

## For further information

Visit [www.arc.govt.nz](http://www.arc.govt.nz) or contact the ARC on (09) 366 2000.

Other useful references available from ARC:

Riparian Zone Management Guidelines (TP148)

Wonderful Wetlands Factsheets 1 & 2

Welcoming Wildlife pamphlet

Coastal Planting Guide Series 1 – 6

Fish Passage Guidelines for the Auckland Region (TP131)

Environmental Funding for Community Groups

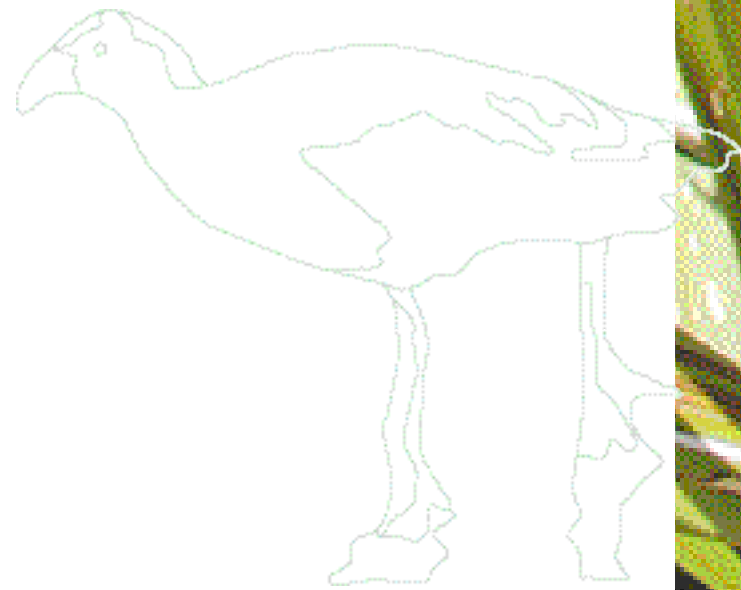
Environmental Initiatives Fund Guidelines and Application Form

Water Facts – What's all this about dams?

Good Start Planting Guide.

## References

ARC Riparian Zone Management Guidelines (2001) TP 148.



# riparian facts

09 366 2000 [www.arc.govt.nz](http://www.arc.govt.nz)

THE BIG CLEAN UP.  
[www.arc.govt.nz](http://www.arc.govt.nz)

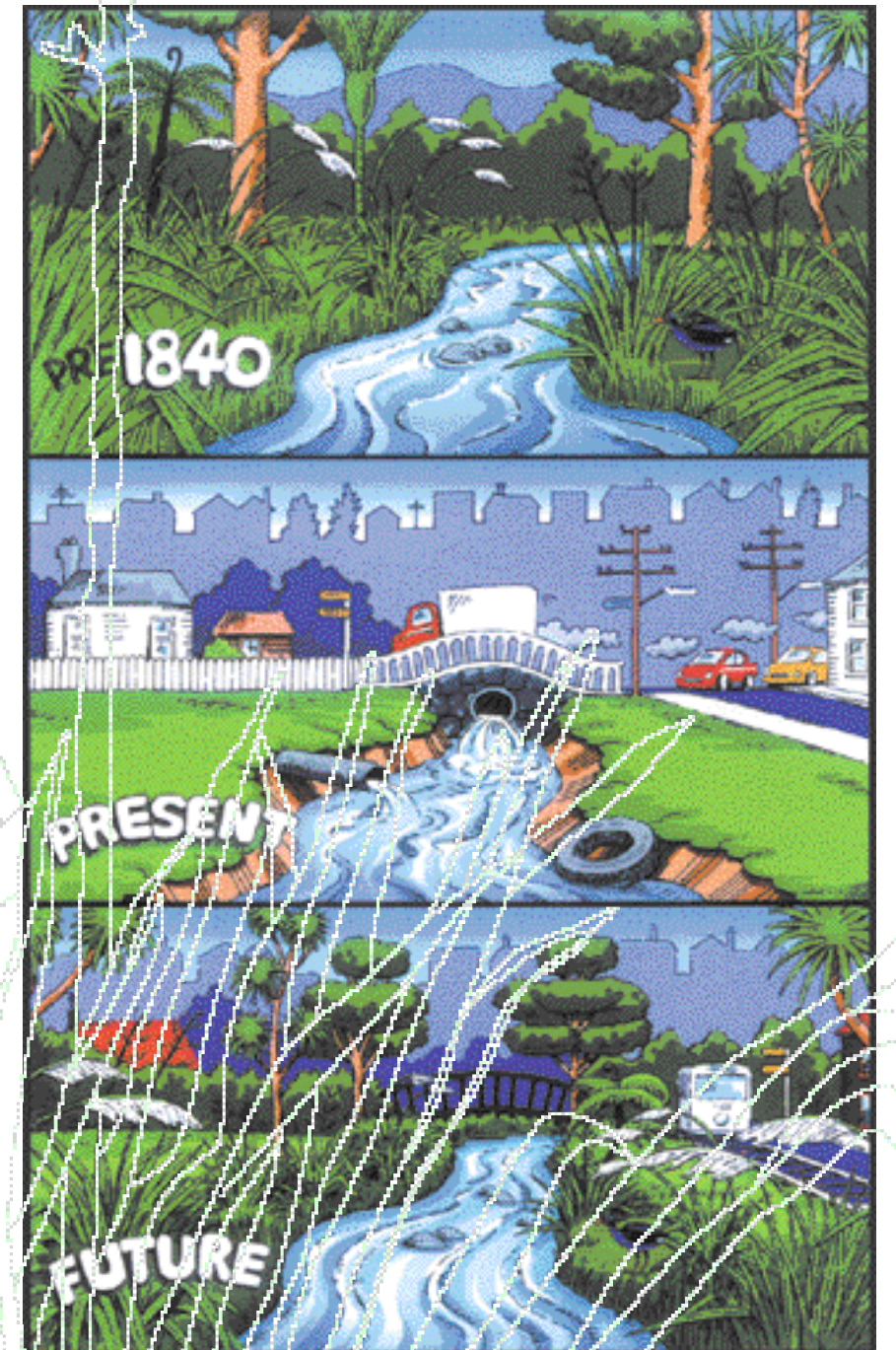


# Streamside Planting Guide



A practical guide for protecting, enhancing and restoring riparian areas in the Auckland Region.

The Auckland Region has an extensive coastline, three large harbours, numerous estuaries, many lakes and wetlands, and an extensive network of small streams. In the past, native forest and wetlands once flanked sparkling streams. Today, due to land clearance and urban development, only 19% of our 10,000km long stream network passes through native forest. Our unique native fish need healthy waterways and clear, undisturbed passage between the open sea and catchment headwaters. The healthiest streams are those with forest buffers, which shade the water, filter run-off and stabilise the stream banks.



## What is a "Riparian Zone"?

The "riparian zone" is the area of direct interactions between land and water ecosystems. Many terms are used to describe riparian areas including:

- Streambanks
- Wetlands
- Buffer zones
- Estuary margins

The riparian zone is an important zone for land and water interactions. Most runoff must pass over or through the soil and vegetation of this zone before it reaches the adjacent water body. Riparian areas therefore have a crucial influence on water quality – especially light and temperature, as well as flows. Riparian zones act as buffers which moderate the adverse effects of adjacent land uses on stream, lake or estuarine systems.

The buffer effect of riparian vegetation also works like a sponge by holding back the water and helping to protect the land from flood damage. Riparian zones also provide important habitat and stepping stones for wildlife both in the streams and on the land (e.g.: fish, birds and insects).

## Some key facts:

- There are about 10,000km of permanently flowing streams in the Auckland Region.
- Forest clearance and land development over the past 150 years has severely affected riparian vegetation.
- It is estimated that only 19% of the total length of large streams and rivers in the Auckland region now flow through native forest or scrublands.
- Less than 10% of the region's original wetlands remain.
- Less than 30% of the region's native forest remains, and a large proportion of this is in the Hunua and Waitakere Ranges.

## What are the benefits of riparian vegetation?

- Improved water flows and water quality. Vegetation and the soil it grows on act like a kidney and filter pollutants. A vegetated buffer also acts like a sponge by controlling flood flows (reducing peaks and prolonging flows)
- Reduced water temperatures and increased oxygen levels in the water
- Increased water clarity
- Stream channel shape and structure are maintained
- Improved terrestrial habitat diversity in the catchment as a whole
- Greater ecological quality and biodiversity in both the water (aquatic) and land (terrestrial) environments

## Effects of loss of riparian vegetation

When stream bank vegetation is removed, there is a loss of:

- Habitat quality (aquatic and terrestrial)
- Biodiversity – trees, insects, whitebait, eels, birds
- Wind protection
- Connected corridors (hills to sea)
- Amenity values (recreation)
- Aesthetic values (visual landscape)
- Public awareness
- Sense of a typically New Zealand place



## How can we make up for past losses?

It is almost impossible to turn the clock back, so it is not really practical to restore all of the freshwater and riparian habitat the region has lost. However, by restoring riparian buffers where possible, significant environmental benefits can be obtained for a reasonable cost.

Landowners, community groups and councils around the region have already started protecting waterways, enhancing existing areas and replanting what has been lost. Even by fencing a waterway and excluding livestock, you can make an important contribution to improving the stream habitat and water quality.

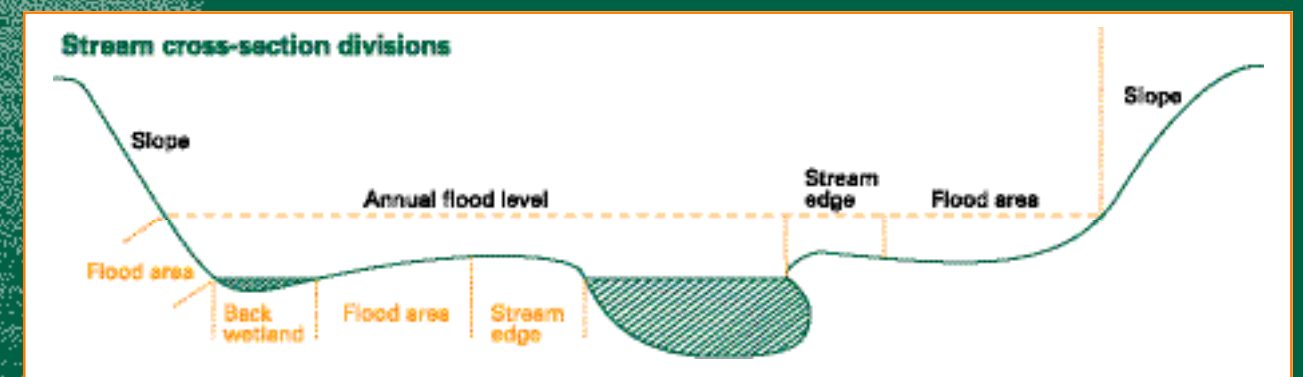
This pamphlet provides some simple steps for planting and maintaining a riparian buffer. For more detailed information, the ARC has produced some riparian management guidelines ('Riparian Zone Management: Strategy, Guideline and Planting Guide' (TP148)) and holds regular workshops.

For more information on the guidelines and workshops, contact the ARC on 366 2000 or visit [www.arc.govt.nz](http://www.arc.govt.nz)

## 5 Key Steps to Planting and Maintaining a Riparian Area

### 1. Get to know your stream

- Observe your stream throughout the year and think about how you might improve it. Look at the varying water levels and make notes of the seasonal changes.
- Consider what you want to achieve and identify risks and benefits.
- Do you own the land? If not, contact the landowner to discuss your ideas and seek permission.
- Are any stream-works required? Contact your local Council to check if a Resource Consent is required.
- Select your planting site and decide how wide to make the riparian buffer (10 metres either side of the stream is the recommended minimum width).
- Who else is involved? Is there an opportunity for neighbours or the community to work together?
- Identify the different 'planting units or zones' [stream edge, flood area, back wetland or spring, slope – see below]. To identify these areas consider slope, distance from stream, how damp the area is and how your stream flows throughout the year.



- The **stream edge** planting unit is on the edges of stream channels. This planting unit is in a zone of high erosive potential and it is essential that this is recognised in planning which species to plant and when to plant them. Much of the original mature vegetation of the stream edge planting unit never becomes particularly tall. Many species remain less than a metre in height and are able to lie flat when flood waters rush over them. Grass-like sedges are common on stream edges.

- The **flood area** planting unit is very similar to the stream edge planting unit. It is the flat area that becomes wet and boggy over winter. Plants in this zone need to be able to cope with the extreme conditions of higher moisture levels over winter and dry soils in summer. You also need to plant species that do not restrict flood waters and bend with the flow of water (e.g. *Carex* spp)
- **Back wetland or spring** is the area where stream banks have accreted or streams have changed course, or where springs emerge. The plants within these areas need to be able to tolerate permanently wet conditions.
- **Slopes** of varying steepness, including cliffs, may be present in clay, volcanic, alluvial or sandy soils. The conditions will be drier than on the stream flats, with moisture levels decreasing towards the top of the slope.

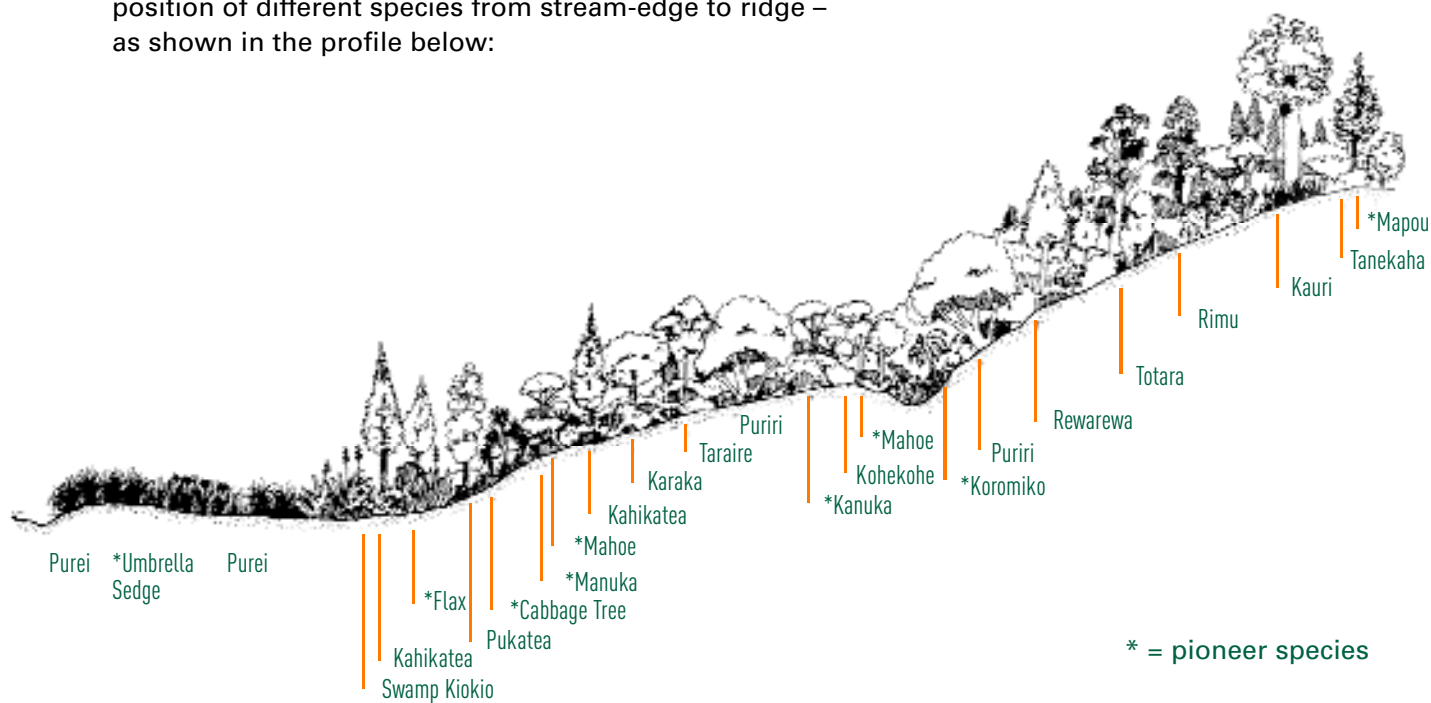
## 2. Prepare a Planting Plan

To find out how many plants you will require and of which species, you need to know the size of the planting area and compile a list of appropriate plants for each zone along the streambank. Space the plants according to the zone they belong in and how big they grow. You will need approximately one plant per square metre (1 metre apart). Ferns, rushes and small sedges need to be planted up to three per square metre (about 50cm apart). Larger tree species (e.g. kahikatea, puriri) need more room – plant them 5m apart in amongst smaller species.

The species list in this factsheet provides a basic list of some typical Auckland riparian plants and their general tolerance limits. To obtain further plant lists specific to certain soil types (e.g. volcanic, alluvial, clay and sand) and other detailed information, refer to the ARC's Riparian Management Guidelines (TP148) or contact the ARC. The list focuses on freshwater species – for salt water tolerant species, refer to the ARC's Coastal Planting Guide No. 5 – Coastal Wetlands, Saltmarshes & Estuaries.

Initial plantings may be needed to establish suitable pioneer (or nurse) vegetation. Pioneer species are those able to grow first at a site. They are able to cope with the drier, hotter conditions in open areas. These species should make up the bulk of a planting in an open area. These plants will provide shelter for other species that will establish naturally or that are planted later to encourage forest diversity. The species list in this factsheet includes some forest diversity species, which could be planted in amongst established pioneer species where appropriate.

Choose plants which are characteristic of your stream. Look at other streams in your area to see what naturally grows there and the position of different species from stream-edge to ridge – as shown in the profile below:



## 3. Prepare the Site

Successful plantings require good site preparation. Native plants grow best with low disturbance from pests and stock. Stock needs to be excluded from the planting site and waterways, with alternative water sources being provided. Pests, such as rabbits, goats and possums need to be removed or controlled.

Clear grass and weeds around each planting site to ensure the new plants get enough light and nutrients. This initial weed control will prevent the young native plants from being immediately outcompeted by weeds.

Important weeds to watch for and remove include willows, tree privet, *Tradescantia*, ginger, woolly nightshade, kikuyu grass, moth plant, blue morning glory and bindweed.

For further advice on weed and animal pest control, contact the ARC or visit [www.arc.govt.nz](http://www.arc.govt.nz).

## 4. Planting

Using your planting plan, source your plants and prepare to dig!

Depending on soil moisture, in riparian areas in Auckland, you can plant throughout autumn, winter and spring. The best planting season is from April to August, which allows plants to establish before the heat and dry of summer. If your site is susceptible to frosts, plant frost sensitive species in early spring.

### Handy hints!

- Purchase native plants from nurseries that source plants from your area ("ecosourced"), to ensure they are suited to your area's climate and soils. Contact the ARC or visit the ARC website for a list of nurseries.
- Grow some of your own plants from seeds or cuttings.
- Stage your planting and don't try to do too much at once! Remember that each planting area will require some ongoing maintenance, especially weed control.
- Mulching around the plants will help to suppress invasive weeds and help the soil retain moisture.
- Stake plants when planting to make them easier to locate later.

## 5. Ongoing maintenance

- Regularly check on the plants' health for several years after planting.
- Weeding around plants may be necessary to avoid competition and stress. This should be carried out as required.
- Monitor the growth of your planting – enjoy watching it grow, attract wildlife and become self-sustaining. Take photographs each year to follow the changes!
- Further planting can be carried out when the pioneer cover of the site has established successfully. This is called 'forest diversity planting'. Refer to the planting list for suggested species. These forest diversity or later successional species need the shelter of the pioneer species to establish and are less likely to survive in the open.

## Planting Guide

### Decide on the plant's location

**Skim any grass or weeds** off the top of the planting site using a spade or grubber. If left they will compete with and could rapidly smother the plant.



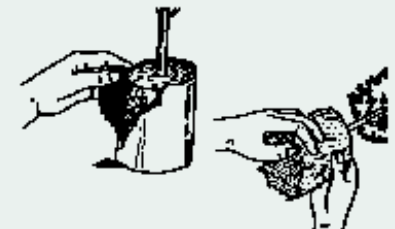
### Prepare the planting hole

The hole should be larger than the plant container or root ball. Once the hole is large enough, loosen the soil on the sides and in the bottom of the hole, to allow the plant's roots to penetrate the soil more easily. The hole should be deep enough so the collar (base of the stem where the roots start) is slightly below (1cm) ground level on most sites, and slightly above (1-2cm) on wet or saturated sites.



### Remove the plant from its pot, plastic bag or root trainer

carefully retaining as much soil around the roots as possible. If the roots are tightly bound, gently tease them apart. Root bound plants are slower growing and take longer to become well established.



### Place the plant in the hole

so the stem is the correct depth in relation to the adjacent soil surface. Before placing the plant in the hole, apply fertiliser if there is some available, to give the plant an extra growing boost. Mix the fertiliser with the loose soil in the bottom of the hole. Don't spread the fertiliser on the surface as this will just promote more weed growth.



**Gradually add soil into the hole** around the roots, firming each layer with your hands.




### Firm the soil well after the hole is filled

with the heel of your boot, leaving a slight depression to catch any rain or water run-off.





| Common / Maori Name   | Species                                  | Planting unit |            |              |       | Lifeform             | Height | Moisture requirements | Salt-wind tolerance | Planting Stage                             | Comments  |
|---|--|---------------|------------|--------------|-------|----------------------|--------|-----------------------|---------------------|--|---|
|   |  | Stream edge   | Flood area | Back wetland | Slope |                      |        |                       |                     |  |   |
| <b>Clump Formers</b>  |  |               |            |              |       |                      |        |                       |                     |  |   |
| flat leaved sedge   | <i>Carex dissita</i>                     | ✓             | ✓          |              |       | Sedge                | 50cm   | wet                   |                     | pioneer                                    | Can spread seeds under forest canopy when ground cover weeds have been controlled. Plant densely.   |
| flax, harakeke  | <i>Phormium tenax</i>                    |               |            | ✓            | ✓     | Monocot clump former | 2m     | wet or dry            | ✓                   | pioneer                                    | Very hardy with wide environmental tolerances. Unless the alluvial flats are wide, this species should be planted above frequent flood levels as it resists flood waters and can be torn out of bank. |
| purei   | <i>Carex secta</i>                       | ✓             | ✓          | ✓            |       | Sedge                | 1m     | wet                   |                     | pioneer                                    | Establishes particularly well on Auckland stream banks, even though it was not a particularly common species naturally. Can form short trunks. Plant densely.   |
| rautahi   | <i>Carex lessoniana</i>                  | ✓             | ✓          | ✓            |       | Sedge                | 1m     | wet                   |                     | pioneer                                    | Good for bank stability. Plant densely.   |
| small swamp sedge   | <i>Carex virgata</i>                     | ✓             | ✓          | ✓            |       | Sedge                | 80cm   | wet or dry            |                     | pioneer                                    | Plant densely.  |
| toetoe  | <i>Cortaderia fulvida</i>                |               | ✓          |              |       | Grass                | 1.5m   | wet or dry            | ✓                   | pioneer                                    | Smallest of the toetoes. Can be distinguished from invasive pampas by its drooping flowering spike. Able to grow on dry, disturbed, compacted sites. Plant densely.                                   |
| <b>Ferns</b> Note: Ferns will often establish naturally and may not need to be planted. |  |               |            |              |       |                      |        |                       |                     |  |   |
| gully fern  | <i>Pneumatopteris pennigera</i>          |               |            | ✓            |       | Fern                 | 1m     | wet                   |                     | shaded site<br>pioneer or forest diversity | Can form short trunks. Requires damp, shaded position.  |
| swamp kiokio  | <i>Blechnum novaezelandiae</i>           | ✓             | ✓          | ✓            |       | Fern                 | 60cm   | wet or dry            |                     | pioneer                                    | Is a hardy plant that is widespread throughout the region. Particularly important on sandy substrates.  |
| <b>Shrubs and small trees</b>   |  |               |            |              |       |                      |        |                       |                     |  |   |
| hangehange  | <i>Geniostoma rupestre</i>               |               |            |              | ✓     | Broadleaf shrub      | 4m     | mid                   |                     | forest diversity                           | Fast growing shade tolerant species that grows well beneath a canopy or gorse.  |
| karamu  | <i>Coprosma robusta</i>                  |               |            |              | ✓     | Broadleaf shrub      | 2-4m   | wet or dry            |                     | pioneer                                    | Fast growing, hardy species with wide tolerances from shade to full sun. Bird distributed, with abundant autumn berries for birds.  |
| kawakawa  | <i>Macropiper excelsum</i>               |               |            |              | ✓     | Broadleaf shrub      | 4m     | wet or dry            |                     | shaded site<br>pioneer or forest diversity | Bird distributed. Prefers shade.  |
| koromiko  | <i>Hebe stricta/<br/>Hebe macrocarpa</i> |               |            |              | ✓     | Shrub                | 2m     | dry                   |                     | pioneer                                    | Very hardy, fast growing native shrub species.  |

| Common / Maori Name  | Species                                  | Planting unit |            |              |       | Lifeform       | Height | Moisture requirements | Salt-wind tolerance | Planting Stage                                     | Comments  |
|--|--|---------------|------------|--------------|-------|----------------|--------|-----------------------|---------------------|--|---|
|  |  | Stream edge   | Flood area | Back wetland | Slope |                |        |                       |                     |  |   |
|   |  |               |            |              |       |                |        |                       |                     |  |   |
| <p>Planting stage:<br/> <b>pioneer</b> – planted first, establishes quickly and shelters other plants in planting.<br/> <b>forest diversity</b> – planted when pioneer and early species have established, added beneath the existing shelter.</p> |  |               |            |              |       |                |        |                       |                     |  |   |
| <b>Shrubs and small trees cont.</b>  |  |               |            |              |       |                |        |                       |                     |  |   |
| marble leaf, putaputaweta  | <i>Carpodetus serratus</i>               | ✓             | ✓          |              | ✓     | Broadleaf tree | 6m     | moist, wet            |                     | forest diversity                                   | Bird-distributed. Tolerant of cool, wet sites. Host to puriri moth.   |
| seven finger, pate   | <i>Schefflera digitata</i>               |               |            | ✓            |       | Broadleaf tree | 5m     | moist, wet            |                     | shaded or wetland edge pioneer or forest diversity | Grows rapidly in damp sites, particularly if there is some shade. Small fruits in autumn attract birds.   |
| tea tree, manuka   | <i>Leptospermum scoparium</i>            |               |            | ✓            | ✓     | Broadleaf tree | 4m     | wet or dry            |                     | pioneer  | Grows vigorously and has a wide ecological tolerance, including the ability to colonise inhospitable, low fertility sites and the lower slopes along brackish streams. Needs to be planted in autumn and must not have roots disturbed during planting. |
| <b>Trees</b>   |  |               |            |              |       |                |        |                       |                     |  |   |
| cabbage tree, ti kouka   | <i>Cordyline australis</i>               | ✓             | ✓          | ✓            | ✓     | Monocot tree   | 8m     | wet or dry            | ✓                   | pioneer  | Bird-distributed. Can grow on lower slopes on brackish streams.   |
| lacebark, houhere  | <i>Hoheria populnea</i>                  |               |            |              | ✓     | Broadleaf tree | 12m    | dry                   |                     | pioneer  | Leaves are a winter food for kereru. Some native birds use bark for nest material.  |
| white pine, kahikatea  | <i>Dacrydium dacrydioides</i>            | ✓             | ✓          | ✓            | ✓     | Conifer tree   | 30m    | moist, wet            |                     | forest diversity                                   | Succulent fruits eaten by birds which distribute seeds.   |
| white tea tree, kanuka   | <i>Kunzea ericoides</i>                  |               |            |              | ✓     | Broadleaf tree | 12m    | dry                   |                     | pioneer  | Major nursery species. Needs to be planted in autumn and must not have roots disturbed during planting.   |
| karaka   | <i>Corynocarpus laevigatus</i>           |               | ✓          |              | ✓     | Broadleaf tree | 12m    | moist                 | ✓                   | forest diversity                                   | Large orange fruits in summer attract kereru.   |
| kauri  | <i>Agathis australis</i>                 |               |            |              | ✓     | Conifer tree   | 25m    | dry                   |                     | forest diversity                                   | Survives in infertile soil.   |
| kohekohe   | <i>Dysoxylum spectabile</i>              |               |            |              | ✓     | Broadleaf tree | 15m    | mid                   |                     | forest diversity                                   | Bird-distributed seed. Highly palatable to possums.   |
| kowhai   | <i>Sophora microphylla/S. chathamica</i> |               | ✓          |              | ✓     | Broadleaf tree | 10m    | dry                   | ✓                   | pioneer  | Fast growing, semi-deciduous. Useful for erosion control. Yellow flowers in spring attract tui  |
| mahoe  | <i>Melicetyus ramiflorus</i>             |               | ✓          |              | ✓     | Broadleaf tree | 10m    | wet or dry            |                     | pioneer  | Best planted in autumn. Establishes more slowly than other bank stabilising species, but is a very common species in young riparian vegetation throughout the region. Shade tolerant. Abundant purple fruits in late summer attract birds.              |

| Common / Maori Name  | Species                         | Planting unit |            |              |       | Lifeform       | Height | Moisture requirements | Salt-wind tolerance | Planting Stage             | Comments  |
|--|---------------------------------|---------------|------------|--------------|-------|----------------|--------|-----------------------|---------------------|----------------------------|---|
|  |                                 | Stream edge   | Flood area | Back wetland | Slope |                |        |                       |                     |                            |   |
| <p><b>Trees cont.</b></p> <p>Planting stage:<br/> <b>pioneer</b> – planted first, establishes quickly and shelters other plants in planting.<br/> <b>forest diversity</b> – planted when pioneer and early species have established, added beneath the existing shelter.</p> |                                 |               |            |              |       |                |        |                       |                     |                            |   |
| mapou  | <i>Myrsine australis</i>        |               |            |              | ✓     | Broadleaf tree | 6m     | dry                   |                     | pioneer                    | Bird distributed.   |
| NZ honeysuckle, rewarewa   | <i>Knightia excelsa</i>         |               |            |              | ✓     | Broadleaf tree | 25m    | dry                   | ✓                   | forest diversity           | Slender, tapering tree with long, narrow serrated leaves. Rich nectar in summer attracts bellbirds and tui.               |
| pigeonwood   | <i>Hedycarya arborea</i>        |               |            |              | ✓     | Broadleaf tree | 12m    | dry                   |                     | forest diversity           | Fruits popular with kereru. Requires some shelter from winds and protection from frost while young.                       |
| pukatea  | <i>Laurelia novae-zelandiae</i> |               |            | ✓            |       | Broadleaf tree | 25m    | moist, wet            |                     | forest diversity           | Slow growing, but characteristic of wet sites   |
| puriri   | <i>Vitex lucens</i>             |               |            |              | ✓     | Broadleaf tree | 20m    | wet or dry            |                     | forest diversity           | Prefers fertile sites. Year round flowers and fruit provide food for bellbirds, tuis and kereru. Frost tender when small. |
| rimu   | <i>Dacrydium cupressinum</i>    |               |            |              | ✓     | Conifer tree   | 30m    | mid                   |                     | forest diversity           | Bird-distributed. Midslope species.   |
| swamp maire, maire tawake  | <i>Syzygium maire</i>           |               |            | ✓            |       | Broadleaf tree | 7m     | wet                   |                     | forest diversity           | Needs moisture. Bird-distributed. Develops breathing roots in waterlogged soils.  |
| taraire  | <i>Beilschmiedia tarairi</i>    |               |            |              | ✓     | Broadleaf tree | 20m    | mid                   | ✓                   | forest diversity           | Frost tender. Large rounded glossy leaves. Big purple fruit eaten by kereru, in autumn-early winter.                      |
| titoki   | <i>Alectryon excelsus</i>       |               |            |              | ✓     | Broadleaf tree | 8m     | mid                   |                     | pioneer & forest diversity | Prefers fertile sites. Bird-distributed.  |
| totara   | <i>Podocarpus totara</i>        |               |            |              | ✓     | Conifer tree   | 30m    | moist or dry          |                     | forest diversity           | Survives well on dry and exposed sites. Orange-red fruits eaten by many native birds.                                     |
| whauwhaupaku, fivefinger   | <i>Pseudopanax arboreus</i>     |               |            |              | ✓     | Broadleaf tree | 8m     | moist or dry          |                     | pioneer                    | Very hardy species. Has bunches of succulent purple fruits.   |
| wineberry, makomako  | <i>Aristotelia serrata</i>      |               |            |              | ✓     | Broadleaf tree | 8m     | moist                 |                     | pioneer                    | Fruit a favourite of tui and silvereye. Fast growing. Provides shade for other species.                                   |