Integrating native planting and flood protection:
an operational guide for Greater Wellington

2021

Greater Wellington
Te Pane Matua Taiao

CONTENTS

1 INTRODUCTION

This guide is for Greater Wellington (GW) staff who carry out flood protection works. The aim is to increase the proportion of native species in riverside planting on the rivers that we manage for flood protection in the Wellington region.

We are responsible for enhancing biodiversity as well as flood protection. There are many situations where these two tasks can be complementary and better integrated. This guide explains how to recognise opportunities to do this, and put it into practise. This guide includes information on how to:

- look broadly for opportunities at the river-system-scale
- look for specific situations where native planting could be used
- decide how to proceed, and optimise success, by using detailed criteria.

1.1 Why use more native plants?

All plants provide important ecosystem services such as cleansing the air, producing oxygen, storing carbon and regulating air temperature. In river environments, plants used for flood protection provide ecosystem services such as controlling erosion and filtering runoff. Willow planting has been a dominant method of flood protection in the past, and will continue to be used. However, using more native plants increases indigenous biodiversity. This increase broadens the range of ecosystem services and improves environmental resilience.

Native plants are also culturally significant and an important part of New Zealand's national identity. Tangata whenua value many native plants for a range of traditional uses. In the modified landscapes of our region's floodplains, rivers are valued as important natural features and the presence of native vegetation can reinforce that sense of natural character.

1.2 Definitions

Figure 1: *cross section of river corridor*

River corridor: The space set aside on a floodplain for a river to flow, separate from assets and places that could be adversely affected by floods (e.g. housing, roading). The river corridor is designed and managed to cope with any changes that could occur naturally in a river, while also reducing the flood risk. For example, the width and form of the riverbed may vary depending on the amount of gravel carried down and deposited, but it is managed to remain within guidelines.

Within the river corridor there are two distinct zones where planting takes place:

- buffer zone: The 'front line' of flood protection. It forms the margin of the riverbed, where the river flows at low or normal levels. The buffer zone withstands the 'high energy' flows which can cause erosion, and may be strengthened with built structures or planting. The width of the buffer zone and riverbed can vary as the river changes over time
- river berm: The area between the buffer zone and a stop bank or naturally higher ground. This is where the river overflows during floods.

Stop bank: An embankment constructed to contain floodwaters within the river corridor.

2 TYPICAL SITUATIONS IN THE RIVER CORRIDOR

2.1 Optimising success

We have researched methods for bringing more native plants into the river corridor, and learnt from experience in the field. For these methods to work, the context is important.

> There is no standard formula. Each site will be different. Consider the type of river, the way the local community values it, and the site-specific features, then decide your approach.
> Look for winners. Focus on sites with suitable conditions that will be practical to manage. Work with what's already there if it gives you a head start (e.g. a sheltered site in the lee of existing trees).

Think about the 'big picture' when looking for opportunities to increase native vegetation. It is useful to think about the flood protection scheme as a ***system*** of inter-related factors that affect the level of risk. For example:

- erosion risk increases downstream as river volume and velocity increases
- there is less risk to stop banks and assets where wide river berms provide more overflow capacity.

Figure 2 on the next page illustrates typical situations where site conditions may be suitable for native plants on their own, or in combination with willows or hard structures.

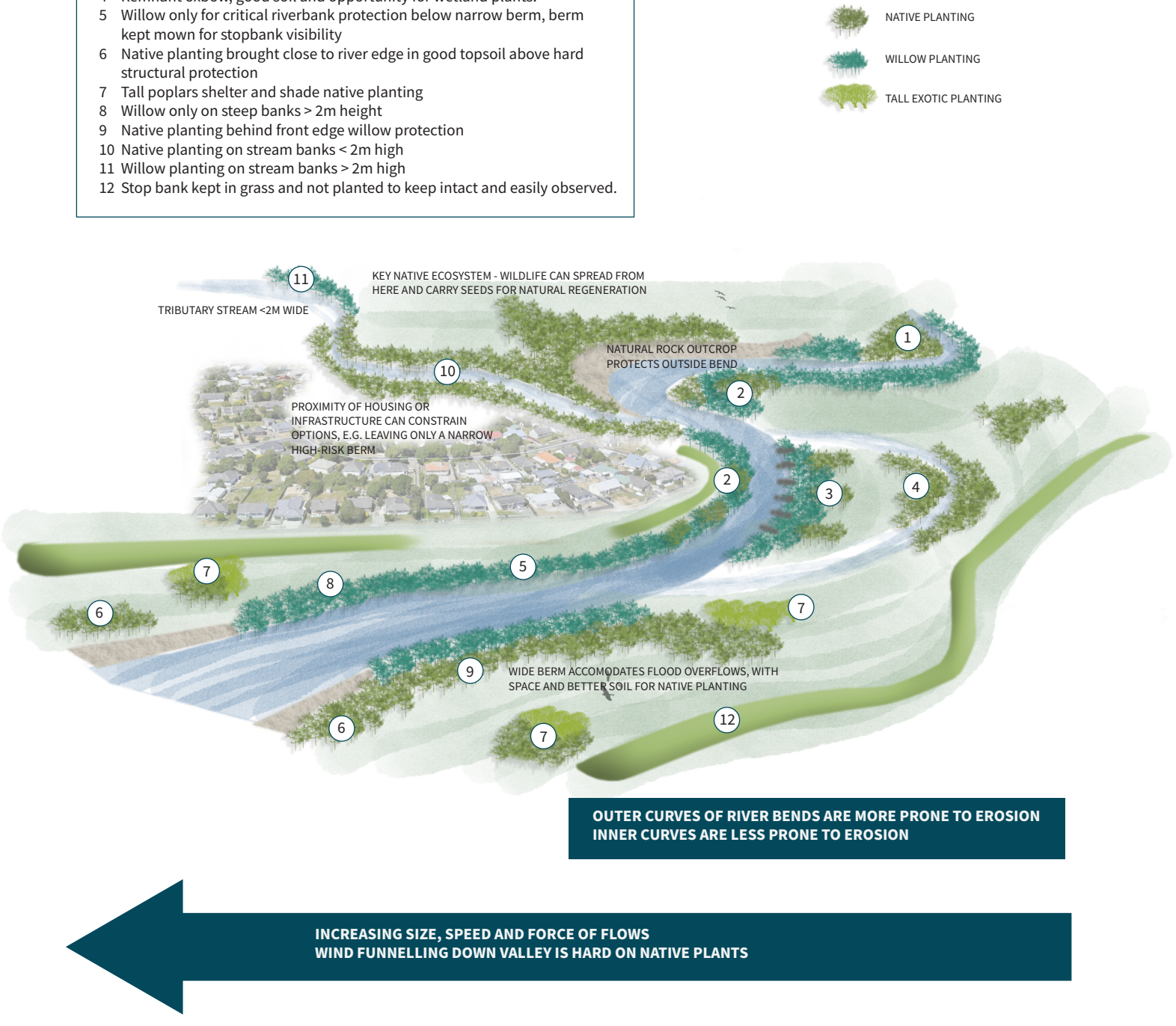
Other factors to think about are:

> resourcing and cost: See the decision-making flow chart in section 4
> community perceptions and participation: See section 5.

2.2 Opportunities for native planting

Figure 2: *Native plants can be introduced in different ways along rivers and small waterways. This depends on site factors, as shown in these typical situations.*

1 Native planting inside bend, easy access
2 Native regeneration within willows, seed from Key Native Ecosystems
3 Intermixed planting, with groynes reinforcing straight river edge
4 Remnant oxbow, good soil and opportunity for wetland plants.
5 Willow only for critical riverbank protection below narrow berm, berm kept mown for stopbank visibility
6 Native planting brought close to river edge in good topsoil above hard structural protection
7 Tall poplars shelter and shade native planting
8 Willow only on steep banks > 2m height
9 Native planting behind front edge willow protection
10 Native planting on stream banks < 2m high
11 Willow planting on stream banks > 2m high
12 Stop bank kept in grass and not planted to keep intact and easily observed.



3 NATIVE PLANTING TECHNIQUES OVER TIME

There are several ways to introduce native plants into the river corridor. The choice at any site will be informed by a combination of site conditions, cost and time.

Decisions on planting should be made with long-term goals in mind. Here's an example:

> short term: after assessing options, willows are planted alone (see Section 4 decision-making)
> ten years later: the willows have created a 'nurse' environment where native seedlings are now regenerating
> 15 or more years later: the time may be right to plant more diverse native plant species (if local seed sources are limited).

Table 1: ways to introduce native plants into the river corridor

	Propagation and planting: *plant faster growing, hardy native species into prepared areas or rows.*	**Natural regeneration:** *encourage native plants to grow from seeds spread by birds.*	**Enhancement planting:** *plant slower growing, longer lived species throughout established native or exotic cover.*
What's involved?	• seed collection • propagation • spraying • mulching • minimum two-three years' maintenance.	• control invasive weeds. • thinning willows as required.	• thinning at dispersed planting sites • control invasive weeds.
Timing from bare site	One-five years	Five-ten years, if existing cover is well established and provides shade and shelter.	Ten or more years, if existing cover is well established and provides shade and shelter.
Plant diversity	Least Diverse: all hardy, pioneer species.	More diverse: mostly pioneer species, depending on local seed sources.	Most diverse.
Cost (assuming invasive weed control is common to all)	Most costly: propagation, labour for site preparation and site maintenance.	Least costly: no propagation.	Moderate cost: propagation and planting labour.
Site selection	Pick winners due to cost: • good soil • some shelter • easy access for preparation planting and maintenance.	Established existing willow cover with: • shade • shelter • organic layer • seed sources.	Well-established mixed or native planting with: • shade • shelter • organic layer • easy access.

The following examples illustrate how techniques for increasing native plant cover vary according to site conditions, and in response to changes over time.

3.1 Planting Bare sites – streams & rivers

3.1.1 Small stream – riparian planting

Native planting can be safely used where there is a low erosion risk. If the channel is less than two metres wide, with banks less than two metres high and gently sloping, the erosion risk is low.

The cost of planting is justified by:

- planting onto a favourable site with good soil, increasing the chance of success
- the potential to enhance water quality by providing shade
- increasing riparian biodiversity.

Use hardy pioneer plants to optimise survival. They will usually close over the ground after four-five years, reducing maintenance.

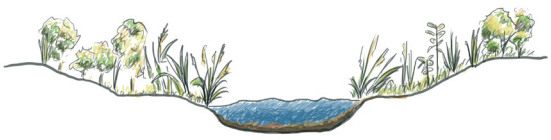


Figure 3 (a) Year one. *On small streams, low-growing sedges, toetoe and flax can be included in the first planting of hardy, fast-growing native species (see plant lists, section 4.4).*

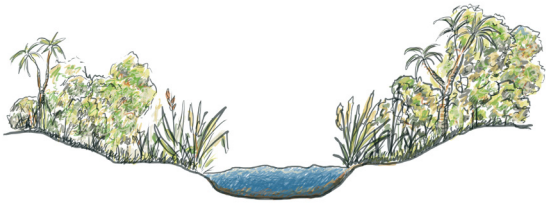


Figure 3(b) Year ten. *The first planting is well-established, and an organic soil layer is developing. The environment is suitable for enhancement planting of taller but slow growing native trees (e.g. podocarps).*

Figure 3 (c). *Spray the site with pre-emergent herbicide before planting, to reduce weed competition and maintenance. Use biodegradable weed mat if budget allows (see left). This suppresses weed competition in the first several years while the plants are establishing.*

3.1.2 Willow pole buffer zone planting

Plant willows in areas with high erosion risk and/or where the soil is of poor structure and fertility. Over time, willows will create conditions more suited to native plants. Natives may regenerate naturally amongst the willows (see right below) or can be encouraged (see section 3.2).

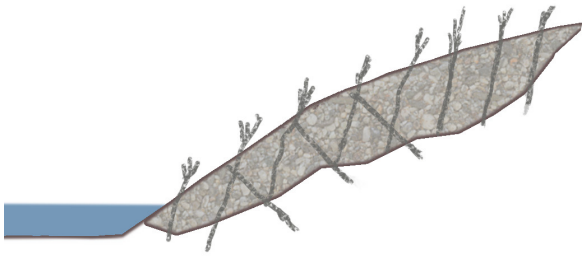


Figure 4 (a), Year one. *The buffer zone has been reshaped, made up of river stones and gravel with some sediment in the gaps. Willow poles alone are used to quickly stabilise the river edge and hold sediments.*

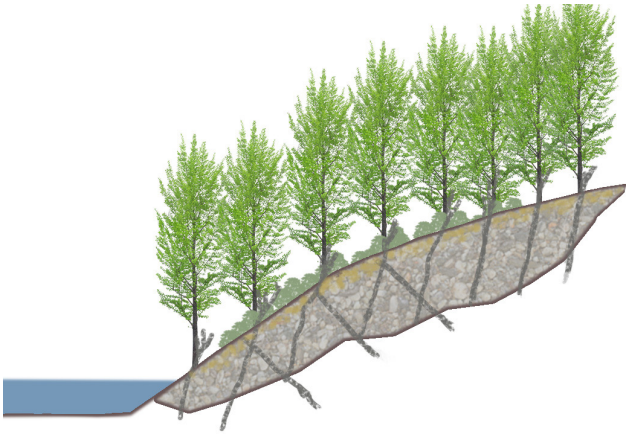


Figure 4 (b), Years five-ten. *The willows are well-established trees. Grass cover under the trees has helped to catch sediments, and an organic top layer has formed. Native seedlings are developing well with the improved soil, shade and shelter. The willows continue to provide edge protection.*

3.1.3 Mixed willow and native buffer zone planting

Willows and native species can be intermixed in new planting where there is:

- moderate to low erosion risk
- good soil (or ability to add soil) and
- good access for the extra site preparation and maintenance native planting needs.

Use mixed planting where other factors can justify or offset the extra cost of natives, such as sites where:

- there is little existing native vegetation
- there is good soil, but strong winds. Fast-growing willows will shelter the native plants
- reliable volunteer labour is available for maintenance.

Intermixing can be done in various ways, as illustrated below. After 15-20 years, you can gradually increase the proportion of native plants by replacing some of the willows with native enhancement species. This will be more effective if the site is reasonably stable and the front edge is well protected.

Alternatively, consider thinning patches of the willows to encourage natural regeneration of native plants in the created 'light wells'.

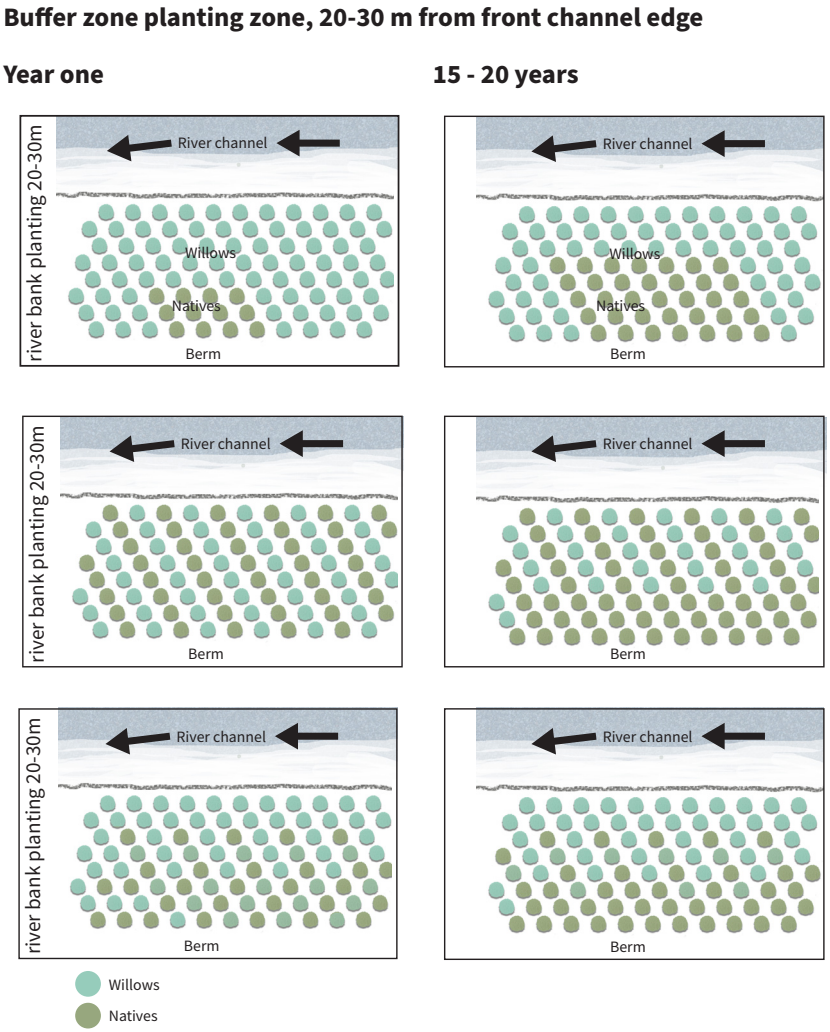


Figure 5 (a). *Willows at the front edge with blocks of native plants behind. Over time, the native planting can be expanded outwards.*

Figure 5 (b). *Rows of willow alternating with rows of natives. Over time, replace willows at the back of the rows with natives.*

Figure 5 (c). *Willows at the front edge with 50/50 mix of willow and native behind. This is more labour intensive, but could be warranted on exposed sites where the close inter-planting will benefit natives with shade and shelter. Increase the proportion of natives gradually over time.*

Figure 6 (d): *Example of alternating native/willow plants within planting rows. Note the easily accessible site and the plant protectors on the native plants, which are more vulnerable than willows to browse damage from pests such as rabbits. Te Awa Kairangi/Hutt Rriver.*

3.1.4 Native Planting with hard structure protection

Make use of opportunities where hard structure flood protection allows native plants to be brought closer to the river channel. This is less possible where only soft protection is used.

Figure 7 (a). *Where rock rip rap or gabion baskets are used to protect river edges, the buffer zone is protected by the hard structure. Soil-binding willows are not needed here, and native species can be planted close to the river on the berm. If construction has caused poor soil structure, bring in topsoil to help get the planting off to a good start.*

Figure 7 (b). *On a wide, exposed river berm, consider limiting planting to the hardiest species in section 4.4, and include toetoe and flax for fast ground-level shelter.*

Alternatively, use quick-growing exotics, such as alders or poplars, to 'nurse' native plantings. Once the hardy pioneers are well-established with a closed canopy, gradually remove the nurse trees and diversify by planting more native species.

3.1.5 Berm planting – second line

Where willows are needed in the buffer zone, consider planting a 'second line' of native planting on the berm behind. Look for opportunities where the willows shelter the berm and where there is good soil.

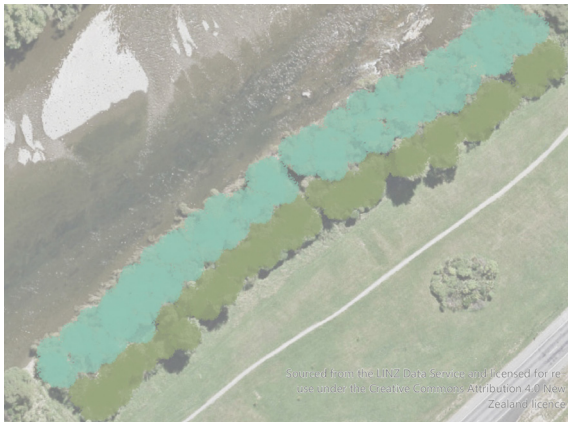


Figure 8 (a).

Willows, well-established on the buffer zone

Native planting on well prepared site in the sheltered 'lee' of the berm

Figure 8 (b).

Good river loam on the berm and easy drive-on access made this a good choice for a second line of native planting behind willows, especially with the ready seed source provided by the Key Native Ecosystem on the hill behind.
(Hulls Creek Forest & Bird project.)

Figure 8 (c).

An initial planting of mixed pioneer species is now well established. Enhancement plants can now be introduced (e.g. rewarewa, totara).

Natural regeneration is also occurring.

3.1.6 Berm planting – discrete groups

Look for opportunities for native planting on wide river berms, where clear flood overflow paths can be maintained around grouped plantings. This may not be feasible on narrow berms.

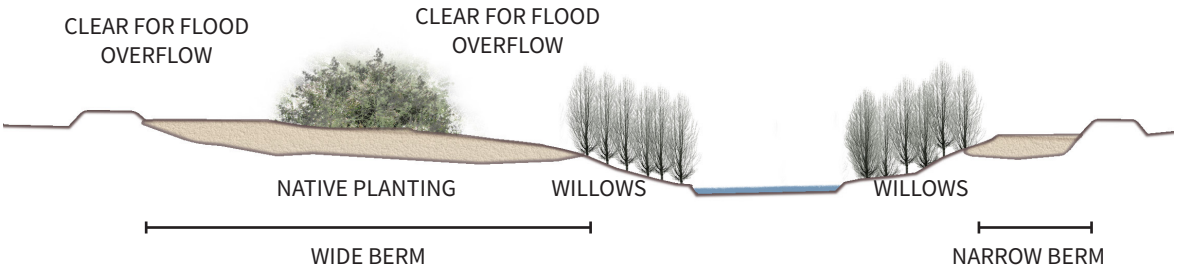


Figure 9 (a). *Opportunities for grouped berm plantings are present on wide berms (left) but are more limited on narrow berms (right).*

In some areas, the wide, open river berms can be exposed to winds funnelling down the river valley, which can cause native plants to struggle. In these situations, consider planting fast-growing tall exotic trees, such as poplars, alders or eucalypts as a nurse cover to shelter and shade native planting (see below). These tree stands can break up the wind flow and improve the visual and recreational amenity of otherwise exposed expanses of grass in the river corridor. Establish a small range of hardy native species under or in the lee of the tall exotics, then start enhancement planting of slower-growing tall native trees to eventually replace the exotic trees.

Figure 9 (b) 5 years after planting. *Fast-growing poplars now provide enough shade and shelter to prepare the site for underplanting with hardy native trees and shrubs.*

Figure 9 (c) 3-4years later. *The native underplanting is coming on well, but some areas have yet to close over (foreground). In another 3-5 years enhancement planting can begin.*

Note: This is a simulation

3.2 Adapting established willow planting

Take advantage of the favourable conditions that established willows provide (shade, shelter and organic topsoil content). Adapt the willow planting to accommodate more natives. This can be an effective and less risky way of bringing native plants closer to the river, rather than planting large bare sites. Encourage natural regeneration where there are local sources of native seeds for birds to carry in, especially where access is limited. Consider planting under the willows, where there is reasonable access and a lack of local seed sources.

Note: The favourable 'nurse' conditions mean that more diverse native species can be planted in addition to hardy pioneers. Several adaptive methods are shown below.

3.2.1 Native regeneration under established willows

Figure 10 (a). *Encourage regeneration by thinning areas of willow to let in more light, especially where native seedlings are already appearing.*

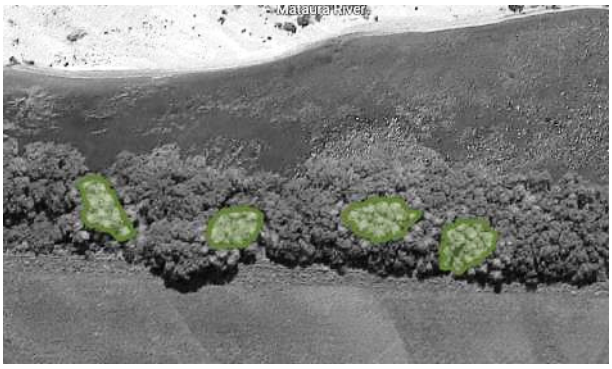


Figure 10 (b). *Over time, extend the thinned willow patches as the native patches develop, with further thinning around the edges.*

Figure 10 (c): *Native shrubs have regenerated under the willow canopy. Thinning patches of willow can create 'light wells' to encourage growth of the native trees within the main willow block.*

3.2.2 Ripping into established willow

Rip strips for native planting into the willows, extending close to the river channel where there is low erosion risk.

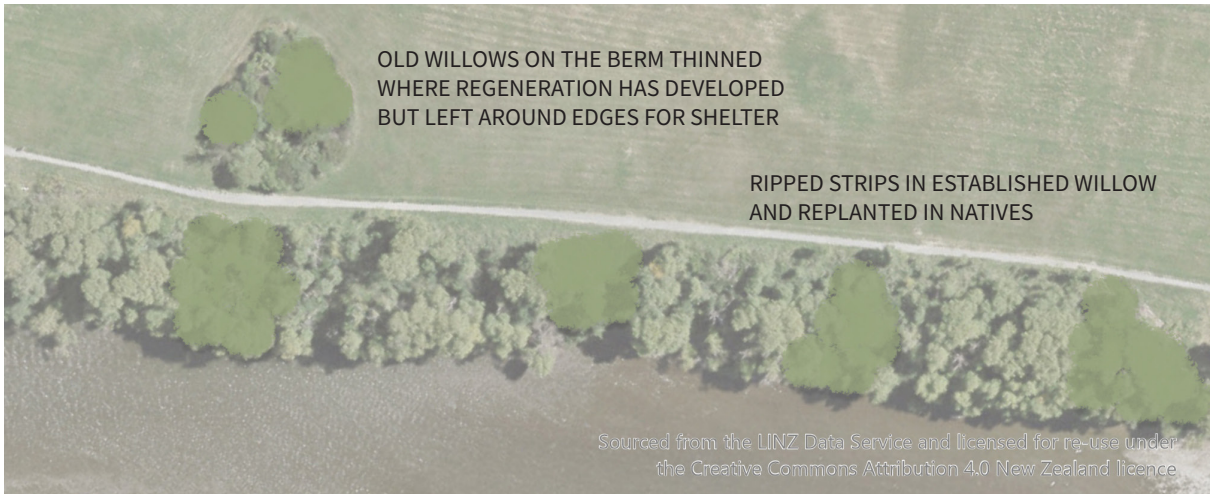


Figure 11 (a). *The buffer zone is sufficiently stabilised, and native planting can be extended to the front edge in some places. The established willows continue to protect most of the buffer zone.*

Figure 11(b). *Flax is placed towards the back of the native planting zone, where it is less likely to get washed away and cause downstream blockages.*

3.2.3 Introduce natives where rock groyne buffer zone has stabilised

Where rock groynes and willows were originally put in place to stabilise and rebuild the buffer zone, look for opportunities some 10-15 years later to start introducing natives.

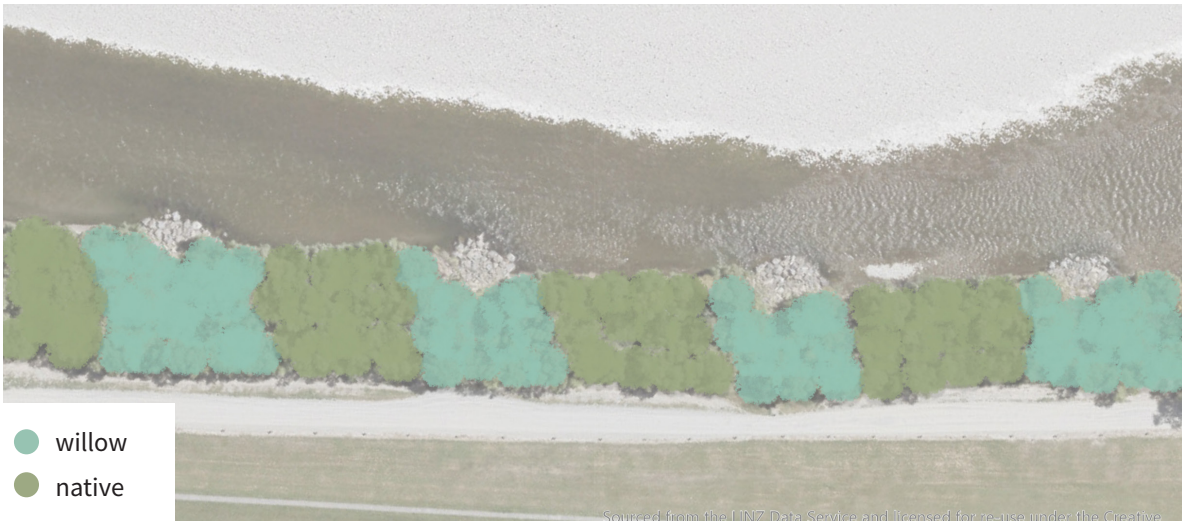


Figure 12. *Gradually replace the willows with native plants in bands. This can extend to the river edge on the downstream side of the groynes, where erosion risk is less and sediment is often deposited. Keep the established willows on the more vulnerable upstream side of each groyne. Monitor this closely, as erosion can occur between the groynes.*

3.2.4 Old willows in need of rejuvenation (20 – 25 years after original planting)

After 20-25 years, willows need a hard prune to rejuvenate them. Where the site is well stabilised, consider replacing a proportion with natives. Protect well-established native trees that have already regenerated, and remove patches of willow to encourage native regeneration or to do native enhancement planting.

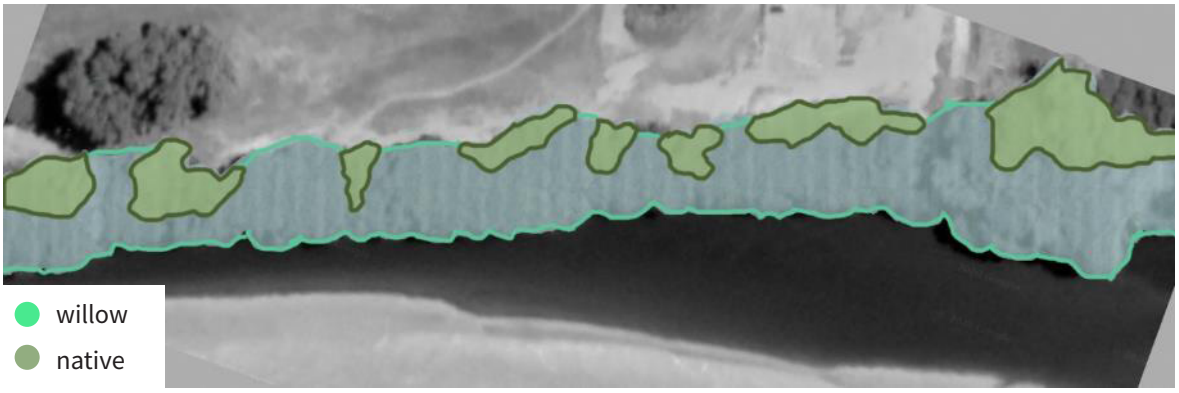


Figure 13. Selective replacement of willows with natives, during rejuvenation pruning.

3.3 Rural situations

River environments in rural areas are usually larger and less groomed than rivers near urban areas. This difference presents different opportunities and challenges for increasing biodiversity and native vegetation.

3.3.1 Riparian weeds

Large areas of weedy vegetation such as gorse, broom and tree lucerne often establish in rural riverbeds. These areas are often large scale, remote, and exposed to harsh conditions, making native restoration planting difficult and expensive.

Although these areas are weedy, they still provide some ecosystem services including soil binding, filtering of runoff, and habitat for wildlife. This vegetation can also be used as a nurse cover for native plants. Natives will regenerate if there are nearby seed sources which can be distributed by birds. Select areas where some native plant regeneration is occurring (see 3.3.2 winner sites) and encourage the regeneration by:

- controlling weed species that smother regenerating natives (e.g. blackberry and old man's beard)
- fencing out stock where necessary.

Figure 14. *Weedy scrub in rural river corridors can support native plants regeneration over time.*

3.3.2 Winner sites

Picking 'winner sites' (see 2.1 optimising success) is relevant in the large-scale environments of rural rivers. This involves using available resources for specific areas where success is more likely and measurable. It is better to focus on fewer sites and achieve some 'wins' which can be built on, than spread effort and resources thinly over numerous sites, and achieve poor results.

Look for remnants in the river corridor that can be extended and enhanced over time. A remnant might be a surviving totara, or a small group of kowhai and cabbage trees. Control weeds such as blackberry that threaten to smother native regeneration and, if resources allow, plant natives around the edges.

Figure 15. *Even a single remnant native tree can be the starting point for planting or encouraging regeneration around it.*

Figure 16*. A potential 'winning site' on the Tauherenikau River. The wide vegetated berms upstream of the bridge are easily accessible and ideally placed to receive bird dispersed seed. This may be sourced from the scattered mature podocarps on nearby paddocks and from the native bush remnant (lower right).*

3.3.3 Crack and grey willow

Crack and grey willow are 'unwanted organisms' under the Biosecurity Act, which means that they are not to be propagated or planted. Under the operative ***Regional Freshwater Plan for the Wellington Region (2014)*** it is nevertheless permitted to use both species for layering and tethering on rivers where crack and grey willow predominate, mainly in the eastern part of the region.

This continued use of crack and grey willow is not desirable and should be phased out over time. When loose sticks and branches are carried downstream, they can take root and form dense thickets. This can increase flood risk by causing blockages, and adversely affect biodiversity by smothering or excluding desired vegetation.

Eradication of both species from the affected rivers is a big task, but not impossible. Start planning a long-term control programme that can be implemented by gradually replacing the crack or grey willow with non-invasive willow hybrids, native plants, or a mixture of both.

The key considerations for getting started are:

- start at the top of the catchment and work down
- poison and leave to die off where they are, rather than cutting for removal. Any live fallen material can readily re-sprout
- work with manageable areas, even if they are small. Over time, the areas will add up and downstream spread will gradually reduce.

See the page on each species on www.weedbusters.org.nz and consult GW's biosecurity officers for advice on devising a control programme.

Figure 17. *Dead willows after poisoning.*

4 DECISION-MAKING

Draw up a list of potential sites then decide which your 'winners' are. The typical situations and techniques outlined in Sections 2-3 should be taken into account.

- consider what river bank protection is needed – hard, soft or a combination. See 4.1.
- if using soft (planted) protection, consider what type of planting. See 4.2.
- use the decision-making flow chart to firm up your plan. See 4.3.

Look for winners

✓ Focus on sites with favourable conditions that will be practical to manage

✓ Look for things that give you have a head start

4.1 Hard and soft flood protection – Criteria for Use

Use Table 2 to help determine where to use soft protection, then refer to Section 4.2 for guidance on the use of exotic and native species in planting.

Hard protection involves built structures that reinforce river banks, absorb energy and deflect the current.

Soft protection involves planting which reinforces river banks with soil-binding root systems.

Hard structures are the most effective at river edge protection, if they are well designed. However, they are expensive and support few other river values. A combination of hard and soft measures is often best.

Table 2: comparison of hard and soft buffer zone protection.

Note: this table is a simplified summary of the factors considered when planning flood protection works. For more detail, refer to the GW *Code of Practice for River Management Activities.*

ATTRIBUTES	**Hard protection**	**Soft protection**
Longevity	Permanent if rock top-up continues.	• 20-30-year rejuvenation cycle • Can become more effective and self-sustaining as soil builds up.
Maintenance	• rock top-up • may involve some instream works to form a working platform for machinery.	May involve intensive instream works, especially during establishment.
Ecosystem services: catching runoff & sediment	Low value: • limited flood absorption • low filtering • limited habitat values • can be improved by building to create niche fish habitat and varied aquatic conditions (e.g. pools, different flow velocities).	High value (see 1.1).
Natural character and aesthetics	Low value: • functional, engineered appearance. • visual impact can be reduced if combined with planting.	High value, especially if native.
Cost	More expensive.	Less expensive.
CRITERIA FOR USE ON FRONT EDGE OF BUFFER ZONE **Note:** the extent of flood risk is the key determining factor		
Steep, high (> 2m) buffer zone	✓ especially where assets at risk.	✓ if species is fast-growing with good soil-binding.
Subject to fast, forceful flows (e.g. outer bend of river)	✓ especially where assets at risk.	✓ if species is fast-growing with good soil-binding.
Protection needed quickly	✓ effective as soon as built.	× takes time to establish & bind soil.
Berm width	✓ narrow berm.	✓ wide berm.
WHERE MOST OFTEN USED		
Scenario	• lower river reaches • higher erosive force due to greatest water volume and velocity • around infrastructure such as bridges.	• higher reaches • smaller watercourses where banks are lower • where there is less erosion risk.

4.2 Planting – exotic or native or both?

4.2.1 Willows

4.2.1.1 Advantages

Willows are very effective for front-line river edge planting because:

- their fast growing root systems bind soils where erosion is a risk
- they are deciduous, which allows light for grass and other herbaceous plants to grow underneath, helping to bind top soil
- they are hardy in exposed sites
- they tolerate poor and weakly structured soil
- over time, they can help to rebuild river banks and soils by catching river-borne silt and adding organic matter from fallen leaves
- they are easy to propagate and establish with little maintenance.

Purpose-bred sterile willow hybrids that don't self-seed are now used instead of the invasive varieties used historically.

Figure 18: *willows will grow from poles driven into the ground with 90-100% success rates, even on sites disrupted by major ground works.*

4.2.1.2 Disadvantages

Mass willow planting provides a limited variety of habitat and food for wildlife. Like all trees, willows are susceptible to various parasites. There is a risk of catastrophic die-back if they are used exclusively within a river corridor. Willows need to be renewed every 15-30 years.

Willows are best suited to:

- **buffer zones where front edge protection is needed, but there is no hard structure protection**
- **river or stream banks > 2 m high**
- **poor quality or weakly structured soil**
- **exposed sites with little shade or shelter**
- **sites where fast establishment is required**
- **narrow river berms**
- **where fencing to exclude stock is not possible**
- **sites where budget is limited.**

4.2.2 Other exotic species

Alders and poplars are also fast-growing, hardy species used for flood protection. They are less suited to buffer zone protection, but can be used for tall group planting in river berms. They can provide an attractive visual feature in the river corridor while offering shade and shelter to 'nurse' slower growing native species that can eventually replace them.

4.2.3 Native planting

4.2.3.1 Advantages

Diversifying river corridors by planting native species can:

- support biodiversity by bringing variation to habitats and food sources
- supply year-round leaf litter for invertebrates, due to being mostly evergreen species
- reinforce river edges, if given several years to establish without exposure to severe floods
- introduce long-lived plants that may save planting renewal costs in the long term (some natives can live 100+ years)
- reduce the impact of possible willow die-back.

4.2.3.2 Disadvantages

While some lower growing species can establish with time, native plants can cause issues due to:

- low levels of survival on the front river edge near the active channel
- their slow growth rate and shallow roots, which are rarely deeper than 2m
- their low tolerance for poor soil fertility and structure
- the soil not being stabilised quickly
- the higher cost involved in propagation, planting and ongoing maintenance
- blockages if washed downstream
- taller, shallow rooted trees on river edges decreasing bank stability
- blocking the light needed for lower growing herbaceous plants which bind top soil
- needing protection from stock damage.

Native plants are best suited to:

- **small waterways (< 2m wide) if bank heights are less than 2m**
- **buffer zone front edge in larger rivers where there is low flow velocity and no active erosion**
- **areas behind hard or soft (willow) front edge buffer zone protection**
- **combination planting with willow or exotic 'nurse' species (see 4.2.4 below)**
- **readily accessible sites where demanding planting and maintenance will be easier**
- **berms. Especially on large berms back from the river channel, with better soil conditions**
- **shaded and sheltered sites, for both planting and natural regeneration**
- **sites where grazing stock is absent or can be fenced out**
- **rivers, or parts of the river, that are being managed to achieve a more natural flow pattern (e.g. meandering).**

4.2.4 Mixed willow and native

Willows are currently the main planting option for stabilising at risk river edges. However, longer-lived native species are likely to play a greater role in river management as they establish over time.

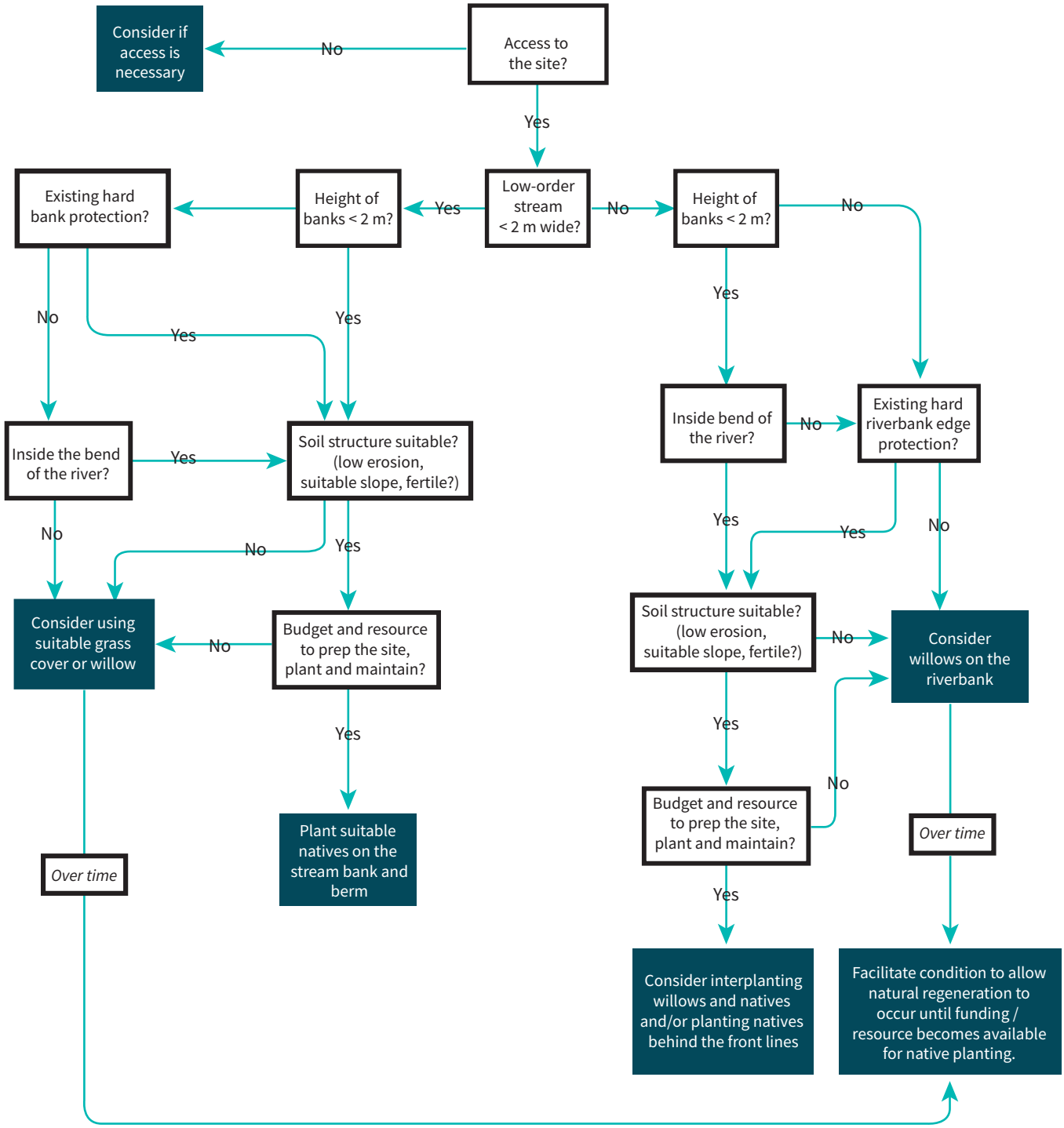
In the long term, more intermixing is likely to achieve a good balance of flood protection and biodiversity, with improved landscape character and resilience. Techniques are still being researched, but some examples of intermixed planting are described in section 3.1.3.

4.3 Decision-making Flow chart

Use the flow chart in Figure 19 to determine the appropriate planting choice for each site.

The ultimate objective is to increase the proportion of native plants in the river corridor.

Figure 19: *Decision-making flow diagram*



4.4 What to plant

4.4.1 Plant lists:

The following lists have been compiled to optimise native planting success in the river corridor. The first objective in most sites is to establish a small selection of reliable species. Later, you can diversify with planting of less hardy, slower growing species where there are good conditions. Many of the listed plants will attract birds, which assist regeneration through seed dispersal.

For more guidance on species selection, planting techniques and maintenance requirements:

- refer to *Wellington Regional Native Plant Guide 2010*
- talk to a GW biodiversity advisor.

List 1 – Reliable pioneers – hardy, fast-growing, better survival in harsh conditions and under periodic inundation

➢ Use anywhere but particularly on open, exposed sites

Species name	**Common name**	**Factors to consider [Keep this simple: tolerates dry/ damp; frost hardy/tender; coastal/non/coastal; long-lived heritage tree]**
Aristotelia serrata	Makamako / wineberry	Fast growing, useful coloniser, frost hardy, prefers open sunlight
Coprosma robusta	Karamū	Very hardy coloniser, tolerates wide range of conditions, attracts birds
Cordyine australis	Ti kōuka / cabbage tree	Durable tree, grows in wet areas, open sites, hardy, attracts birds.
Dodonea viscosa	Akeake	Small hardy tree, excellent as windbreak, including coastal winds. Fast growing
Hebe stricta	Koromiko / hebe	Hardy, fast growing, tolerates dry conditions, good in riparian plantings
Kunzea ericoides	Kanūka	Hardy, useful for revegetation and shelter, resistant to rabbits, prefers open sunlight
Leptospermum scoparium	Manūka	Hardy coloniser, tolerant of damp and dry
Myoporum laetum	Ngaio	Quick growing coastal tree, wind hardy
Myrsine australis	Māpou / red matipo	Small compact hardy tree, nice foliage, attracts birds
Olearia paniculata	Akiraho	Hardy fast growing, provides good shelter
Plagianthus regius	Mānatu / ribbonwood	Quick growing, hardy, upright, small deciduous tree
Pittosporum tenuifolium	Kōhūhū	Very hardy small tree. Good for revegetation or as a specimen. Attracts birds
Pittosporum eugenioides	Tarata / lemonwood	Hardy fast growing , good for revegetation. Attracts birds
Podocarpus totara	Tōtara	Hardy, tolerant of a range of conditions, good in revegetation projects or as a specimen
Pseudopanax arboreus	Puahou / five finger	Hardy, versatile plant, good for revegetation, attracts birds
Sophora microphylla	Kowhai	Hardy small tree, prefers open sunlight and average conditions. Spring flowering, very attractive to native birds

List 2 = native ground covers

Use on:

- Streams < 2m width.
- Rivers at the back of buffer zone planting or on berms.

➢ *Carex secta*	Pukio / Sedge	Large vigorous green sedge, forms lifted tufts in swamps
➢ *Austroderia toetoe*	North Island toetoe	Hardy, tolerant of wide range of conditions
➢ *Phormium cookianum*	Whararikí / mountain flax	Hardy, tolerates salt winds, prefers full sun and well drained soils, attracts birds
➢ *Phormium tenax*	Harakeke / flax	Very hardy, excellent shelter, tolerates wet, dry and cold, attracts birds

List 3 - Coastal / tidal influence

- Use where salinty is a factor through tidal influence in the river/stream (which limits willow survival) and/or where exposed to salt-laden winds.

Apodasmia similis	Oioi	Suited to front edge
Cyperus ustulatus	Coastal cutty grass, giant umbrella sedge	Prefers wet but tolerates wide range of conditions
Juncus kraussii	Sea rush	Ground cover suited to front edge
Juncus usitatus	Common Rush	Ground cover suited to front edge
Coprosma repens	Taupata / mirror plant	Shrub, upper bank or berm
Muehlenbackia complexa	Small-leaved pohuehue / wire vine	Shrub, upper bank or berm
Plagianthus divaricatus	Salt marsh ribbonwood	Hardy shrub, likes wet or damp conditions

List 4 – enhancement planting for diversity and long-lived species

- Use where there is good soil, shelter and some shade.

Alectryon excelsus	Titoki	Reasonably hardy, attracts birds, likes partial shade
Dacrycarpus dacrydioides	Kahikatea / white pine	Often found in swamps but will grow well in dry areas, sun or partial shade, attracts birds
Dicksonia squarrosa	Wheki / rough tree farn	Average hardiness, prefers partial shade, tolerates damp or dry
Hoheria angustifolia	Narrow-leaved houhere	Small tree, hardy, full sun or partial shade, attractive flowers
Knightia excelsa	Rewarewa	Dominant in regenerating bush, reasonably hardy, flowers attract birds and bees
Melicytus ramiflorus	Mahoe / whitey wood	Common small tree, hardy, small flowers, attracts birds
Plagianthus regius	Lowland ribbonwood	Largest of NZ deciduous trees, hardy, upright, fast growing, full sun
Podocarpus totara	Totara	Hardy tree, versatile, attracts birds, prefers well drained soils

5 WORKING WITH COMMUNITIES

People have differing views on the value of willows and native plants in river environments. While some recognise that willow planting is useful for flood protection, others criticise its extensive use as being visually monotonous, reducing natural character and blocking river access. Native vegetation along rivers is often perceived positively for its natural character, its cultural significance and its role in supporting native wildlife. Consequently, people perceive different types of riverside planting differently, whether pure willow, mixed willow and native, or pure native.

Perceptions also differ on the idea of 'sacrificial planting', or planting loss that can happen in the short term, while working towards long-term protection. Generally, losing willows for this 'work horse' purpose is considered more acceptable by the public than losing native planting. As native planting and biodiversity develops, the public is likely to place more value on it and expect its protection.

Working alongside local communities can help manage these differing perceptions and expectations. Increasing native plants gradually (e.g. replacing willows in small areas at a time) may give people time to adjust, and reduce the perceived impact when planting isn't successful. Communities should be kept well informed and offered opportunities to get involved.

5.1 Communication

Be aware of the expectations about native planting in each location. Plan how you will communicate with the community, and start early to avoid possible misunderstandings. Important messages include the following:

- ***integration:*** Flood protection and native planting objectives need to be aligned. This means that in many situations, native planting will need to be used in combination with other flood protection measures such as hard structures or willow planting. While plantings in the river corridor may not be solely native, they are still enhancing biodiversity and ecosystem services
- ***native plants do well in certain situations****:* Generally, natives don't survive well at the front edge of large, fast-flowing rivers that need managing. However, they do well further back, especially where there is shelter and good soil
- ***the dynamic nature of waterways*****:** There can be short-term setbacks while aiming for a long-term vision. Sometimes that can mean losing planting (both native and willow) while a new alignment stabilises
- ***timeframes are measured in decades*****:** Increasing the amount of native vegetation is a long-term vision. It takes many years to:
    - establish hardy pioneer plants
    - develop favourable conditions needed for enhancement planting
    - gradually introduce a greater diversity of plants.

  In harsh, unstable conditions, the first step might be to use willows alone. It might take 10 years before conditions are favourable enough to start adding native plants to the mix

- ***sites vary:*** What works on one site does not guarantee success on another. There is an element of trial and error that can add to timeframes
- ***learning from experience.*** As more native planting is undertaken, we will add to our knowledge. Most of our experience has been at the pioneer/establishment phase, which we're still learning about now. As we gain more experience, we will learn more about the way that planting sites develop and the factors that influence long-term success.

Early communication about planting objectives will help foster community understanding and support.

Participation

Listen to the community's views and ideas. Discussion presents the opportunity to explain the objectives and the issues. Invite ideas about native planting and encourage participation.

- ***local knowledge****:* People in the area might have a good understanding of the native plants that seem to grow well in a particular setting
- ***volunteer involvement.*** Is the community enthusiastic and willing to be involved? Find out what kind of support volunteers might need
- ***schools.*** Is there potential for local schools to be involved? It can be a positive educational experience for kids, and can also be a way to foster community interest as kids tell their parents about their experience.

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