment from overland flow you need to make sure you get your fencing setback far enough to slow water as it passes through the riparian zone. On rolling or steep land the fence will need to be further back from the waterway than on flat land.

Grasses, sedges and rushes, such as pasture grass or native Carex sedges, are great for filtering nutrients from overland flow. You can also combine these with taller plantings to make your riparian strip wider.

Tile and mole drains bypass riparian areas. If you can, allow these drains to run through a wide riparian margin, or constructed wetland.

### *Planting for:*

#### *Bird habitat and biodiversity*

#### **Most suitable options: Three and four will also provide benefit**

Where possible link your planting areas to other areas of existing native vegetation such as forest remnants. If you want your riparian plantings to become a self-sustaining area of native bush where weed management is minimal, you will need to make your planted area at least 10 metre wide.<sup>2</sup>

Riparian plantings can provide habitat and food for a range of bird and insect species. Insects living in the riparian vegetation provide food for fish and birds. Select tree species native to your area that are known for attracting birds. Some examples include flax, kowhai, titoki, karamu, kahikatea and cabbage.

---

<sup>1</sup> Collier KJ, Cooper AB, Davies-Colley RJ, Rutherford JC, Smith CM and Williamson RB, 1995: Managing riparian zones: A contribution to protecting New Zealand's rivers and streams (2 volumes). Department of Conservation, Wellington.

<sup>2</sup> Parkyn SM, Shaw W and Eades P, 2000: Review of information on riparian buffer widths necessary to support sustainable vegetation and meet aquatic functions. NIWA Client Report ARC00262.

*Planting to:*

### *Reducing stream temperature and waterweed growth*

**Most suitable options: ALL – dependant on the stream size. Shade plants need to be at least the same height as the width of the stream.**

Sunlight speeds up weed growth and heats up the water, especially in summer. Providing shade is an important way to keep water temperatures down, improve in-stream life and reduce weed growth.<sup>3</sup>

Fish also benefit from cooler water temperatures. In general, fish can be harmed when water temperatures

increase above 25 degrees and many aquatic insects need the water to be less than 20 degrees. Aquatic insects have huge ecological importance because they break down organic matter and are food for fish, like trout.<sup>4</sup>

To reduce stream temperature, at least 200 metres of stream length must be shaded. However, be aware that too much shading can also shade out grasses on the edge of the bank. Grasses are vital to hold banks up.<sup>5</sup>

If you want to replant your stream bank with native plants while also preventing erosion, you will need to maintain a good cover of grasses on the bank edge. Here are some tips to help provide shade but keep banks stable.

Keep shade levels between 50 to 70 percent to make sure grasses and sedges are not shaded out. Fifty to 70 percent shade occurs where your combined bank and vegetation height is about equal to the stream channel width.<sup>6</sup>

*Planting to:*

### *Improve fish habitat*

**Most suitable options: Three and four.**

Plant a native riparian strip to enhance fish habitat. This will provide stream shade and shelter. Leaf litter and small twigs that fall into the water from riparian plants will provide food for invertebrates on which fish feed. Fish will also feed on insects that fall into the stream from riparian plantings.

In tidal areas create grassy waterway margins as this will provide spawning habitat for whitebait.

Where practical leave woody material in the stream as it will provide sites for fish to spawn and hide.



*This photo illustrates how shade can reduce water weed growth.<sup>7</sup>*

<sup>3</sup> Waikato Regional Council, 2004: Clean Streams: A Guide to Managing Waterways on Waikato Farms. Environment Waikato, Hamilton.

<sup>4</sup> Greater Wellington Regional Council, 2009: Mind the Stream – A guide to looking after streams in the Wellington Region. Wellington.

<sup>5</sup> Rutherford JC, Davies-Colley RJ, Quinn JM, Stroud MJ and Cooper AB, 1999: Stream Shade – Towards a Restoration Strategy. NIWA and Department of Conservation

<sup>6</sup> Davies-Colley RJ and Rutherford JC, 2001: Some Approaches to Measuring and Modelling Riparian Shade. In Proceedings of the International Ecological Engineering Conference, 25-29 November 2001, Lincoln University.

<sup>7</sup> Environment Canterbury, 2005: A guide to managing waterways on Canterbury farms. Environment Canterbury. Christchurch.

## Planting to:

### Prevent further erosion

#### Most suitable options: Five and six

Willows and poplars can be ideal for erosion control. They have excellent soil binding characteristics provided by their fibrous roots. This is important for the stabilisation of river margins, as the banks are often formed from non-cohesive silts sands and gravels. They grow rapidly, even in relatively poor soils and can handle conditions ranging from dry sites to very wet, partially submerged sites.

#### Willow and poplars

Hybrid sterile willows have been bred specifically for soil conservation. Unlike weed willows (crack and grey) they will not spread easily or cause blockages and erosion. For information on poplars and willows see:

[poplarandwillow.org.nz](http://poplarandwillow.org.nz)

[poplarandwillow.org.nz](http://poplarandwillow.org.nz)

Contact your local regional council for information on the most suitable varieties for your areas and where to source them.

#### Propagation

- Willows and poplars can be propagated relatively easily and cheaply. They can be planted out from small cuttings, stakes, branches or even whole trees. Do not propagate weed species.
- A wide range of specially selected and bred varieties are available.

#### How to plant

Poplars and willows are planted as stakes (less than one metre) or poles (one-and-a-half to three metres). A poplar pole is a young tree cutting which roots and sprouts when planted in the ground.

The spacing between willow and poplar trees is important. Plant tree species at least three metres back from the top of the stream bank and six to 10 metres apart. At this spacing, by the time your trees are five years old, they would have formed a solid mass of roots along the bank of the waterway.

Shrub (Osier) willows are medium-sized willows that often have flexible branches which are unlikely to break off in high river flows (e.g Irette). They will bush out into the water helping to deflect the current away from the eroding area and slow water flow which results in deposition of sediment helping to rebuild eroded banks.<sup>9</sup>

Plant shrubby willows on wide meandering streams at one to two metre spacing at the base of eroding banks or on top of steep banks that are eroding to prevent scouring and reduce future slumping.



*Poplar pole planting along a waterway. In a dairy situation these trees need to be fenced from stock. This will improve the survival rate.*

*Source: Gibbs, 2007: Best Practice Guidelines for Vegetation Management and In Stream Works. Waikato Regional Council Technical Report 2007/41.*

<sup>9</sup> Waikato Regional Council. Poplar and willow planting: A guide to planting poplar and willow on your property

## How to plant

The key to healthy survival of poles and stakes is planting them deep and firm. The most effective ways of planting poles is ramming and digging.<sup>10</sup> To ensure survival, don't let large animals graze around the pole plantings for the first two years.

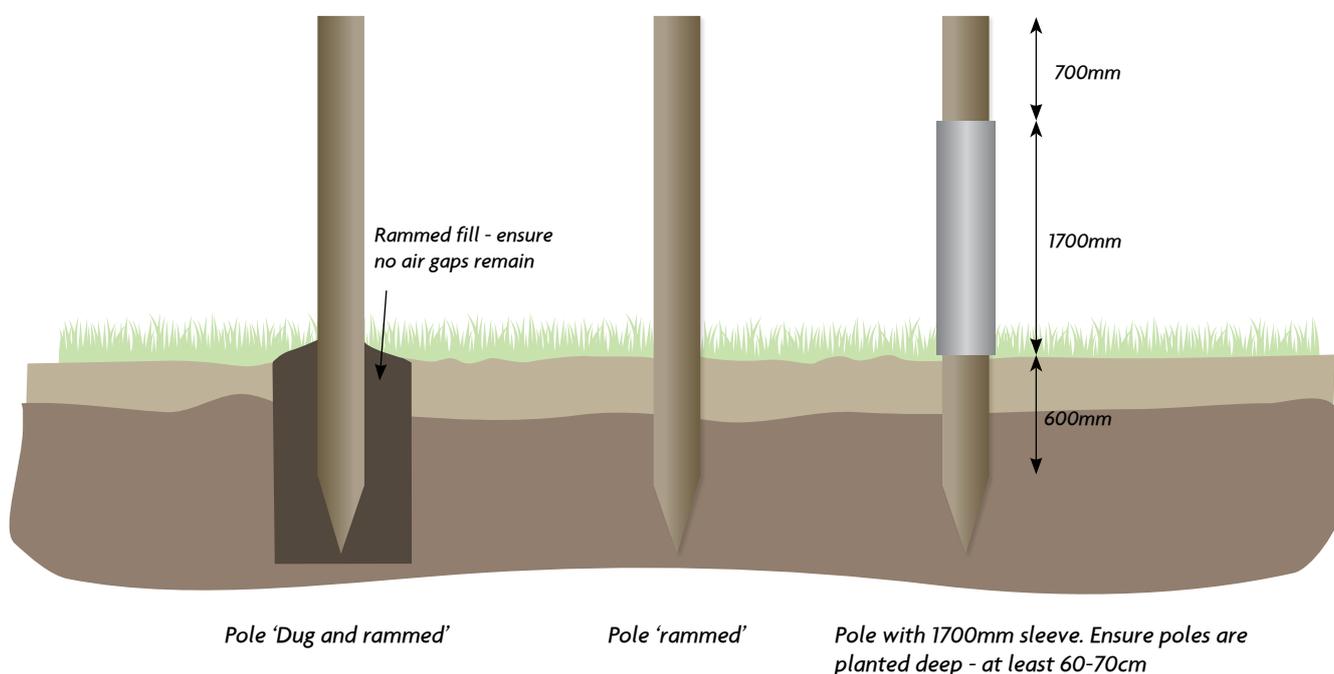


Diagram showing how to plant poplar and/or willow poles.

Source: Hawkes Bay Regional Council, Land Management Factsheet. Retrieved from <http://www.hbrc.govt.nz/IBRC-Documents/IBRC%20Document%20Library/Planting%20Poplars.pdf>

### Ramming

A pole rammer or pole bar can be used to drive the pole as tightly as possible into the ground, with the base of the pole anchored into undisturbed soil.

It may be helpful to prepare a pilot hole with a hand auger, crow bar or attachment on a rammer which should be slightly smaller than the diameter of the pole.

Using the rammer, drive approximately a third of the pole into the ground. If the pole is 2.3m long, drive it into the ground at least 60cm.

### Digging or using a post hole borer

A post hole borer or spade can also be used to create a hole. However, ensure poles are rammed tightly into the bottom of the hole. It is recommended that during summer the soil around the pole is rammed/compacted to prevent the pole from loosening.

<sup>9</sup> Waikato Regional Council. Poplar and willow planting: A guide to planting poplar and willow on your property

<sup>10</sup> Waikato Regional Council. Poplar and willow planting: A guide to planting poplar and willow on your property

## Timing

The best time to plant poplar and willow poles and stakes is during the winter months when willow are generally dormant.

## Maintenance

Bear in mind before planting poplar and willow that they are large growing trees and will require silviculture maintenance over their 15-35 year lifespan.

Because of their vigorous growth and limited lifespan (15-35 years), poplar and willow plantings need to be monitored and managed to ensure their ongoing effectiveness. This will include thinning the trees to 10 to 12 metre spacings at 10 to 20 years old, form pruning and coppicing.

The Taranaki Regional Council has produced a factsheet that details maintenance requirements for poplar and willow poles. See [trc.govt.nz](http://trc.govt.nz)<sup>11</sup>

## Combining with native plants

Willows and poplars require extensive long term maintenance so planting native plants should always be considered in the first instance. Native plants are slower growing but have a longer life span than willows and poplars. Unfortunately native shrubs and trees are not always appropriate as a direct alternative to willows and poplars for erosion control. Some native species exhibit many of the attributes listed above but none have all of these attributes.

In most situations native vegetation can be inter-planted between willows and poplars and once mature the willow and poplar trees can be removed.

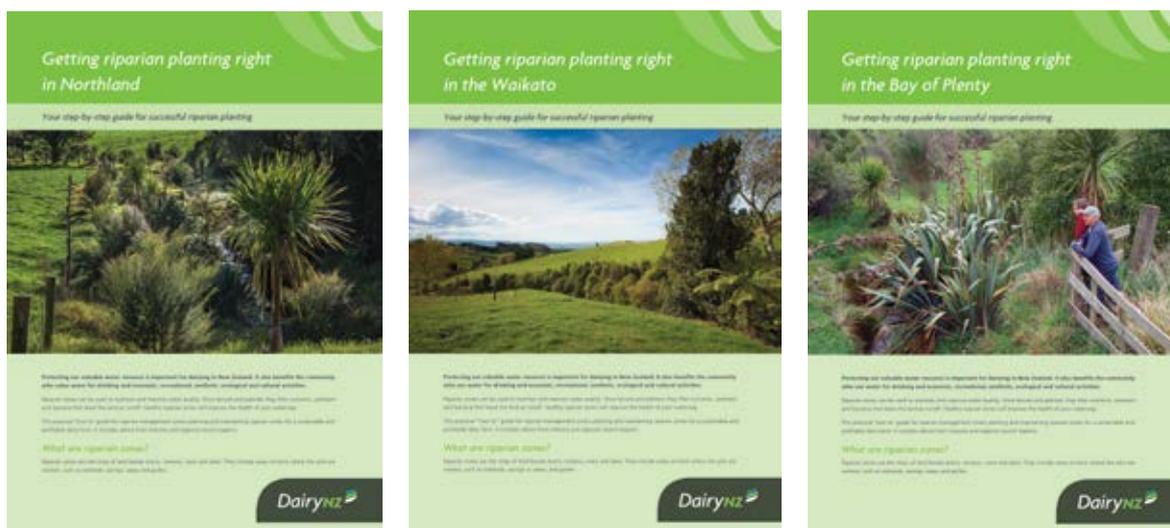
## Root spread and depth in native plants

Integrated native planting with willow and poplar species is often the best option. You can plant a range of natives as the willows and poplars will usually provide all the stability required to prevent further erosion.

## Step 3 – follow the steps in the planting guide specific to your region

DairyNZ has produced riparian planting guides for a number of regions in New Zealand.

See [dairynz.co.nz](http://dairynz.co.nz)



<sup>11</sup> Taranaki Regional Council: Pole planting – maintenance (Pamphlet). Taranaki Regional Council, Stratford.

## Working out how many plants you need

- Sketch out your planting area showing the different planting zones and the dimensions of each zone.
- Work out the area of each planting zone. For example, if zone A (waterway margin/lower planting area) is 200 metres in length and three metres wide the area will be 600m<sup>2</sup>.
- Work out how many plants you need for each planting zone. Plants should generally be spaced one metre or one-and-a-half metres apart, although small rushes and sedges can be planed half a metre apart. Trees with a large mature size such as rimu and totara could be planted at five to 10 metre spacings with smaller species in between.
- Record your calculations in a table such as the example below.

Waterway Name	Planting zone	Area (square metres)	Desired plant spacing (metres)	Number of plants required
Bob's drain	Zone A – margin and lower bank	600	1	600
Bob's drain	Zone B – Upper bank	600	1.5	266
	Other e.g wetland			

*An example of a table noting planting number calculations*

## Where to get your plants

- Use native plants that have been grown from locally sourced seed.
- Buy from a reputable wholesale native plant nursery, close to your location. Local nurseries often source seed from the local area. This is important – ask them!
- Place an order with the nursery ahead of time. You may need to adjust your plan for the year depending on plant availability.
- If you are involved in a large project, consider entering into a contract with a specialist nursery.
- Some agencies may provide you with free or cheap plants to get you started. Check with your regional council for any information about places to source good quality cheap plants.

## Plant purchasing

- When purchasing plants, they are often in pb bags (pint size bags) or pots, with pots generally referred to in litres.
- Re-vegetation grade plants vary, but a good rule of thumb for cost effective sized plants will be pb2/pb3 which is the equivalent of 1.2 litres/1.8 litres.
- Larger sized plants will be more expensive, but are more resistant to weeds. Smaller sizes will be cheaper, but will require more weed control while they establish.
- Ecosourced plants have a higher survival rate as they are adapted to local conditions.
- Buy plants from a reputable wholesale nursery. Your regional council should be able to advise where is best to go.



*A common grade of plant is around the pb3 or 1.5L size.*

- Generally bigger is better as they have the ability to get up above rank grasses. However, leggy plants that are tall and slender often struggle when exposed to wind and dry conditions. Also ensure the plant is not root bound as they can also get shocked.

### Plant storage

- If you have to store your plants ensure that they are on a hard surface, not on soft ground or grass as the roots will grow into the ground. This causes shock when moved at planting time and can damage or kill the plant.
- Keep plants exposed to the night air before planting to “harden them off”, but under cover if they are frost sensitive and you are expecting frosty conditions.

## Tips for doing the work

### Weed control

- Make sure you do a thorough job of removing weeds before planting native trees.
- Four to six weeks before planting, spray one metre diameter circles at the location where you will plant each plant.
- Specialist products are available for protecting plants such as treeguards and biodegradable weed mat. Treeguards are designed to create a microclimate, reducing the effects of adverse weather. They also protect the plant during release spraying and give protection from rabbits and hares. They need to be installed at the time of planting.



*Tree protectors like these above can really help ensure a successful planting. They are particularly useful in cold areas, or where animal pests are an issue. They can be re-used and will help protect the plant when spraying weeds.*

### Animal pest control

- Animal pests such as rabbits, hares and possums can cause havoc for new plantings. Even native animals such as pukekos can sometimes be a problem.

### Water plants

- Soak your plants prior to planting while they are still in their bags.
- Water the night before or morning of the planting day. This will be easier than trying to water your plants on site and will help reduce the shock to the plant when planted.

### Space plants out before planting

- Spacing plants out prior to planting makes for easier planting.
- Having an experienced planter lay out the plants will ensure that the plants that need to be planted in certain areas will be put in the correct place.
- Remember your planting zones. Large growing trees (e.g. ribbonwood, kowhai, kahikatea) should be planted well back from the stream edge (at least five metre back).

## Maintenance of grass or sedge filter strips

- In grass or sedge filter strips, or any planting that is completely dominated monocot species, it will be possible to control broadleaf weeds without risk to the native plants.
- Look for labels that contain Triclopyr. These herbicides are very effective against broadleaf weeds and will not harm grasses or sedges.

## Timing for weed control/ releasing

- Plantings will need to be cleared of or “released” from competing weed growth every spring and autumn, until your plants shade out the weeds. Keep a close eye on your site as you may need to do it more often.

## Secondary planting

As with any crop you cannot expect 100 percent success with tree plantings, but if you plant good quality seedlings of the right species, at the right time of year and protect them well, you can expect 70-80 percent survival. It is helpful to replant in the spaces where you have lost trees, to reduce gaps for weeds to grow in the future.

- Once your initial planting has established, go back in three to five years and plant some different species to help diversify the range of plants.
- This will help ensure the longevity of the planting and its continued ability to remain a native dominated site.
- Native birds will also benefit from a more diverse range of plants. Many of the secondary plant species produce flowers and fruit that are part of the diet of native forest birds.

## Who can help/ where to go for advice

Agency/organisation/company	Type of advice
<i>Regional councils</i>	Riparian planning
<b>Northland</b> – land management officer - 0800 002 004	Pest plants and pest animals
<b>Auckland</b> – land and soil advisor - (09) 301 0101	Planting advice
<b>Bay of Plenty</b> – land management officer - 0800 884 880	Resource consent requirements/permitted activities
<b>Waikato</b> – land management officer - 0800 800 401	Possible funding assistance
<b>Taranaki</b> – land management officer - 06 765 7127	Legal protection
<b>Hawkes Bay</b> – land management advisor – 06 835 9200	Helpful publications
<b>Gisborne</b> – 06 867 2049	
<b>Horizons/Manawatu</b> – 0508 800 800	
<b>Greater Wellington</b> - 0800 496 734	
<b>Marlborough</b> – 03 520 7400	
<b>Tasman</b> – 03 543 8400	
<b>Nelson</b> – 03 546 0200	
<b>Canterbury</b> – 0800 324 636	
<b>Otago</b> – 0800 474 082	
<b>Southland</b> – 0800 76 88 45	
<b>West Coast</b> – 0508 800 118	

Agency/organisation/company	Type of advice
DairyNZ	Helpful publications: dairynz.co.nz Riparian planning Planting advice\
Local native plant nurseries	Planting advice

## Glossary

**Releasing** – The task of removing weeds from around plants (releasing them from weeds).

**Broadleaf weeds** – Broadleaf means having relatively broad rather than needle-like or scale-like leaves. Note: Broadleaf is also the common name for the native plant *Griselinia littoralis* – this is not a weed.

**Ecosourced plants** – Ecosourcing refers to the propagation of native plants from local areas and the planting of them back within the same region.

**Riparian** – The area of land next to water courses.

**Carex** – A genus of sedge species (grass-like plants). There are many different species of *Carex* but those most commonly planted along waterways include *Carex secta*, *Carex geminata* and *Carex virgata*.

**Monocot** – These are one of the two major types of flower plants – monocots and dicots. They have a single cotyledon or seed leaf. A cotyledon is the first leaf developed by the embryo of a seed plant. These are the first little leaves that you see when a plant germinates from seed. All grasses are monocots. (Example pictured right)



Source: <http://education-portal.com/academy/lesson/monocot-definition-function-examples.html#lesson>

## Links to more information

For scientific background on the effectiveness of riparian buffer zones in removing sediment and nutrients see Parkyn, 2004: Review of Riparian Buffer Zone Effectiveness. MAF Technical Paper No: 2004/05. Ministry of Agriculture and Forestry. Wellington. [biol.canterbury.ac.nz](http://biol.canterbury.ac.nz).

For information on appropriate species to plant for specific sites go to web tool [natureservices.landcareresearch.co.nz](http://natureservices.landcareresearch.co.nz).

## References

- DairyNZ Riparian Planner – Understanding and managing your riparian margins.
- Davies-Colley RJ and Rutherford JC, 2001: *Some Approaches to Measuring and Modelling Riparian Shade*. In Proceedings of the International Ecological Engineering Conference, 25-29 November 2001, Lincoln University.
- Environment Canterbury. *A Guide to Managing Waterways on Canterbury Farms*. Environment Canterbury. Christchurch.
- Gibbs M., 2005: *Step 7: Best Practice Guidelines for Vegetation Management and In Stream Works*. Environment Waikato Technical Report 2007/41. Environment Waikato. Hamilton.
- Greater Wellington Regional Council, 2009: *Mind the Stream – A guide to looking after streams in the Wellington Region*. Wellington.
- Parkyn, 2004: *Review of Riparian Buffer Zone Effectiveness*. MAF Technical Paper No: 2004/05. Ministry of Agriculture and Forestry. Wellington.
- Parkyn SM, Shaw W and Eades P, 2000: *Review of information on riparian buffer widths necessary to support sustainable vegetation and meet aquatic functions*. NIWA Client Report ARC00262.
- Quinn, 2009: *Riparian Management Classification Reference Manual*. NIWA Client Report HAM2009-072. NIWA. Hamilton.
- Rutherford JC, Davies-Colley RJ, Quinn JM, Stroud MJ and Cooper AB, 1999: *Stream Shade – Towards a Restoration Strategy*. NIWA and Department of Conservation.
- Waikato Regional Council, 2004: *Clean Streams: A Guide to Managing Waterways on Waikato Farms*. Waikato Regional Council. Hamilton.

## Appendix one – planting guides

**Northland Regional Council**, 2005: *Clean Streams – A Guide to Riparian Management in Northland*. Northland Regional Council. Whangarei. <http://www.nrc.govt.nz/upload/2221/Clean%20Streams%20Guide.pdf>

**Auckland Regional Council**: Riparian facts Factsheet (pg 6-8). Auckland Council. Auckland. <http://www.aucklandcouncil.govt.nz/EN/environmentwaste/naturaleenvironment/Documents/streamsideplantingguide.pdf>

**Waikato Regional Council**, 2004: *Clean Streams: A Guide to Managing Waterways on Waikato Farms*. Waikato Regional Council. Hamilton. Page 27. <http://www.waikatoregion.govt.nz/PageFiles/984/cleanstreams1.pdf>

### Horizons Region

DairyNZ: *Getting Riparian Planting Right in the Horizons Region*. DairyNZ. [http://www.dairynz.co.nz/media/660473/horizons\\_riparian\\_management.pdf](http://www.dairynz.co.nz/media/660473/horizons_riparian_management.pdf)

### Taranaki Region

Taranaki Regional Council: Sustainable Land Management Programme Factsheet Series – Native Riparian Plants (Number 50). Taranaki Regional Council. Stratford. <http://www.trc.govt.nz/assets/Publications/information-sheets-and-newsletters/land-management-information-sheets/riparian-management-information-sheets/50riparianplantguide.pdf>

**Gisborne District Council**, 2013: Streamside planting guide. Gisborne District Council page 8 & 9 of the following link. <http://www.gdc.govt.nz/assets/Files/Conservation/Streamside-Planting-Guide.pdf>

### Canterbury Regional Council – pg 20:

Environment Canterbury. *A Guide to Managing Waterways on Canterbury Farms*. Environment Canterbury. Christchurch. <http://ecan.govt.nz/publications/General/Managingwaterways.pdf>

### Tasman and Marlborough District

Dexcel, 2004: *Clean Streams: A Guide to Managing Waterways on Tasman and Marlborough Farms*. Dexcel, May 2004. file:///C:/Users/User/Downloads/TasmanClean%20Streams%20-%20Final%20proof%20May%202004.pdf

### West Coast

Dexcel, 2004: *Clean Streams: A Guide to Managing Waterways on West Coast Farms*. Dexcel, May 2004. <http://www.wcrc.govt.nz/Documents/Environmental%20Management/Clean%20Streams.pdf>

## Otago

Otago Regional Council, 2005: *Environmental Considerations for Clean Streams: A Guide to Managing Waterways in Otago*. Otago Regional Council. Dunedin. [http://www.orc.govt.nz/Documents/Publications/Farming%20and%20Land%20Management/env\\_considerations\\_cleanstreams.pdf](http://www.orc.govt.nz/Documents/Publications/Farming%20and%20Land%20Management/env_considerations_cleanstreams.pdf)

## Southland

DairyNZ: *Getting riparian planting right in Southland*. <http://www.dairynz.co.nz/media/660475/dairynz-riparian-management-southland.pdf>

## Appendix two – What are you aiming for?

When do you know you have it right, or when there's still work to be done?

Good	Needs work	Action
<b>Stable stream banks</b>	Eroded, unstable banks	Investigate why erosion is occurring. For information on options for controlling erosion see <i>Waterways: erosion</i> .
<b>Plants do not hinder the fence</b>	Fences are shorting out from plants touching them	Move fence back further or prune plantings.
<b>Native plants out competing weeds</b>	Weed dominated riparian zone	Undertake weed control See <i>Waterways: pest plants</i> for information about identifying and controlling various weeds.
<b>No damage occurring to plants from animal pests</b>	Animal pests damage planting	Undertake animal pest control. See <i>Waterways: pest animals</i> for information about identifying and controlling various weeds.
<b>Plants are growing well</b>	Plants seem to struggle in this location and grow slowly	Check that plants are suited to the conditions. See <i>Getting riparian planting right</i> series. (e.g frost, soils, wind, soil moisture). Other reasons plants may not be doing well include: <ul style="list-style-type: none"><li>• Plants had been in their pots too long and were root bound when planted</li><li>• Animal pests such as possums, hares and rabbits</li><li>• Species not suited to location.</li></ul>
<b>Plant survival is high</b>	Plant survival is low	Check that plants are suited to the conditions (see above). Are weeds an issue? See <i>Waterways: pest plants/pest animals</i> . Were correct planting techniques followed? See <i>Getting riparian planting right</i> series.
<b>Runoff is slowed and filtered before it enters the stream</b>	Channels forming where runoff gets straight through to stream	Move the fence back and create a wider filter strip. See above

## Appendix three – examples of well planted waterways

Use the examples below to think about what might be possible on your farm



*Streambank planting with a range of native species and sterile willows for erosion control.*

*Source: Waikato Regional Council, 2004: Clean Streams: A Guide to Managing Waterways on Waikato Farms. Waikato Regional Council. Hamilton.*



*Wetland planting is great for attracting wildlife as well as providing a valuable nutrient filter for any farm runoff.*

*Source: Bay of Plenty Regional Council Land Management Factsheet #33*



*Stream margin planting is excellent for stabilising stream banks, cooling water, filtering nutrients from farm runoff and providing wildlife habitat.*

*Source: Taranaki Regional Council. Sustainable Land Management Factsheet Series. Why manage stream banks? Factsheet #21. Taranaki Regional Council. Stratford.*



*Native planting around a Waikato peat lake. A wide riparian margin around peat lakes will help improve and protect water quality.*

*Source: Waikato Regional Council*



*Native planting around a pond. Even small farm ponds can benefit from planting.*

Source: Waikato Regional Council



*Poplar tree planting for erosion control (background) mixed with native planting (flax).*

Source: Waikato Regional Council



*Streambank planting with low growing native plants. Using low growing plants on steep banks is important for stability and increases flow by supporting a V-profile.*

Source: Waikato Regional Council



*Carex sedges planted along a narrow waterway margin provide bank stability, habitat and nutrient filtering without restricting flood flows.*

Source: Canterbury Regional Council: Living Streams Handbook – Part 1: Investigations and planning. Environment Canterbury. Christchurch



*Before and after planting of a swampy area. As well as providing benefits for water quality and native biodiversity this type of planting can dramatically improve the look of your farm.*

Source: Whaingaroa Harbourcare

Before



After



*Planting farm drains can reduce weed growth and sedimentation and reduce the need for cleaning.*

*Source: Waikato Regional Council*