

# Management of Riparian Zones

## Guidelines for Landholder and Community Participation

*Guidelines for improving the management of riparian zones. Prepared by the Goulburn Broken Catchment Management Authority with the support of Land and Water Australia*

**2002**



*Goulburn Broken Catchment Management  
Authority in association with  
Land and Water Australia*

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Goulburn Broken Catchment Management Authority

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## **Foreword**

Streams within our region are highly valued for a range of reasons including, potable, stock and domestic water supply, recreation (both passive and active), the presence of threatened and vulnerable fish species, aesthetic beauty, biodiversity values, provision of irrigation supplies for production and value adding industry.

From the irrigated Goulburn and Murray Valleys to the dryland grazing and cropping regions and high country valued for its tourism and recreational uses, the Goulburn Broken catchment is the foundation of the Victorian and Murray Darling Basin water resources and economic wealth. Although only 2% of the Murray Darling Basin's land area, the catchment generates 11% of the basin's water resources. In addition, the catchment generates 26% of the rural export earnings for the State of Victoria.

Stream health in the region is of vital importance, not only for the local region but also for communities over 500km downstream.

Improved management of the riparian zone will help protect the values associated with rivers and streams.

Over the past decade, significant commitment to improving the health of the waterways in the catchment has been provided from our community.

The present challenge is to build on these successes, learn from the past and focus our energy to meet future challenges.

Communication and co-operation between the community and agencies will be the key to achieving our goals. This will be aided by the development of a shared vision for the future condition of the region's waterways and the quality of water within.

Individuals, agencies and groups interested in protecting or enhancing the condition of our waterways will find this document useful in providing key information to aid successful future activities.

The result will be waterways and riparian zones which we will be proud to pass on to the next and future generations.

Stephen Mills  
Chair  
Goulburn Broken Catchment Management Authority.

## *Introduction*

Streams within our region are highly valued for a range of reasons including, potable, stock and domestic water supply, recreation (both passive and active), the presence of threatened and vulnerable fish species, aesthetic beauty, biodiversity values, provision of irrigation supplies for production and value adding industry.

Over the past decade significant commitment to improving the health of the waterways in the catchment has been provided from our community. However, to make a major difference, further action is essential.

Improved management of the riparian zone will assist in protecting these values and enhancing their condition.

The purpose of this document is to assist individuals, agencies and groups who are interested in protecting or enhancing the condition of our waterways. The document presents information to guide activities, from small scale projects to large scale programs.

Information presented within this document includes:

- What are the Functions Provided by the Riparian Zone?
- Why Manage Riparian Zones?
- Grants for Riparian Protection
- Grazing Management Options
- Successful Revegetation
- Water For Stock
- The Benefits of Native Grasses and Water Plants
- Essential Elements of Ongoing Maintenance

### **Definition of Riparian Land:**



***'Any land which adjoins, directly influences, or is influenced by a body of water (lake, river or stream)***

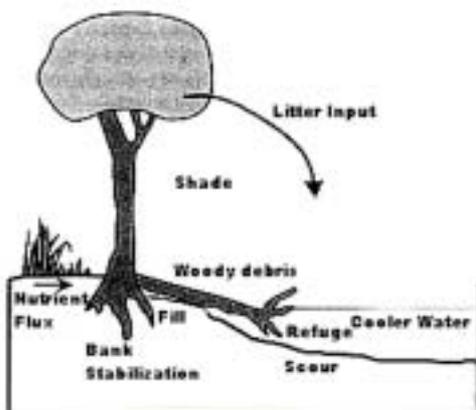
(from: Boulton and Brock, 1999 and Lovett and Price, 1999).

## *What are the Functions provided by the Riparian Zone?*

The riparian zone has *four primary functions*:

1. Providing litter (leaves, twigs, branches, etc.) to streams and wetlands;
2. Shading of streams and other water bodies (temperature and light regulation);
3. Influencing channel shape and stream stability; and
4. Providing a buffer to filter nutrient and sediment input to streams and wetlands.

These functions are often complimentary and, depending on the size of the stream and the width of riparian buffer strips, will vary in importance (Figure 1.1).



**Figure 1.1:** The riparian zone has many functional roles (Source: Boulton and Brock, 1999 p 207).

### *Litter input to streams and wetlands*

Riparian systems are vital to stream health as events occurring in these zones largely determine the quantity and quality of the organic matter and energy source received by the stream. The disturbance and/or removal of riparian vegetation can severely impact on the riverine ecosystem by altering the rate and composition of these inputs.

In southern Australian streams, leaf material usually constitutes the greatest proportion of litter, although bark, branches and fruits can be significant in some areas and at certain times of the year.

Larger organic matter is also important (Figure 1.2). Large woody debris (or snags) promote increased instream diversity, provide shelter for organisms, vary stream velocity and affect erosion and sedimentation patterns.



**Figure 1.2:** Riparian vegetation provides organic matter input to streams in the form of leaf litter, bark and branches.

### *Shading of streams and other water bodies*

The influence of shade in the riparian zone on the structure and function of stream ecosystems is related, at least in part, to stream channel size (Figure 1.3). Several factors including canopy height and density, channel width and orientation, valley topography, latitude and season influence the degree of shade created by riparian vegetation.

Riparian shading influences the availability of direct and diffuse sunlight and variations in water temperature which are two primary factors influencing the function of stream ecosystems. Most aquatic plant growth is limited by light availability. Water temperature can influence the rates of development of aquatic plants and instream fauna.

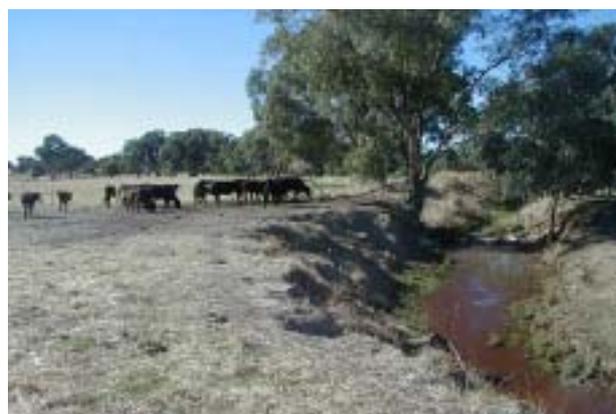


**Figure 1.3:** Shade and light penetration to streams varies with stream width and riparian condition.

#### *Influence on erosion and sedimentation*

Erosion of streambeds and banks is a natural and continuing process. Although riparian vegetation will not stop erosion, its presence generally acts to reduce rates of channel erosion including widening and gullyng (Figure 1.4).

Root systems of trees, shrubs and grasses stabilise banks by reinforcing the soil and providing some resistance to bank scouring.



**Figure 1.4:** Reduced riparian vegetation can result in accelerated bank erosion

#### *Influence on nutrient and sediment input*

Riparian zones can act as storage and filter areas for sediments and nutrients transported by catchment runoff, groundwater intrusions and stream bank and gully erosion. Consequently streams with established riparian vegetation are usually better protected from influxes of sediment and nutrients, than bare or pasture covered riparian areas.

The riparian zone removes sediments and nutrients from runoff by infiltration and deposition. Infiltration occurs when water and dissolved nutrients infiltrate the soil as the water is slowed down by vegetation in the riparian zone. Deposition occurs when sediment is physically trapped by the vegetation and deposited on the banks of the floodplain.

Increased sediment and nutrient inputs to streams can result in increased turbidity, smothering of fauna on the bed of the stream, and changes to the type and number of instream flora and fauna.

## **Why Manage Riparian Zones?**

### **Good Farm and Property Management**

The most productive farms are those that take advantage of the natural features and processes (soils and water) that characterise our landscapes. Over-exploitation leads to degradation of these features by:

- Reducing soil structure;
- Increasing waterlogging;
- Eroding soil and streams;
- Reducing soil fertility; and
- Increasing land and water salinisation.

Riparian zones and their associated floodplains are typically very fertile. When managed appropriately, we can make the most of these areas while still maintaining their function (water quality, habitat, stability, wildlife refuge).



*Degraded riparian land affects the health of the stream and the quality of water within.*

### **Maintenance of Water Quality**

Healthy streams and riparian zones have the capacity to improve and protect the quality of water. Humans and stock rely heavily on the availability of good water.

Poor quality water will threaten the existence of primary and secondary production, industry and domestic supplies if our riparian zones remain unprotected.

If local streams become too degraded, the cost of conveying water from protected areas to the areas in need will become too expensive.

### **Aesthetics and Character**

We value waterways for their natural beauty. Rivers and streams are places to picnic, fish, swim or just relax.

Generally streams in good condition are the focus of these activities, although we often take them for granted.

If we damage the condition of our streams we reduce their aesthetic characteristics and values.

### **Maintenance of Biodiversity**

The full diversity of plants and animals that inhabit aquatic and terrestrial environments can only survive if the processes of that ecosystem are intact.

Stream degradation causes the disruption of these processes (water quality, flow, vegetation cover, etc.) and can alter the ability of some species to survive or flourish in that environment.



### **Farm and Property Values**

A healthy riparian zone can often increase the value of a property. This is associated not only with the aesthetic values, but also the benefits provided through a well established buffer strip, aiding stock shelter and improving water quality.

### **Productivity**

Stock are healthier and gain more weight when drinking from a fresh water source (not one that has been pugged up or polluted by animal manure).

Shade and shelter are essential to reduce stress from extremes of heat and cold.

## **Grants for Riparian Protection**

Our community is committed to working in partnership to achieve sustainable development and conservation of our vital land and water resources for the benefit of all Victorians.

The Waterway Grant Scheme, initiated in the 1999 – 2000 financial year encourages community support and provides incentives on the basis of regional priorities and the contribution from the landowner.

Since its inception, the Scheme has seen increasing interest and involvement by the community in riparian management programs. The community uptake in grants has increased threefold in recent years.

### **The Scheme**

The Scheme seeks to provide a financial stimulus and opportunity for landowners to change land practices, through direct work on the ground. The scheme encourages ownership of the various degradation problems, in a way that a purely regulatory or extension-based process cannot achieve.

The grant scheme recognises that works to prevent or repair degradation will yield substantial benefits to the wider community. The level of assistance takes into account the community benefits from the activities carried out by the land manager.

Grants available include: fencing revegetation; and off-stream watering points where stock have been watering from the stream.



### **Recognising Contribution of Landowners and Regional Priorities**

Grants are based on the benefits provided from the introduction of the project. Key criteria include:

**Width of fenced area** - Higher value is given to wider fenced areas, this provides a high value for biodiversity, water quality and stream stability. Setbacks less than 10 metres will not be considered.

**Location within a priority zone** - Higher value is given to a site within designated priority zones. The zones selected are published as maps in strategies (water quality, nature conservation and stream health) or defined in Government Acts. The values are cumulative if the site is in more than one zone.

**Presence of a constructed grass filter strip** - Grass filter strips have high value for improving water quality. They cannot be sited at all localities and need to be managed for nutrient reduction to have high value.

**Adjacent land use** - Adjacent land use is used as an indicator of potential nutrient loads. The fencing, revegetation and management of the highest nutrient producing areas will produce the greatest benefit to water quality.

**Ongoing management agreement** - High value is given to the more permanent agreements and those that are legally binding.

It is a prerequisite that all landowners receiving a grant sign a standard management agreement.

## Adding value to the natural resources

The Scheme is based on adding value to the natural resources of the catchment by the fencing and revegetation of the riparian zone.

The major values added are:

### Stabilisation of the waterway will result in:

- a reduction in the loss of productive land
- a decrease in sediment impact on public infrastructure; and
- a decreased impact on in-stream aquatic flora and fauna.



### Improvement in water quality by:

- lower nutrient contamination;
- lower chemical contamination;
- decreased turbidity; and
- decreased sediment loads in waterways.

### Biodiversity improvement by:

- improved habitat, especially riparian zone;
- increasing native vegetation cover;
- providing linkages of habitat;
- providing in-stream benefits of food, temperature control and habitat; and
- providing terrestrial fauna habitat.

## Community

Community support is an essential component of all waterway health projects.

Participation by the young members of our community is actively encouraged as investment made for the future. Their involvement provides a foundation for them to become our land and water managers of the future.

## Sharing the Cost

Riparian grant levels in the Goulburn Broken Catchment reflect the contribution of the landowner and contribution towards addressing regional priorities.

The greater contribution towards regional priorities will receive higher level of financial support. However, landowners in lower priority areas making significant contribution towards riparian protection can also receive high grants rates by increasing the width of riparian land protected or by establishing a more permanent management agreement.

**For further information regarding grants for the protection of riparian zones contact your nearest Catchment Management Authority or Department of Natural Resources and Environment office.**

## Grazing Management Options – Fencing

This section provides base information on the construction of fencing to manage stock within the riparian zone. Fencing provides the ability to control stock in the riparian zone and reduce the impact of grazing on stream functions and values.

### Conventional - Plain Wire

- Suitable for flood-prone areas
- Less susceptible to damage if parallel to the flow during a flood
- Less effective in controlling sheep



### Approximate Cost of Fencing (including materials and labour)

Conventional  
(\$ 4.00 to \$ 5.00 /metre)

Hingejoint / Ringlock  
(\$ 4.00 to \$ 6.00 /metre)

Electric  
(\$ 2.00 to \$ 3.00 /metre)

The GBCMA's minimum standard for conventional plain wire fences is 6 plain wires with steel posts at regular intervals and pine, concrete or steel posts, end assemblies and stays.

*This electrified eight wire fence was designed to contain goats.*

### Hingejoint / Ringlock

- This option enables better stock control as it provides a more effective barrier
- More expensive than plain wire however in some instances, cost savings can be made by using fewer posts or droppers
- Not recommended for flood-prone areas



*This fence meets the GBCMA's minimum standards for a conventional fence – stock proof and permanent.*

*Ringlock fences are ideal for containing sheep.*

*The addition of an electrified outrigger means it is also suitable for containing cattle.*

*Barbed wire is not promoted for riparian fencing as it can kill or injure wildlife such as owls and possum gliders.*

## Electric

- Considered the least expensive to install
- Provides most effective stock control where power supply is consistent and reliable
- Posts can be spaced further apart - wire tensions are less
- Ongoing maintenance is essential to ensure it remains stock proof



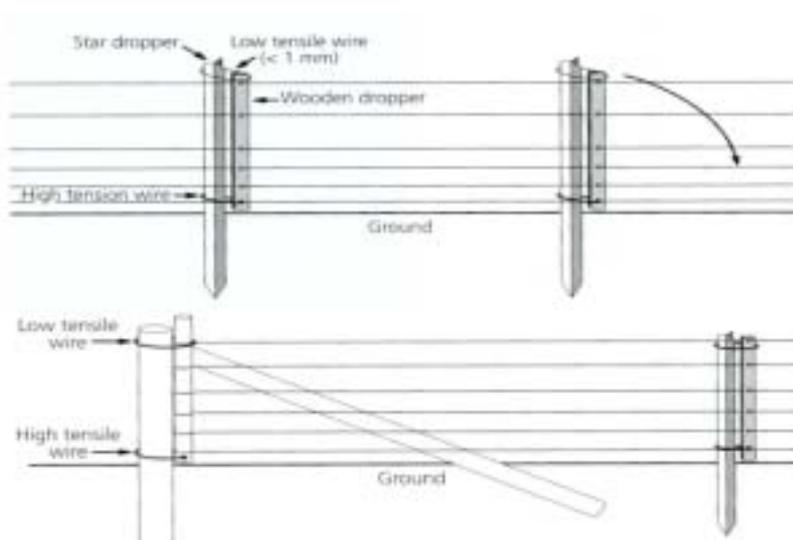
*The GBCMA's minimum standard for an electric fence is four wires - two live wires and two earth wires.*

*Different landholders tend to use varying designs according to the purpose of the fence and the type of stock to be contained within the paddock.*

*Regular checking of electric fences is advisable to ensure their effectiveness.*

## Drop or Lay-down fences

Drop fences (or Lay-down fences) are used in flood-prone areas and will automatically drop as pressure from water and debris builds up behind them. Wooden droppers are permanently attached at their base to the bottom of each star picket by a loop of high tensile wire that acts as a hinge. The top of the dropper is attached to the star picket with a loop of low tensile wire. When flood pressure is exerted on the fence, the top wire breaks and the fence lies flat. Lay-down fences are similar to drop down fences but are laid down manually before a flood.



*Drop / Lay-down fence – top diagram shows drop down wooden posts attached to star pickets.*

*Left diagram shows drop down end strainer post.*

Source Price and Lovett. ((1999)

## Fences Crossing Streams

### *Suspended fences and floodgates*

These fences hang across the stream to prevent stock access during times of low flow.

The fence relies on good strainer posts with firm footing to be able to take the strain of the suspended fence.

### *Non – Electric floodgates*

Hanging panels can be made from a range of materials including galvanised iron ringlock attached to a frame or vertically hanging narrow lengths of timber. Care needs to be taken with this method to avoid erosion within the bed and banks of the stream following the accumulation of debris.

When the water level rises or during floods, the fence rides up with the water level.



*Electrified chain is used in this situation to control stock movement when dry and allow water and debris to pass during high flows.*

### *Electric floodgates*

These require less maintenance than panels or cables.

A control unit should be incorporated to limit voltage loss to the entire fencing system when flooding occurs.

A cut-out switch can be used in the event of prolonged flooding.

Electric panels can be made from hinged lightweight mesh or chain or single strand wire.



*Ongoing maintenance is essential to ensure that fencing remains stock proof.*

*For further information contact your local Goulburn Broken Catchment Management Authority or Department of Natural Resources and Environment office.*

## Successful Revegetation

### Revegetation Options

**Natural regeneration** – This is the cheapest option following fencing to control grazing. Natural regeneration can often take place in the first 18 months – however this is unlikely to occur in blackberry-dominated or willow-dominated areas, or areas of improved pasture. The diversity of species regenerating may be limited due to an absence of soil stored seed or other seed source. These areas may need to be enhanced at a later date with understorey species.

**Direct seeding** – This is a quicker and cheaper option compared with tree planting but depends on availability of local seed in large quantities and availability of equipment and operators from organisations such as DNRE and Greening Australia. Good site preparation including weed and pest control is essential to the success of direct seeding.

**Tree planting** – This is the most expensive option, requiring substantial investments of time and resources. Site preparation, weed and pest control are important for success and is expensive. Advantages include an instant result, ability to choose the species composition and spacing of planting for management purposes.

### Site Preparation for Tree Planting

#### Introduction to Weed Control

This activity is considered ***MOST IMPORTANT.***

Planning for weed control should commence well in advance of planting. Perennial species such as Phalaris and Blackberry should be eradicated from the riparian zone prior to commencement of any revegetation project. These species will outcompete newly established plants and reduce natural regeneration.

Annual grasses and weeds should be controlled as part of revegetation site preparation which is generally undertaken between three and four weeks prior to planting. Reducing the competition from weeds in the first year increases the survival and growth rates of newly established plants. The best approach is a combination of methods that are appropriate to the site and to the preferred management practices of the landholder.



*The smaller tree to the right had strong competition with sorrel - restricting its growth.*

#### ***Grazing / Slashing (Autumn-Spring):***

Grazing or slashing prior to planting is a useful tool to reduce the amount of competition and increase the effectiveness of herbicide application. Avoid set stocking over long periods and look at crash grazing (low numbers over short periods) late Winter / early Spring which should give good control over annual weeds and some perennial weeds. Avoid grazing during wetter periods as stock cause damage to riparian areas when soils are saturated.

#### ***Herbicide Application:***

Following up well-timed grazing or slashing with a knock down herbicide prior to spring growth provides very effective weed control. Where native grasses persist, it is important to avoid grazing or slashing during October to January to allow flowering and seed set.

Glyphosate does a good job on most weeds. Use only the brands that are registered for use on waterways such as Roundup Biactive® (ask the supplier).

Herbicide application may be along rip lines or spot sprayed to reduce disturbance and weed invasion.

### ***Spot Spraying:***

Spot spraying provides good weed control allowing the plants to get established without competition.

If possible, the spots or larger patches should be sprayed 3-4 weeks prior to planting to kill competition while providing a mulch of the dead grasses/weed material. If this area is planted into with minimal disturbance, long-term weed control is effective using this technique.



*Spot spraying provides good weed control allowing the plants to get established without competition.*

### **Vermin Control - Summer / Autumn**

Rabbits and other feral animals can decimate newly-planted trees and shrubs.

Rabbits are selective feeders, consuming the best clovers, grasses and seedlings first. Nine rabbits eat the equivalent of one sheep.

Vermin control is best when incorporating all available management options – including ripping and harbour removal, fumigating, poisoning and biological control.

### **Soil Preparation Techniques**

The technique chosen will vary according to the site. Many riparian areas are difficult to prepare because the banks are steep and not suitable for using mechanical preparation.

#### ***Spot Cultivation:***

This is most appropriate in riparian areas for planting over stream banks. It involves just preparing the area where each tree is to be planted. This may involve scalping an area approximately 1-2 feet in circumference to remove weed competition and weed seed, then digging a hole to plant the tree. The disadvantage is the bare soil left for weeds to colonize around the tree and the time consuming nature of this method.



*Spot cultivation is often most appropriate on stream banks or areas with existing vegetation (overstorey).*

#### ***Ripping- Summer early Autumn:***

Ripping allows seedlings to establish a deeper root system more quickly by improving aeration and infiltration of rainwater.

This is most appropriate for large sites where large-scale planting is planned on the flatter floodplain area

Ripping when the ground is dry has a better soil shattering effect. Plough over rip lines to break up clods.

Soil type and drainage need to be considered, as ripping is not appropriate in all areas.

Use a winged ripper to a depth of 400-600mm or more if possible.

Avoid in areas where water movement is evident and rip along contour lines to minimise erosion.

### ***Mounding / Rotary Hoeing Tree Lines – Autumn:***

Mounding and rotary hoeing of the site speeds up the planting process by loosening the soil and assists mechanical planting operations.



*Mounding over rip lines aids drainage in waterlogged areas and speeds up the planting and guarding process.*

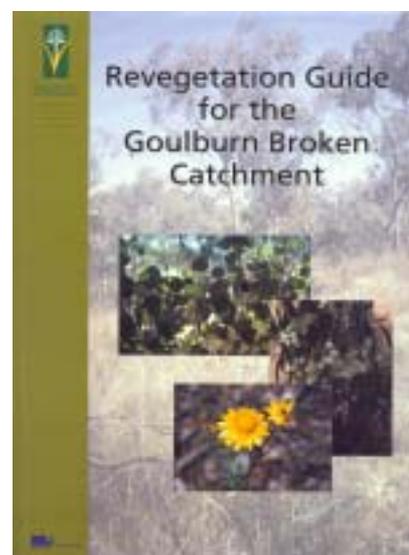


*Rotary Hoeing improves the condition of the soil for ease of planting and erecting tree guards.*

### **Planting and Guarding – Winter / Spring**

#### ***Plants:***

The species chosen should be indigenous to the area being planted and preferably grown from locally-collected seed. The surrounding remnant vegetation is often a good guide, however, many understorey species are often missing. The Revegetation Guide for the Goulburn Broken Catchment is a good source of information.



The Guide is available on the GBCMA website [gbcma.vic.gov.au/revegetation](http://gbcma.vic.gov.au/revegetation) on CD or hard copy from DNRE offices in the region.

### **Support for Revegetation Programs**

The Goulburn Broken Catchment Management Authority provide landowners with support to undertake revegetation programs which assist in protecting riparian zones. Generally the revegetation activities are organised according to what is agreed on between the landowner and an inspecting officer of the authority.

For small (up to 500 plants) and medium (500-1000 plants) sized projects, landowners are encouraged to participate in a joint revegetation program. Under this project financial assistance is provided to the landowner, which contributes towards site preparation, planting, watering and on-going maintenance.

For larger projects, while still involving the landowner, contractors may be engaged to undertake the bulk of the project.

**Guards:**

Guards are recommended where certain pests (rabbits, hares) or native animals (wallabies) are likely to damage or destroy the young seedlings. If these are not known to be a threat, the other advantages of guards are protection from wind and frosts and some protection from competing plants. The disadvantages are also numerous; guarding increases the expense and time it takes to plant the trees and there are more materials to cart around or relocate from site to site.

It is recommended that plastic guards be avoided in areas subject to flooding as their relocation from site can cause long-term pollution in the stream.

Options available to guard trees are shown below.



| Guard types  | Approximate cost per unit | Time factor                              | Appropriate on stream banks | Transporation (bulk)  | Recyclability                 |
|--|---------------------------|--|-----------------------------|-----------------------|-------------------------------|
| Bamboo stakes & plastic sleeve (heavy duty)                          | \$0.60 - \$0.80           | Slow and technique<br><b>**important</b> | No                          | Easy<br>Not too bulky | Sleeves ✓<br>Stakes ✗ (maybe) |
| Hardwood stakes & plastic sleeve (heavy duty)                        | \$0.70 - \$0.80           | Slow and technique<br><b>**important</b> | No                          | Quite bulky           | Sleeves ✓<br>Stakes ✗ (maybe) |
| Milk cartons and bamboo stakes                                       | \$0.30 - \$0.40           | Quick                                    | Yes                         | Easy<br>Not bulky     | Not recyclable                |
| Wire frames and plastic sleeves (re-use most for at least 4-5 years) | \$1.75 - \$1.90           | Quick to erect over plant                | No                          | Awkward<br>Very bulky | Sleeves ✓<br>Frames ✓         |

**Planting**

Planting into mechanically prepared areas speed up planting of trees significantly and enhances the survival rate of plants.

Plant into friable moist soil and water in if necessary.

If the area to be planted has been mechanically prepared, tree planting tools, such as Potiputki or a Hamilton Tree Planter, can be used. These speed up planting significantly.

A staggered planting strategy is preferable to a single line of trees which may weaken the bank along a single axis in strong winds.



*Potiputki tree planters speed up the planting process significantly and prevent constant bending*

## Water for Stock

Often a barrier to the fencing and revegetation of riparian zones is the concern that access to water is denied. Grants may be available for an Off-Stream Water supply to paddocks that lack water as a direct result of stream fencing.

### Incentives

Support is available to develop an alternative water supply where access to previous water points is denied as a result of a riparian management (fencing) project.

The maximum number of watering points / alternative water provisions (Wp) to be provided is to be equivalent to:

$$Wp = P * RZ$$

where

P = number of properties (land parcels / paddocks) currently serviced (having direct access to) by the stream

RZ = number of riparian zones or frontages which are protected under an agreed Waterway (fencing) Grant.

Support above this level is considered second stage development (infrastructure development) and is not to be supported.

Incentives are available on a cost sharing basis.

### Watering Options

#### Pumping / gravitating from waterway / bore / dam to – troughs

Materials eligible for waterway grant assistance - Storage tank (capacity for 5 days supply), troughs, pipe and fittings, trenching / pipe laying costs.

To determine the requirements for such a system, the following needs to be considered:

*Water requirements of stock*

1. Type of stock (daily requirements in hot weather – see table)
2. Number of stock dependent on the system at any one time (multiply this by daily requirements).

*Example: If you run 50 Dry Beef Cattle, which consume 80litres per day in hot conditions, the system needs to supply 4000litres per day (20,000litres for a five day storage capacity)*

| DAILY WATER CONSUMPTION BY ADULT ANIMALS |                |                 |                    |                     |   |
|--|----------------|-----------------|--------------------|---------------------|---|
| Livestock                                | Average Litres | Average Gallons | Average Hot Litres | Average Hot Gallons | Litres needed for 5 day supply (hot conditions) |
| Dairy Cow                                | <b>100</b>     | 22              | <b>160</b>         | 35                  | 800   |
| Beef cattle (lactating)                  | <b>45</b>      | 10              | <b>100</b>         | 22                  | 500   |
| Beef Cattle (dry)                        | <b>40</b>      | 9               | <b>80</b>          | 18                  | 400   |
| Beef calf                                | <b>23</b>      | 4.5             | <b>43</b>          | 9.5                 | 215   |
| Sheep - Ewes                             | <b>12</b>      | 2.5             | <b>16</b>          | 3.5                 | 80  |
| Sheep - Wethers                          | <b>6</b>       | 1.3             | <b>12</b>          | 3                   | 60  |
| Horse                                    | <b>45</b>      | 10              | <b>100</b>         | 22                  | 500   |

Based on Kondinin Group (1996)

*Trough and storage requirements:*

1. Flow rate to the troughs (this is more important than the capacity – determines size of poly pipe required).
2. Number / Size / Shape of troughs required.

3. Amount of storage required to secure the water supply to stock for five days (this gives you minimum size of water storage tank required).

*Example: If you run 55 Dry Beef Cattle, which consume 80 litres per day in hot conditions, the system needs a 22,000 litre storage capacity.*

| <b>Size of Tanks for Stock Watering Systems for 5 day supply</b> |        |         |               |           |     |      |           |     |       |
|--|--------|---------|---------------|-----------|-----|------|-----------|-----|-------|
| Tank size and approx \$  |        |         | Stock Numbers |           |     |      |           |     |       |
|  |        |         | Dairy         | Beef      |     |      | Sheep     |     | Horse |
| Litre  | Gallon | Cost*   |               | Lactating | Dry | Calf | Lactating | Dry |       |
| 1000   | 220    | \$335   | 1             | 2         | 3   | 5    | 13        | 17  | 2     |
| 1600   | 350    | \$415   | 2             | 3         | 4   | 7    | 20        | 27  | 3     |
| 2300   | 500    | \$465   | 3             | 5         | 6   | 11   | 29        | 38  | 5     |
| 2700   | 600    | \$489   | 3             | 5         | 7   | 13   | 34        | 45  | 5     |
| 4500   | 1000   | \$689   | 6             | 9         | 11  | 21   | 56        | 75  | 9     |
| 5400   | 1200   | \$799   | 7             | 11        | 14  | 25   | 68        | 90  | 11    |
| 8000   | 1800   | \$999   | 10            | 16        | 20  | 37   | 100       | 133 | 16    |
| 9000   | 2000   | \$1,105 | 11            | 18        | 23  | 42   | 113       | 150 | 18    |
| 13500  | 3000   | \$1,455 | 17            | 27        | 34  | 63   | 169       | 225 | 27    |
| 22000  | 5000   | \$1,939 | 28            | 44        | 55  | 102  | 275       | 367 | 44    |
| 27000  | 6000   | \$2,209 | 34            | 54        | 68  | 126  | 338       | 450 | 54    |
| 44000  | 10000  | \$3,829 | 55            | 88        | 110 | 205  | 550       | 733 | 88    |
| 54000  | 12000  | \$4,359 | 68            | 108       | 135 | 251  | 675       | 900 | 108   |

\* Approximate price for a black poly tank including GST as at September 2001

### **Trough positions**

- not in corners as fewer and deeper tracks are formed causing increased run off and erosion
- along a fence line at least 50 m from a waterway
- can be placed through a fence to service separate paddocks
- Avoid depressions or slopes
- Place in shade if available



*A trough placed on a fence line can service two paddocks.*



*Troughs with covered ball valves are now available. These prevent cattle damaging valves and ensure a more secure supply of water to the trough.*

## Dams

Sometimes a dam is the only option if there is no access to a water source (bore, stream) for a reticulated system. However, dams used as a direct watering point (rather than storage to feed troughs) will still offer poor water quality due to stock access, muddying and fouling of the water.

Approvals and permits may be required if the proposed dam is on a waterway (contact Goulburn Murray Water). Your Shire Council may also require you to obtain a permit for proposed dams greater than a specified size (usually 2 Megalitres).

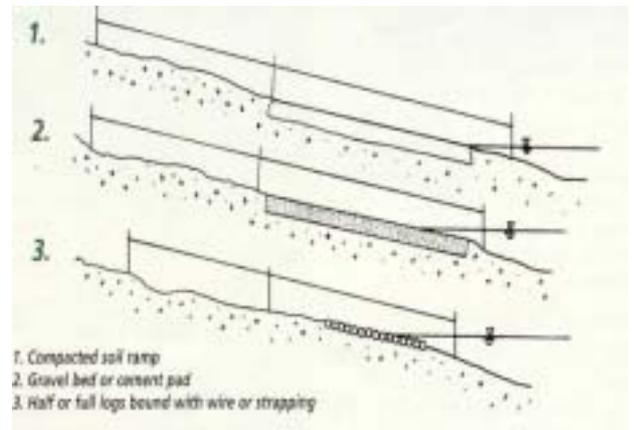
Reputable earthmoving contractors in your local area should be able to offer good advice about the best location for a dam to ensure that it will fill and hold water.



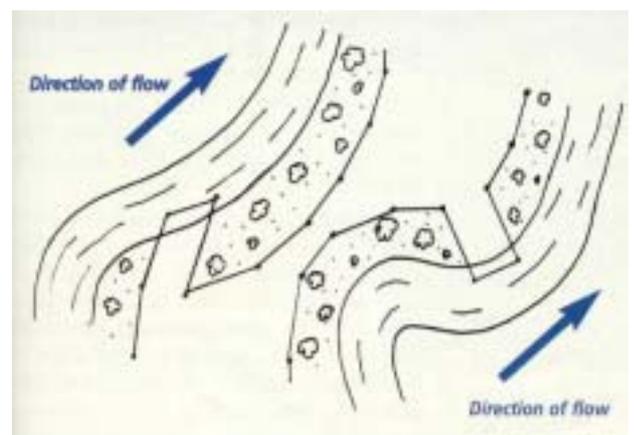
## Properly Constructed / Controlled Access Points

A controlled access point usually consists of a fenced area protruding into the stream. Electric fencing has to be used and might only consist of one or two wires or tape so that the impact of flooding is reduced.

These are the least-preferred option as an alternative. While this is preferable to full stock access because most of the stream is protected, they may concentrate the impact of the stock (particularly excrement which decreases water quality) in a small area.



*Different construction methods for limiting access points.*



*Locating watering points on inside bends and angled away from the direction of flow reduces the risk of erosion.*

*Source: Kondinin Group (1996)*

The following provides some guidelines, which would help to minimise the impact:

**Gravel, timber or stone pads should be used to reduce pugging and sediment mobilisation.**

The access point should be relatively flat to reduce erosion and to make it easier for stock to get to the streamside.

Best located on an inside bend where water movement is slower – never on an outside bend as this is a natural eroding point and sensitive to trampling.

Angle the access point in a downstream direction, so that stock enter the stream in the direction of the water flow. This allows the stream to flow past the access point rather than into it, which may cause erosion.

The width of the access point depends on the number of points and number of stock to be watered. The suggested range is between 12 and 20 metres.

## **Diversion Fees**

Security of a water supply is a key consideration in the protection of riparian zones. Many landowners express concern that fencing off a stream limits access to water and an alternative supply needs to be established prior to participation. One option regularly explored is diversion from the stream into a tank, dam or other secure storage.

In some instances, where the diversion is across a Crown Frontage or other alienated land, the extraction of water requires a licence and diversion fee from the rural water authority (Goulburn Murray Water). This has been considered a barrier to the implementation of programs and a disincentive to undertake the construction of stock proof fencing along streams.

“This issue has been resolved, in the Goulburn Broken Catchment, as follows.

*[In] situations where landowners are required to divert water across a crown frontage to provide stock water the following shall apply. . . . . provided the project meets the criteria for a waterways grant and includes the completion of an ongoing management agreement the following applies*

### *Licence Application*

*the Stock and Domestic Licence Application Fee is paid by the landowner initially and then is reimbursed by the Catchment Management Authority as part of the waterway grant. (It is important to note that the landholder must still complete the Domestic and Stock Licence form, as the landholder will always be the licensee. The CMA cannot apply on behalf of the landholder.)*

### *Annual Domestic and Stock Licence Fee*

*the Standard Annual Domestic and Stock Licence Fee is funded by Goulburn Murray Water; and*

*a 2 Megalitre water entitlement is made available free of capital charge. . . . .”*

This policy / agreement has overcome a significant barrier to the support of riparian programs.

## ***The Benefits of Native Grasses and Water Plants***

A continuous cover of grass on the stream banks and water plants in the stream are features of many fenced waterways. Such waterways are distinguished by the volunteer growth of grasses, rushes, reeds and sedges as well as planted trees and shrubs.

Management to encourage and maintain this coverage sets stream management apart from the management of other farm plantations and wind breaks.

The establishment and maintenance of a vigorous cover of grasses and waterplants is integral to effective waterway management.

### **The Advantages of Grasses and Water Plants**

The contribution that grasses and water plants make to stream stabilisation is often not realised by land managers. Grasses and water plants offer many advantages over trees and shrubs particularly in the steep bank and instream situation.

Grasses and waterplants have characteristics which make them extremely important in waterway rehabilitation and stabilisation.



*Instream and riparian vegetation.*

Some waterplants provide specific habitat quality for aquatic fauna.

Some of the characteristics which make this group of plants so useful in relation to stream stabilisation, include;

- the wide range of species;
- soil binding root systems;
- the rapid speed of growth;
- the large seed production;
- the ability to establish voluntarily in large numbers;
- the ability to colonise the different conditions on steep banks; the stream edge and often right across the stream bed;
- the ability to grow together to form a tough and resilient mat;
- the flexibility in high flows with limited disruption to stream flows (except Cumbungi *Typha spp* in some instances); and
- the ability to grow through deposited sediment and keep growing after bank slumping.

### **Improving Sediments after Flooding**

Grasses and waterplants do more than stabilise the banks with their roots.

During high flows, the leaves trap a boundary layer of slow moving water and form a barrier between the main flow and the soil. The reduction in water speed against the soil further reduces erosion.

## *Essential Elements of Ongoing Maintenance*

### **Planning for Low Maintenance**

Staff from the Goulburn Broken Catchment Management Authority and the Department of Natural Resources and Environment are available to assist in planning to fence a waterway. The main considerations are stock management; fence maintenance; planting maintenance; removing the land from active production; and access for vermin and weed control.

The fenced frontage will be removed from the normal farming activities. Without grazing it will develop a cover of grass. The grass cover is important for erosion control, particularly on the stream edge and steep banks. It is important that disturbance is minimised. (See Role of Grasses and Waterplants).

Total stock exclusion for at least two years is absolutely essential after the planting of trees and shrubs.

The lowest levels of ongoing fence maintenance are achieved when the normal rules of fencing are observed ie. long straight runs and when reaches are completely fenced on both sides with no flood fences to be continually cleaned off and maintained.

Future management access for vermin and weed control will be required. Careful fence alignment and consideration of the placement of planted trees will ease future access. Confining tree and shrub plantings to plots is one way of allowing better access within the fenced frontage when the plants grow to maturity.

*Source "Stream Action"  
Broken River Management Board*

### **Management of a Fenced Waterway –**

The support of the adjacent landowner is very important to the success of any waterway or riparian zone project.

Approval of a Waterway Grant (fencing, revegetation or off-stream water supply) is subject to the landowner signing an agreement to manage the area appropriately.

Management Agreements include conditions, such as

- Ongoing management of vermin and weeds;
- Maintenance of Fencing;
- Elimination / control of stock access for an agreed period (generally 2 – 4 years) to allow reestablishment of vegetation; and
- Support in maintenance of vegetation.

Ongoing management issues and arrangements are to be resolved through discussions between the Catchment Management Authority/Natural Resources and Environment field staff and the landholder.

Prior identification of the management actions and responsibilities allows the landholder to make an informed decision on the level of participation.

## Stock Management

The landholder is responsible for working to prevent / control stock access into the riparian zone. Stock management is the primary responsibility of the adjacent landowner. The main threat to immature plants is from stock; they will destroy young trees and shrubs very quickly. Stock must be completely excluded for a minimum of two years after planting. Monitoring of stock and regular checking of fences is critical. The frequent checks and minor fence repairs are best done by the landholder.

## Fence Maintenance after Rainfall Events

Checking and repairing the flood fences after rises in the water level is the responsibility of the landholder. This needs to be done soon after the waters recede.

Major repairs after floods are a different matter and will usually be undertaken on a co-operative basis.

## Planting Maintenance

Weeds reduce the rate of growth and the success of establishment. Maintenance of a weed-free zone of a least one square metre, around the planting, in the first year is critical.

Assistance from landholders to control weeds (mulching at planting or spraying in late winter/spring) will ensure the best result. Pre-planting weed control and mulches will be used to reduce weed competition where practical.

Watering of plants over the first summer may be necessary, depending on seasonal rainfall.

## Weed Management (Willows)

The Catchment Management Authority is responsible for willow control. The Authority has the equipment for instream tree and willow management and has developed policies on the planting of willows.

Follow-up control of willow regrowth is the responsibility of the Catchment Management Authority. Landowners are requested to identify areas of regrowth.

## Weed Management (Blackberry and others)

Management of Blackberries and other significant weeds are the responsibility of the landowner (public and private).

An annual maintenance program is encouraged.

Contact your local Department of Natural Resources and Environment office for further advice.

The use of any chemical next to a waterway requires extreme care.

### Ongoing Management:

- Sheep do less damage than cattle to vegetation in the riparian zone.
- Stock should be moved from the riparian zone as soon as signs of damage occur.
- Young stock cause less damage – exclude fully grown stock.
- Stock access to streams should be gravel or stoned ramps.
- Avoid grazing riparian land in the growing and flowering season which generally means spring and summer, and when germination is occurring.
- Stock should be excluded if soil moisture levels are high and there is a risk of pugging and compaction.
- If riparian land is to be grazed, it should be grazed only when the bulk of the vegetation is dormant.
- Low stocking rates for short periods and long rest periods is best if grazing is necessary.
- Grazing can introduce weeds and requires greater management.

## Further Information

### Further Information / Reading

Boulton, A.J. and M.A. Brock, (1999). Australian Freshwater Ecology: Processes and Management. Gleneagles Publishing, Glen Osmond, South Australia.

Kondinin Group (1996). Liquid Assets – Water management for dryland agriculture, Kondinin Group, Belmont

Lovett, S. and Price, P. (eds), (1999). Riparian Land Management Technical Guidelines. Volume One: Principles of Sound Management,. Land and Water Resources Research and Development Corporation, Canberra.

Price P. and S. Lovett, (eds), (1999). Riparian Land Management Technical Guides. Volume 2. On-ground Management Tools and Techniques, Land and Water Resources Research and Development Corporation, Canberra.

Rutherford, I and Bartley R.. (eds), (1999). Proceedings of the Second Australian Stream Management Conference, Volumes 1 and 2, 11 February, Adelaide, Co-operative Research Centre for Catchment Hydrology.

Nicholas S (1997). Manage Your Banks – A Practical Guide to streamside management, fencing and water supplies, Goulburn Valley Environment Group, Shepparton.

Wright D and Jacobson T (2000) Managing Streambanks: Stock Control, Fencing and Watering Options, Department of Primary Industries, Water and Environment, Tasmania

### Key Contacts and Organisations

Goulburn Broken Catchment  
Management Authority.

P.O. Box 1752, Shepparton, 3630 - Ph 03 58222288  
P.O. Box 124, Benalla, 3672 - Ph 03 57611675  
High Street, Yea, 3717 - Ph 03 57972001

Department of Natural Resources and  
Environment (Waterway Health Unit)

Victoria Parade, East Melbourne – Ph 0394124011

Department of Natural Resources and  
Environment (Regional)

Alexandra Ph 03 57720200  
Benalla Ph 03 57611611  
Broadford Ph 03 57841303  
Tatura Ph 03 58335222

Landcare Networks

Contact your local DNRE office (see above)

### Web Sites

Goulburn Broken Catchment Management Authority.

[www.gbcma.vic.gov.au](http://www.gbcma.vic.gov.au)

Land and Water Australia

[www.rivers.gov.au](http://www.rivers.gov.au)

Department of Natural Resources and Environment

[www.nre.vic.gov.au](http://www.nre.vic.gov.au)

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