

Riparian Corridor Revegetation Guideline



**For use on existing and future
Public Land and Open Space**

DEFINITION

'Riparian Corridor' refers to land that adjoins or directly influences a permanent or ephemeral waterway, such as a: river, creek, gully, lake or wetland. It plays a crucial role in the health and viability of waterways through trapping sediments and nutrients, stabilising bed and banks, improving water quality and providing habitat for terrestrial and aquatic organisms. Also referred to as 'Riparian Land' or 'Riparian Zone'.

INTENT

The intent of this revegetation guideline is for use by internal staff and external contractors when reinstating or revegetating the riparian corridor on existing or future public land within the Ipswich City Council area. This guideline is not intended for use on private land or for large scale rehabilitation projects within the riparian corridor.

This guideline provides advice on site requirements, planting locations and species selection for use in riparian corridors along Ipswich's waterways.

This guideline is a general guide only and is not intended to prescribe mandatory standards or requirements for development application conditions or requirements under state legislation and planning policies.

MAINTAINING A MINIMUM STANDARD

As a minimum, the integrity of the riparian corridor including the native vegetation, bed and bank stability and aquatic habitat are to be protected from loss or degradation, using the following actions:

1. Retain and protect the existing native vegetation wherever practical, protecting the trunk, limbs and roots from damage through use of machinery.
2. Manage and prevent the impacts of erosion to the bed and banks. Minimise any adverse impacts on water quality through sediment movement.
3. Control and remove all environmental and declared weed species, as listed in the Ipswich City Council's Pest Management Plan. Ensure that bank stability is not compromised in the process.
4. Replant with local indigenous species only.
5. Wherever possible, maintain and revegetate a width that extends a minimum of 10 metres beyond the upper bank of the riparian corridor¹. Refer to diagram 1.

Before commencing any revegetation work, gain an understanding of the existing local vegetation and undertake a review of existing projects and future plans for the site.

¹ This is a guide for revegetation purposes only and is not the recommended width for riparian corridors under the Ipswich Planning Scheme.

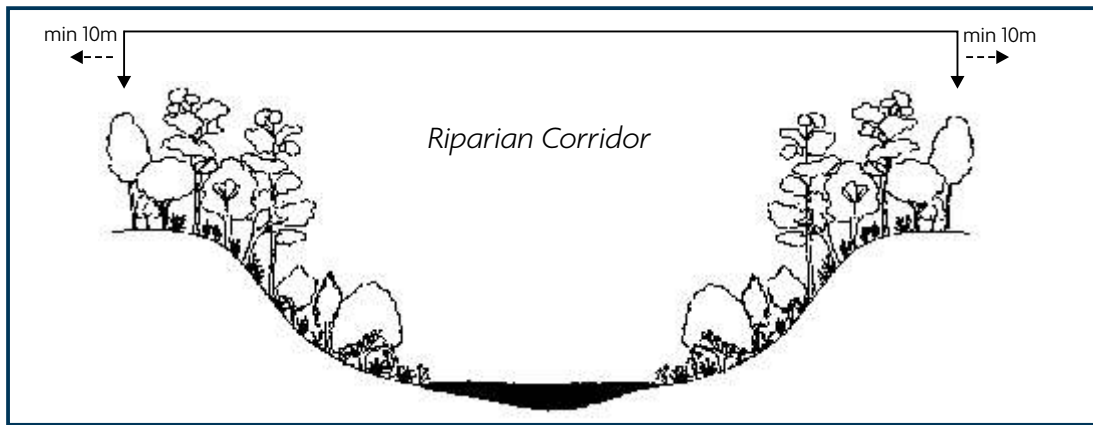


Diagram adapted from Land and Water Australia Fact Sheet 1: managing riparian land

Diagram 1. Revegetation to a minimum width of 10 metres beyond the riparian corridor width

WEED CONTROL

The majority of riparian corridors in Ipswich are impacted on by invasive woody weeds, vines and exotic grasses. A key element of riparian revegetation is the control and removal of all environmental and declared weed species. Weed control in the riparian corridor is to consist of:

- Identification of all environmental and declared weeds.
- Cut stump treatment of large woody weeds, such as: Chinese elm, Camphor laurel and Mulberry, leaving the stump in place to protect the bank. Removal and chipping of the cut trunk and branches, away from the bank.
- Cut stump treatment close to the ground for large vines, allowing the vine to die in place. If the infestation is very small the vine may be removed from its host after it is cut and in some instances it may be dug out by hand (eg: Asparagus Fern). Foliar spraying may be used on small infestations, where there is no risk to native host plants or surrounding vegetation.
- Foliar spray treatment of exotic grasses, small shrubs and saplings, using a recommended herbicide for waterways (eg: Roundup Bioactive).
- Follow-up treatment of emergents at 4 weeks and 8 weeks to ensure 100% kill.
- Maintain control of emerging weeds for a minimum 12 months.

Always seek specialist advice on the latest control methods and approved herbicides before undertaking any weed control activities. Advice may be obtained through the Queensland Department of Natural Resources and Water (DNR&W).

Table 1. Common riparian environmental weeds in Ipswich

Species	Common Name	Form
<i>Celtis sinensis</i>	Chinese Elm	Tree
<i>Cinnamomum camphora</i>	Camphor Laurel	Tree
<i>Schinus terebinthifolius</i>	Broad-leaved Pepper Tree	Tree
<i>Leucaena leucocephala</i>	Leucaena	Small Tree
<i>Macfadyena unguis-cati</i>	Cat's Claw Creeper	Vine
<i>Anredera cordifolia</i>	Madeira Vine	Vine
<i>Ipomoea sp.</i>	Morning Glory	Vine
<i>Asparagus sp.</i>	Asparagus Fern	Vine
<i>Panicum maximum</i>	Green panic	Grass
<i>Chloris gayana</i>	Rhodes grass	Grass
<i>Sorghum halepense</i>	Johnson grass	Grass

SPECIES SELECTION

Local Native Species

Before revegetating your site, it is important to gain an understanding of the local indigenous species that are either present or are known to have existed in the local area, to maintain the genetic integrity and biodiversity of the riparian corridor. Choose fast growing native species that provide quick coverage for weed suppression and protection of the bank. The Recommended Species List (page 4), provides a list of fast growing plants that are commonly available from local and regional stockists. Note: this is not a comprehensive list of all riparian species indigenous to Ipswich's waterways.

Bank Positioning

The location and function of vegetation on stream banks is important to ensure structural integrity and protection of the banks, particularly in high rainfall and flood prone areas. When selecting species for revegetation, select a diverse range of vegetation forms suitable for planting in the different zones of the bank, as follows.

Lower Bank (Toe) – dense plantings, in rows or clumps, of mat rushes and sedges with matted root systems and flexible branches to protect the bank from undercutting and scour. Larger trees and shrubs, such as: Weeping bottlebrush *Callistemon viminalis*, provide shade and habitat for aquatic organisms. Note: planting tree species below the frequent flood line is not suitable.

Mid-Bank – plant a diverse mixture of fast growing native grasses, mat rushes, shrubs and trees to bind bank soils and reduce flow velocities in flood events.

Upper-Bank – use fast growing, hardy trees and shrubs with deep root systems to provide structure to the bank and bind soils. Inter-plant with ground covers and native grasses to prevent loss of soil and filter nutrients and pollutants from surface run-off, before entering the waterway.

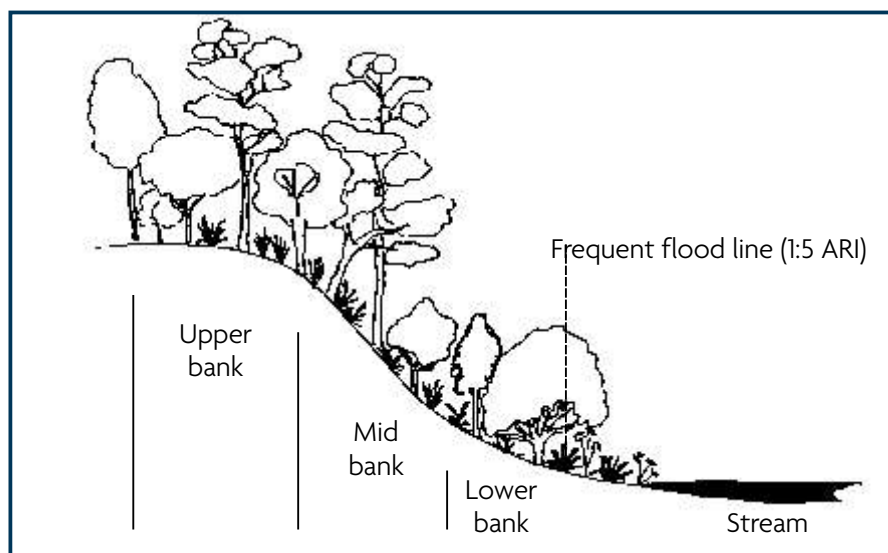


Diagram adapted from DNR River Facts R31, 1998

Diagram 2. Structural diversity and bank positioning of native species in the different zones.

RECOMMENDED SPECIES LIST

SPECIES	COMMON NAME	PLANT FORM	BANK POSITION	PROTECTION (from sun & wind)	DROUGHT TOLERANCE	FROST TOLERANCE	SOIL TYPE		
							R	S	A
<i>Acacia fimbriata</i>	Brisbane Wattle	Tree	M, U	N	M	H	R		C A
<i>Acacia maidenii</i>	Maiden's Wattle	Tree	M, U	N	M	H			C A
<i>Acacia melanoxylon</i>	Blackwood	Tree	M, U	N	M	H	R		C A
<i>Acmena smithii</i>	Creek Lillypilly	Tree	L, M	YY	N	N			C A
<i>Alectryon tomentosus</i>	Hairy Birds Eye	Tree	M, U	YY	M	N	R		C A
<i>Angophora subvelutina</i>	Rough-barked Apple	Tree	M, U	N	M	H		S	C A
<i>Araucaria cunninghamii</i>	Hoop Pine	Tree	M, U	Y	H	L	R		C A
<i>Backea virgata</i>	Twiggy Baeckea	Shrub	M, U	N	N	H		S	C A
<i>Callistemon viminalis</i>	Weeping Bottlebrush	Tree	L, M	N	M	H			C A
<i>Carex sp</i>	Sedges	Low	L	N	M	L	R	S	C A
<i>Castanospermum australe</i>	Black Bean	Tree	M, U	Y	N	L			C A
<i>Casuarina cunninghamiana</i>	River Sheoak	Tree	L, M	N	M	H	R		C A
<i>Citriobatis pauciflorus</i>	Orange Thorn	Shrub	M, U	YY	M	L	R		C A
<i>Crinum pedunculatum</i>	River Lily	Low	L	N	M	L			C A
<i>Cryptocarya triplernervis</i>	Three Veined Laurel	Tree	L,M,U	YY	M	L			C A
<i>Dianella cerulea</i>	Flax Lily	Low	M, U	N	H	L	R	S	C A
<i>Eucalyptus tereticornis</i>	Forest Red Gum	Tree	M, U	N	M	H	R	S	C A
<i>Euroschinus falcata</i>	Chinaman's Cedar	Tree	M, U	YY	M	L	R		C A
<i>Ficus coronata</i>	Creek Sandpaper Fig	Tree	L,M,U	Y	M	L	R	S	C A
<i>Ficus obliqua</i>	Small leaved Moreton Bay Fig	Tree	M, U	Y	M	L	R		C A
<i>Ficus opposita</i>	Sandpaper Fig	Tree	L,M,U	Y	M	N	R	S	C A
<i>Ficus platypoda</i>	Small leaved Moreton Bay Fig	Tree	M, U	Y	M	N	R		C A
<i>Flindersia australis</i>	Crows Ash	Tree	U	N	M	L	R		C A
<i>Gahnia aspera</i>	Razor Grass	Low	M, U	N	H	H	R	S	
<i>Glochidion ferdinandi</i>	Cheese Tree	Tree	M, U	Y	M	L	R		C A
<i>Grevillea robusta</i>	Silky Oak	Tree	M, U	N	M	H	R		C A
<i>Harpulea pendula</i>	Tulipwood	Tree	M, U	Y	N	N	R		C A
<i>Hibiscus heterophyllus</i>	Wild Hibiscus	Tree	M, U	N	M	L	R	S	C A
<i>Hymenosporum flavum</i>	Native Frangipani	Tree	M, U	YY	M	L			C A
<i>Jagera pseudorhus</i>	Foambark	Tree	M, U	Y	H	L	R		C A
<i>Juncus spp</i>	Rushes	Low	L	N	M	L			C A
<i>Lomandra hystrix</i>	Mat Rush	Low	L, M	Y	H	L		S	C A
<i>Lomandra longifolia</i>	Mat Rush	Low	L, M	N	M	H		S	C A
<i>Lophostemon confertus</i>	Brush Box	Tree	M, U	Y	M	L	R		C A
<i>Lophostemon suaveolens</i>	Swamp Mahogany	Tree	M, U	Y	M	H	R	S	C A
<i>Melaleuca bracteata</i>	Black Teatree	Tree	L, M	N	M	H			C A
<i>Melaleuca linarifolia</i>	Snow-in-summer	Tree	M, U	N	N	H		S	
<i>Melaleuca quinquinervia</i>	Coastal Teatree	Tree	M, U	N	N	H		S	
<i>Melia azederach</i>	White Cedar	Tree	M, U	N	H	H	R		C A
<i>Pittosporum rhombifolium</i>	Hollywood	Tree	M, U	Y	M	L	R		C
<i>Rhodosphaera rhodantha</i>	Deep Yellowwood	Tree	M, U	Y	M	H	R		C A
<i>Syzygium australe</i>	Brush Cherry	Tree	L, M	YY	N	L			C A
<i>Toona australis</i>	Red Cedar	Tree	M, U	Y	M	L	R		C A
<i>Trema tomentosa</i>	Poison Peach	Shrub	M, U	N	M	N	R	S	C A
<i>Tristaniopsis laurina</i>	Water Gum	Tree	L	Y	N	L			C A
<i>Waterhousia floribunda</i>	Weeping Lillypilly	Tree	L	YY	N	L			C A

NOTES

Bank position
L – lower bank
M – mid bank
U – upper bank

Protection (from sun and wind)
N – not required
Y – required
YY – protection very important

Drought tolerance
N – no tolerance
M – moderate tolerance
H – high tolerance

Frost tolerance
N – no tolerance
L – light frost only
H – high tolerance

Soil types
R – rocky S – sandy
C – clay A – alluvial

PLANTING GUIDE

Plant Spacing

High density planting with fast growing species provides quick canopy cover, protecting the banks and providing shade cover for weed suppression and habitat for native fauna. Recommended plant spacing, as follows:

- **Lower Bank** - Lomandras and sedges can be planted in clumps or rows along the Lower Bank or at 1m centres. Plant trees and shrubs at wider spacings of 2m – 3m in stable conditions. For areas subject to moderate or high erosion processes, particularly on the outside bend of the waterway, plant species such as She-oak *Casuarina cunninghamiana* and Weeping bottlebrush *Callistemon viminalis* in dense groupings at 1m – 1.5m spacing, interspersed with mat rushes and sedges for good bank protection.
- **Mid and Upper Bank** – Plant tree, shrub, native grasses and ground cover species at 1.5m – 2m centres. Extend Lomandra plantings from the Lower Bank into the Mid Bank zone. For good structural diversity, plant an even ratio of tree, shrub and ground cover species.

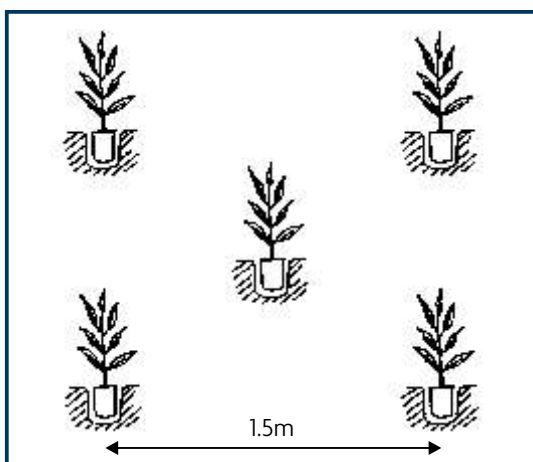


Diagram 3. Plant spacing on mid and upper bank

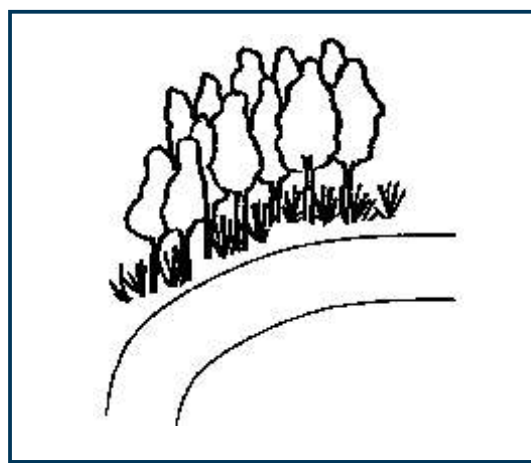


Diagram 4. Group planting on outside bend of waterway 1m – 1.5m spacing

Time of Planting

Choosing the best time to undertake riparian revegetation plantings is difficult due to the potential impacts of frost, drought, flood and erosion on seedlings and young plants. Spring is the preferred time for planting to allow for strong establishment of the root structure and good plant growth, before floods or frosts.

Pre-winter planting is not advisable, however, this is not always possible to avoid. Choose hardy species with high frost tolerance, and wherever possible, extend plantings over to spring to ensure better revegetation success of the site. On some sites where there is a risk of soil loss, provide protection to the banks with covers such as Jute mat, Geofabric or Coconut Coyr. (Refer to manufactures specifications and understand site conditions before using these products.)

Mulching

Organic mulch such as hoop pine fines or similar (to meet AS4454-2003) provides protection to bare soil, retention of soil moisture and suppression of weed re-growth. Ensure that mulch is free of weed seed or foreign objects. Spread to a depth of 100mm – 150mm and allow to settle for four (4) weeks before planting seedlings. Spot spraying of any emerging weeds maybe needed at this stage. The use of mulch is only recommended on the Mid and Upper Banks, with a slope less than 1:1.5.

For steep banks consider the use of alternative covers such as weed mats. Take into consideration the site conditions, flow regimes, protection of seedlings and impacts to the waterway before using any product and follow manufacturer's specifications.

Hydromulch

'Hydromulching' is an alternative technique that can be used for covering steep banks with a sprayed-on mixture of fertilisers, seeds, water and mulch. It is often used where there is a large area of bare earth or the site is too steep for safe access with machinery or people. This technique is relatively expensive, but is useful in instances where planting of seedlings is not practical. The seed mix is to consist of native trees, shrubs and grasses, in accordance with suppliers standard specifications and subject to Council approvals.

Planting Success

Hand planting seedlings or tube-stock is the preferred method for revegetating riparian corridors. The following steps will assist in the successful establishment of seedlings:

- Rake away an area of mulch (min 300mm x 300mm) to expose the soil.
- Dig a hole at least twice the size of the tube / pot (min 300 x 300 x 200mm deep).
- Disturb the surrounding substrate up to 100mm to avoid leaving 'clean' sides and base of the hole, particularly when an auger has been used to dig the hole.
- Pour 5-6 litres of water into the hole and allow to drain freely.
- Add a slow release fertiliser and soil-wetting agent to the base of the well and cover with a small amount of existing soil, or mix in with the soil to be placed back around the plant. Avoid any contact of the fertiliser and soil-wetting agent with the plant roots.
- Plant the seedling slightly below the soil level and back-fill the hole with existing soil, covering the top of the potting mix. Create a small well to catch water.
- Replace mulch around the plant. Ensure no mulch touches the base of the trunk, maintaining a space of 50-100mm between mulch and trunk.
- Erect a 'Growtube' around each plant. Remove Growtubes when plants are at 1.5 times the height of the Growtube.
- Water each plant thoroughly within 1 hour of planting.

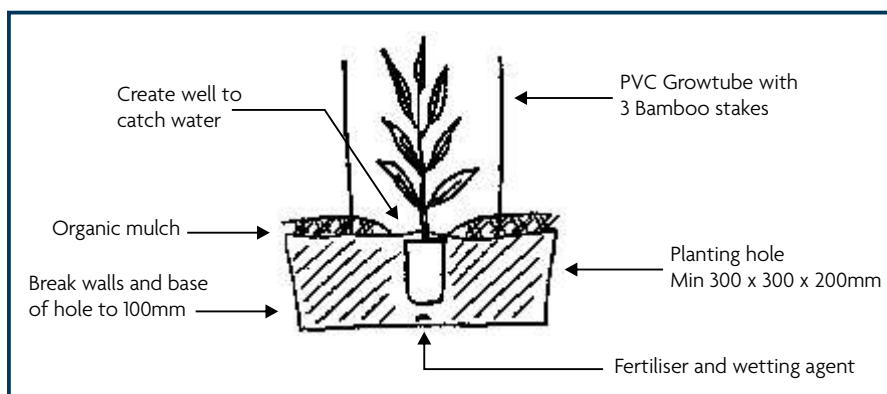


Diagram adapted from DNR River Facts R31, 1998 and ICC Standard Drawing SP.04

Diagram 5. Planting tube stock

Watering

Soils along river banks are often free draining and access to water is sometimes limited. In most cases, water trucks will be required for watering purposes. Initial watering of tube stock is essential to help successful establishment of new plants. Water each tube prior to planting and again within one hour of planting. Follow-up watering should consist of:

- Once per week – for the first 4 weeks
- Once per fortnight – for 4 to 12 weeks
- Once per month – for 3 to 6 months

FOLLOW-UP MAINTENANCE

Follow-up maintenance of the revegetation site is required to ensure a minimum standard is achieved, as follows:

- 90% survival rate of seedlings at 6 months and 80% survival rate at 12 months.
- 100% kill rate of environmental and declared weeds at 12 months.
- Removal of Growtube bags and bamboo stakes at specified plant height.
- Removal, and where necessary replacement, of any bank protection material (eg: Jute Mat) that has been displaced through flooding, poor installation or vandalism.

REVEGETATION TIMELINE

- Initial weed control and removal.
- Mulching of the upper and mid banks, to a minimum depth of 150mm.
- Installation of bank protection material where necessary.
- Follow-up weed control and spraying at 4 weeks.
- Planting of tube stock and initial watering.
- Weekly watering for 4 weeks.
- Fortnightly watering for 4 – 12 weeks.
- Monthly watering for 3 – 6 months.
- Removal of Growtubes at plant height 1.5 times Growtube height.
- Inspection of plant survival rate: minimum 90% at 6 months and 80% at 12 months.
- Inspection of 100% kill of weed species and follow-up control where needed at 6 and 12 months.

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