FACT SHEET 13

Managing riparian widths . . .

13

. . . to achieve multiple objectives

The question that landholders and other river managers ask most frequently when discussing riparian areas is "How wide does it need to be?" In this Fact Sheet, we have tried to respond to this question by bringing together information from a variety of sources about the different widths of riparian vegetation required to achieve different purposes or management objectives. Although there is a broad consistency about the general widths recommended for riparian areas, there are differences depending on the aims being sought, location and the regulatory framework that governs the area. This Fact Sheet provides approximate guides for achieving different management objectives in riparian areas, as well as highlighting where to go for further information and technical expertise.

River Landscapes

This Fact Sheet is the thirteenth in a series dealing with the management of rivers and riparian land.

Landholders and river managers often want to achieve multiple objectives through their management of riparian areas. Sometimes it is possible to simply combine the recommended practices for different objectives. For example, a 10–20 metre wide grass filter strip could be combined with the replanting of native vegetation immediately adjacent to a stream or creek to meet the multiple objectives of trapping sediment and nutrients, while also providing shade to the stream. In other cases, it will not be so simple to combine the recommendations, and in most situations there will be a trade-off between what is required to meet one management objective (for example, improving water quality) and what is required for another (for example, to maximise riparian grazing).

Decisions on the preferred combinations of riparian zone management will differ according to the priorities and circumstances of the manager.

The following sections provide information about the different management objectives landholders and river managers might want riparian areas to achieve, discusses how riparian areas function to meet those objectives, and outlines the recommended widths required to achieve them. It also lists some different State and Territory regulations that impact upon activities in riparian areas, and provides references to further information.

m = metres
t = tonnes
ha = hectares
yr = year
P = phosphorus
N = nitrogen

A riparian area fenced out to allow regeneration for native species. Photo CSIRO Ecosystem Services Project.

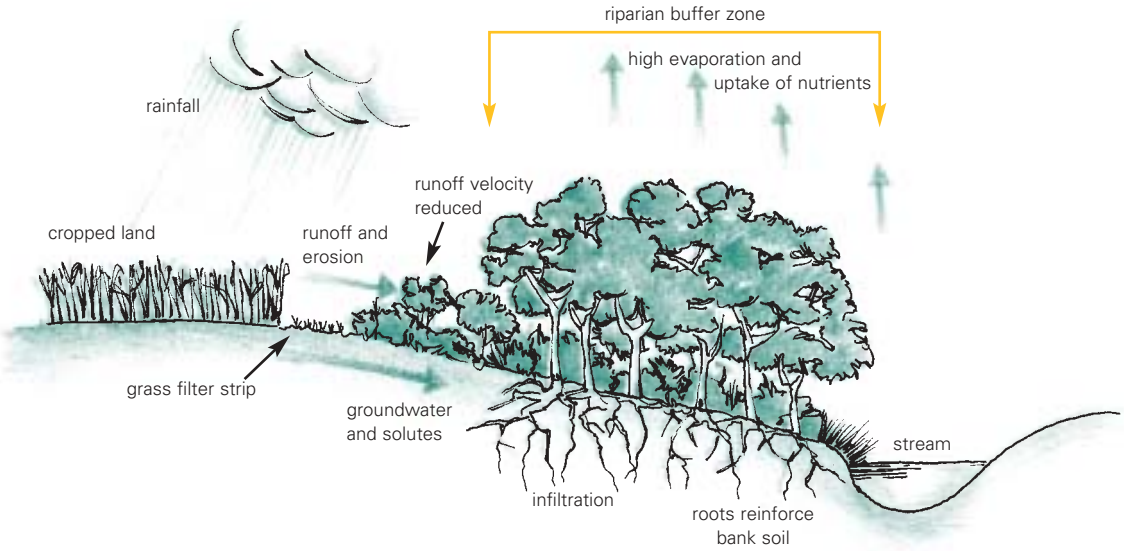
Management objective: Improve water quality

Riparian function

Riparian vegetation acts as a filter to trap sediment, nutrients and other contaminants, reducing their movement into streams.

Recommended width

Wherever possible, preserve and improve existing native riparian vegetation to provide a minimum 10 metre width upslope (away from) from the top of the bank. Where no vegetation is present, replant native species, (especially groundcovers), so that this vegetation forms a 10 metre riparian buffer. For maximum trapping of sediment, nutrient and other contaminants, combine the 10 metre riparian vegetation buffer with a grass filter strip. A minimum width of 5 metres is recommended for a grass filter strip to be effective over more than one rainfall run-off event. The width required should be selected based on site characteristics of slope, soil erosivity, and rainfall intensity (see Table 1, overleaf).



How a riparian vegetation buffer and grass filter strip combine to trap sediment, nutrient and other contaminants. Illustration The Idea to Here.

Forested filter strips, if they have bare ground or only litter, will need to be wider in order to have the same trapping effect as grass.

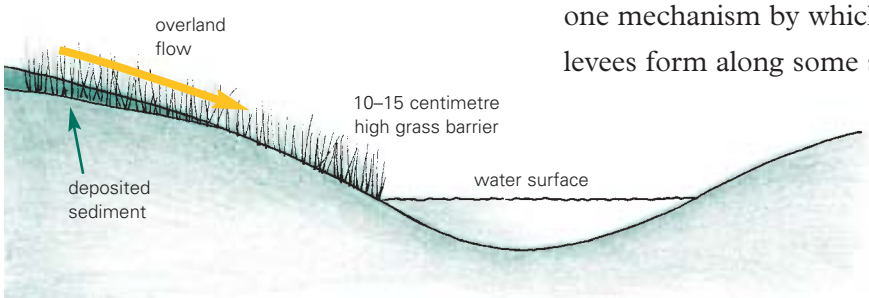
Recommended grass filter strip widths (m) for typical values of annual soil loss and filter gradient under conditions of dispersed overland flow.

soil loss (t/ha/y)	filter strip slope (%) 1	2	3	4	5	6	7	8	9	10
1	2 m	2 m	2 m	2 m	2 m	2 m	2 m	2 m	2 m	2 m
2	2 m	2 m	2 m	2 m	2 m	2 m	2 m	2 m	2 m	2 m
5	2 m	2 m	2 m	2 m	3 m	3 m	3 m	4 m	4 m	4 m
10	2 m	2 m	4 m	5 m	6 m	6 m	7 m	7 m	7 m	7 m
20	3 m	9 m	11 m	12 m	12 m	13 m	13 m	13 m	13 m	14 m
30	9 m	15 m	17 m	18 m	19 m	19 m	19 m	20 m	20 m	20 m
40	15 m	21 m	23 m	24 m	25 m	25 m	26 m	26 m	26 m	26 m
50	22 m	28 m	30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m
60	28 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m
70	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m	>30 m

A grass filter trapping strip sediment downslope of a ploughed paddock. Photo Ian Prosser.

Explanation

Sediment is deposited from overland surface flows when the flow is slowed down; this process effectively traps the sediment, absorbed nitrogen and phosphorus, as well as other solid particles and contaminants within the filter vegetation. A dense grass sward with a height of 10–15 centimetres is considered most effective for trapping solid particles. Many grass species are able to grow through the trapped sediment (especially those that produce roots from stem nodes), and stabilise it for the long-term; this may be one mechanism by which grassed levees form along some streams.



How a grass filter strip functions to trap sediment. Illustration The Idea to Here.

Definitions

- **Absorbed** — nutrient that is bound to sediment and only dissolves into water under particular chemical conditions.
- **Porosity** — the proportional volume of soil pores that can be filled by surface run-off.
- **Infiltration** — the movement of surface run-off water into the soil through the filling of empty pore spaces.
- **Denitrification** — the process whereby microbes break-down nitrogen-containing compounds (including nitrate and other contaminants) with the release of gaseous nitrogen.

Riparian vegetation can also influence the movement of dissolved contaminants by increasing soil porosity and infiltration rate. Some of the surface run-off may infiltrate the riparian soil which enables water and nutrients to be taken up by riparian plant roots. In addition, dissolved forms of nitrogen (an important potential contaminant of streams) may be removed through denitrification.

Factors to be considered when making decisions about the width required for a riparian vegetation buffer include the:

- *Type of vegetation cover* — dense, rough, ground vegetation may slow the run-off more. The more spread out the flow, and the slower it moves, the quicker suspended particles are likely to drop out and become trapped. Native species are generally recommended, but if the native riparian vegetation has little ground cover and concentrates flow into a few pathways, then a grass filter strip next to it (upslope) is required.
- *Physical form of the land and timing and intensity of run-off* — gullies can concentrate run-off and sub-surface flow into narrow areas at the base of a hill slope, the size and shape of this area will influence the ability of vegetation to filter sediment. Vegetated slopes adjacent to waterways will increase the effectiveness of the riparian filter strip by slowing the flow of run-off before it enters the riparian zone. Where confined run-off results from an adjacent road, stockyards, or stock tracks, minor works may be required to spread the flow and its potential contaminant load either across a sufficiently-wide grass filter strip, or for it to be channelled elsewhere to prevent movement directly into the stream. Grass filter strips should be installed at the base of the upslope paddock, so that they are between the paddock and the high bank of the stream. It is recommended that modern practices of soil conservation and minimum tillage be used on sloping land, with the use of within-paddock contour banks and filter strips where required.
- *Amount and type of pollutant* — it is easier to trap pollutants attached to soil particles, so it is important to use farm management practices to reduce losses of nutrients and other pollutants in soluble form.

Farmer combining grass filter strip with riparian buffer to trap sediment coming off crop paddock.
Photo Ian Prosser.

By combining a minimum 10 metre wide riparian vegetation buffer strip with a 5–10 metre grass filter strip, maximum trapping of sediment, nutrient and other contaminants can be achieved. Maintaining native riparian vegetation buffers also have the environmental benefits of providing shade, inputs to in-stream food webs and terrestrial habitat. This combination can achieve many riparian management objectives.

For more information

★ *Fact Sheet 3: Improving Water Quality*, Lovett, S. & Price, P. 2004, Land & Water Australia.

A Guide to Riparian (River-Bank) Vegetation and its Management, Munks, S.A. (ed.) 1996, Department of Primary Industries and Fisheries, Tasmania.

★ 'Designing Filter Strips to Trap Sediment and Attached Nutrient', Prosser, I. & Karssies, L. 2001, *River and Riparian Land Management Technical Guideline Update Number One*, Land & Water Australia.

★ *Managing Riparian Land for Multiple Uses*, Robins, L. 2002, Rural Industries R&D Corporation.

★ *Riparian Land Management Technical Guidelines, Volumes 1 and 2*, Lovett, S. & Price, P. (eds), 1999, Land & Water Australia.

★ available online at www.rivers.gov.au and in hard copy from CanPrint Communications 1800 776 616.

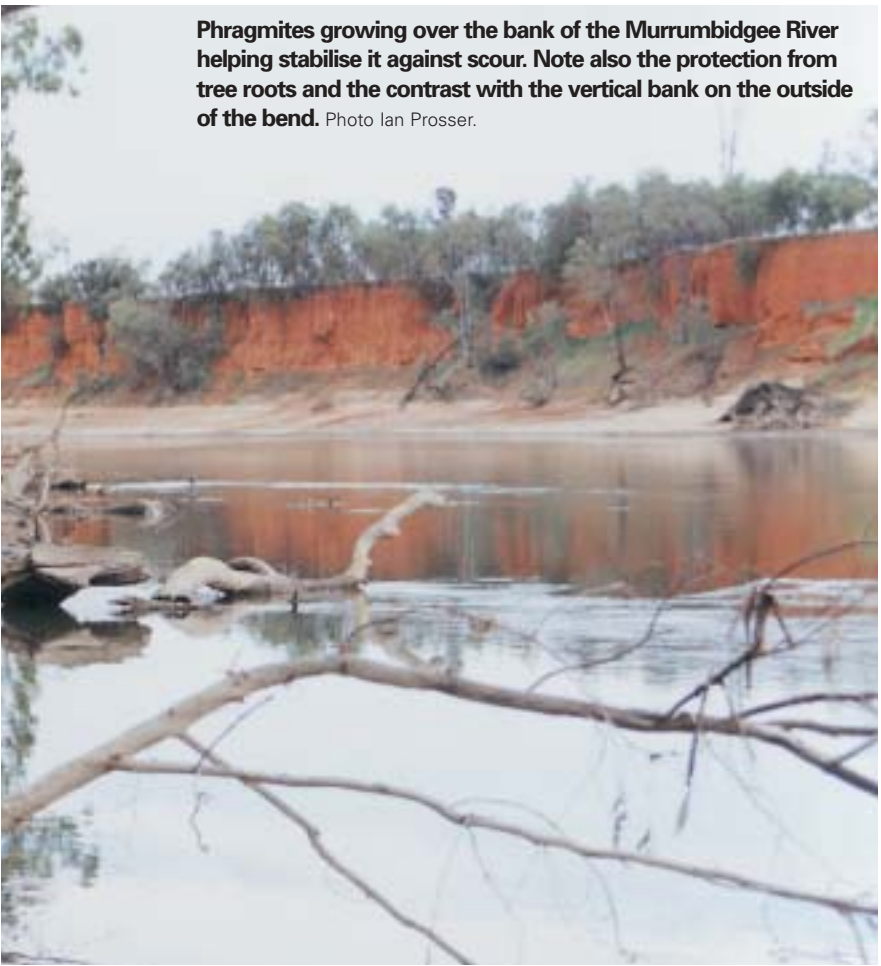
Management objective: Reduce erosion of streambanks

Riparian function

Riparian vegetation protects banks from surface erosion by rain, water flow or stock. The roots of riparian vegetation can help to dry and reinforce bank soils to prevent cracking and slumping.

Recommended width

Wherever possible, preserve and enhance existing native riparian vegetation to provide a minimum width upslope (away from) from the top of the bank of 5 metres, plus the height of the bank, plus an additional width if the bank is actively eroding. The erosion allowance is calculated as the rate of bank erosion in metres per year, multiplied by the number of years it will take for replanted vegetation to reach maturity or a height of 10 metres (use the lesser period). For example, if the bank height from low flow water level to the top of the channel (use the one in two year peak flow channel) is 4 metres, the bank is actively eroding at 0.2 metres/year, and replanted trees will take 20 years to reach 10 metres in height, the width of native riparian vegetation required for bank stabilisation is:



Phragmites growing over the bank of the Murrumbidgee River helping stabilise it against scour. Note also the protection from tree roots and the contrast with the vertical bank on the outside of the bend. Photo Ian Prosser.

Minimum width	5
Bank height	+ 4
Erosion rate 0.2 m x 20 years	+ 4
Total width	= 13 metres (min)

On larger streams, account should also be taken of the natural process of channel migration. The rule of thumb' for channel migration is 1% of the channel width per year. Therefore, half a channel width is the suggested minimum distance on each side of a river for vegetation whose primary purpose is for erosion control (I. Rutherfurd pers. comm.)

Explanation

The key principle in preventing or reducing erosion on riparian land and streambanks is to maintain good vegetation cover of the soil surface. This reduces contact between falling raindrops or floodwaters on the soil surface, and decreases the amount of soil eroded into the stream or creek.

In the case of bank erosion, there are three broad processes at work — sub-aerial erosion, scour and slumping. They may occur singly or in combination, in different parts of the stream or creek. It is important to identify which one is causing the bank to erode so that you can implement the appropriate management strategy.

Sub-aerial erosion

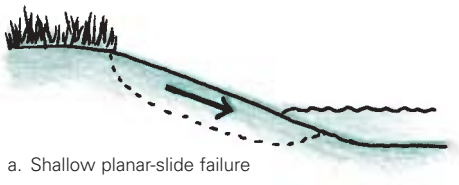
This involves processes that loosen the soil of the streambank, making it vulnerable to being carried away by the water flowing past. Loosening processes include frost heave, where moisture in the soil freezes and expands at night, flaking off the soil surface; trampling by stock; and the impact of wind and rain. The key to preventing this type of erosion is to ensure there is good vegetative cover over the whole of the bank. Cracking clay soils are particularly prone to this type of erosion.

Scour

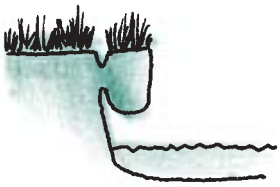
Scour occurs when a force applied to the bank by flowing water exceeds the resistance to erosion of the bank surface. On outer bends of a stream meander, water flow is fast and there is strong contact between the flow and the bank itself. Scouring tends to take place in the area known as the toe of the bank, that is, at the water's edge. Repeated scour at this point can undercut the bank, which then topples into the water when its weight can no longer be supported. For this form of erosion the key to management is to ensure the bank is vegetated and protected against the scour mechanism.

Processes of erosion.
Broken lines indicate failure planes.

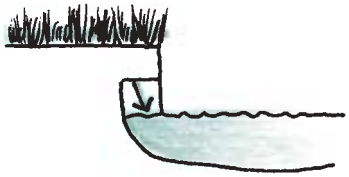
Before

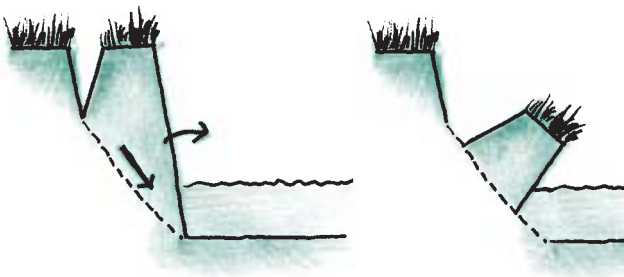


a. Shallow planar-slide failure

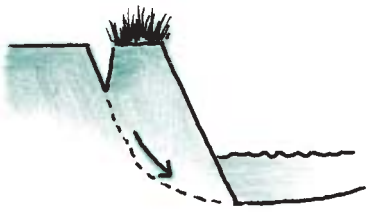


b. Scour failure (above and below)





c. Slumping failure (slide → topple)



d. Slumping failure (slope failure → toe failure → base failure)

This stream has had unrestricted stock access that has kept the banks bare and unstable. The area has recently been fenced off in an effort to prevent further bank erosion. Photo Siwan Lovett.

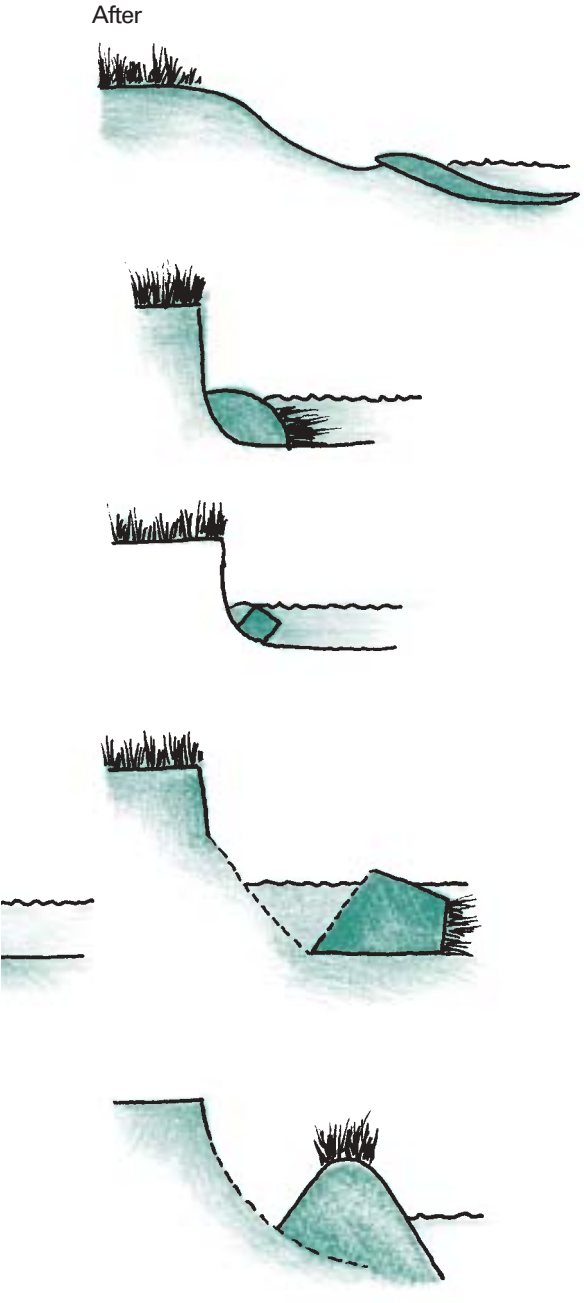


Illustration The Idea to Here.

Slumping

This occurs following undercutting, but can also happen when the bank soil itself has been saturated, e.g. by heavy rainfall or from a flood peak, or when the level of flow in the stream drops quickly, leaving the heavy, saturated soil of the bank unsupported. Some soils have natural planes of weakness shown by cracks or gravel bands resulting from past deposition. These are natural places where banks can slump into the stream or creek. Vegetation can be used to prevent slumping by drying out the soil as well as providing networks of roots that reinforce and strengthen the bank.

As a general rule, stock access to streambanks should be prevented or carefully controlled to ensure that grazing does not result in bare areas. Stock tracks along or up and down banks are also an erosion hazard. In addition, cultivation should not be undertaken within 5 metres of the top of a bank or within the 1 in 50 year flood zone, whichever is the greater. The overall aim should be to keep streambanks fully vegetated, control stock access and retain a minimum 5–10 metre width of riparian vegetation along the stream.

For more information

★ *Fact Sheet 2: Streambank Stability*, Lovett, S. & Price, P. 2004, Land & Water Australia.

ACT Land Planning and Environment Act, Territory Plan 1991, Australian Capital Territory Government.

A Guide to Riparian (River-Bank) Vegetation and its Management, Munks, S.A. (ed.), 1996, Department of Primary Industries and Fisheries, Tasmania.

Fish and Fish Habitat of the Queensland Murray-Darling Basin, 2002, Department of Primary Industry, Queensland.

Guidelines for Riparian Strips for Queensland Irrigators, Karssies, L. & Prosser, I. 1999, CSIRO Land & Water Technical Report 32/99.

Guidelines for Stabilising Streambanks and Riparian Vegetation, Abernethy, B. & Rutherfurd, I. 1999, Cooperative Research Centre for Catchment Hydrology Technical Report 99/10.

★ *Managing Riparian Land for Multiple Uses*, Robins, L. 2002, Rural Industries R&D Corporation.

★ *Riparian Land Management Technical Guidelines, Volumes 1 and 2*, Lovett, S. & Price, P. (eds), 1999, Land & Water Australia.

Management objective: Maintain natural light and temperature levels within streams

Riparian function

Native riparian vegetation provides shade which is crucial for maintaining natural levels of light intensity and water temperature for healthy in-stream ecosystems.

Recommended width

Ideally, two to three tree or tall shrub widths (10–20 metres) need to be maintained, though a minimum of one tree or tall shrub width (5–10 metres) will provide shade and reduce temperature levels.

Explanation

The aim should be to achieve 75% riparian cover (shade) across the stream if the sub-catchment is less than 1000 hectares, or the active channel less than 10 metres wide. To achieve this level of cover may require only one width of riparian trees if they are healthy with full crowns. Where shading is a high priority, two or three tree widths would be a safer approach. Widths may therefore vary from between 5–20 metres, depending on the species used and the site. Higher rainfall areas will need a continuous strip of native riparian species to mimic natural conditions, whilst in drier inland areas riparian cover may be discontinuous. Compare with local uncleared riparian areas to work out what is the 'natural' pattern of vegetation cover in your area.

Channel width = 1.7 m
Bank shade = < 1%
Canopy shade = 1%
Total shade = 1%

Channel width = 8 m
Bank shade = 6%
Canopy shade = 18%
Total shade = 24%

Channel width = 4 m
Bank shade = 10%
Canopy shade = 39%
Total shade = 49%

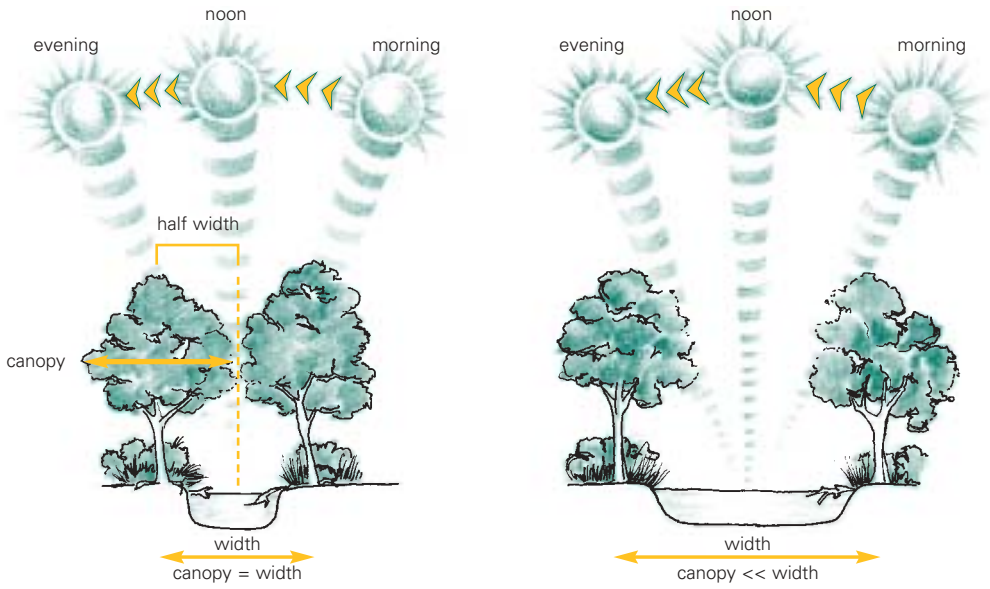


Illustration The Idea to Here.

Influence of channel width on cover. A small stream can be completely shaded if the active channel width is equal to or less than the width of the tree canopy. As channel dimensions increase, and vegetation height and width remain relatively uniform, riparian shading of the channel becomes less effective.

Shade from riparian vegetation has been shown to be essential in regulating water temperature. The relationship between vegetation height and stream width is such that vegetation can shade much of a small stream (up to 10 metres wide) during most of the day and across seasons. It is also known that high light intensity can lead to increased growth of in-stream nuisance plants, including algae. Shade and low light can prevent such growth, even in the presence of enhanced nutrient levels following catchment development. For an east–west running stream, most shade is provided from the northern bank, so this needs to be the priority for restoration works designed to improve in-stream health.

For more information

- ★ *Fact Sheet 4: Maintaining Instream Life*, Lovett, S. & Price, P. 2004, Land & Water Australia.
- ★ *Riparian Land Management Technical Guidelines, Volume 2*, Lovett, S. & Price, P. (eds), 1999, Land & Water Australia.
- ★ 'Managing high in-stream temperatures using riparian vegetation', Davies, P., Cook, B., Rutherford, K. & Walshe, T. 2004, *River and Riparian Land Management Technical Guideline Update Number Five*, Land & Water Australia.

Channel width = 8 m
Bank shade = 4%
Canopy shade = 57%
Total shade = 61%

Channel width = 6 m
Bank shade = 3%
Canopy shade = 80%
Total shade = 83%

Photos courtesy CENRM.

Management objective: Provide food inputs and habitat for aquatic ecosystems

Riparian function

Native riparian vegetation provides food inputs and aquatic habitat essential for aquatic ecosystems.

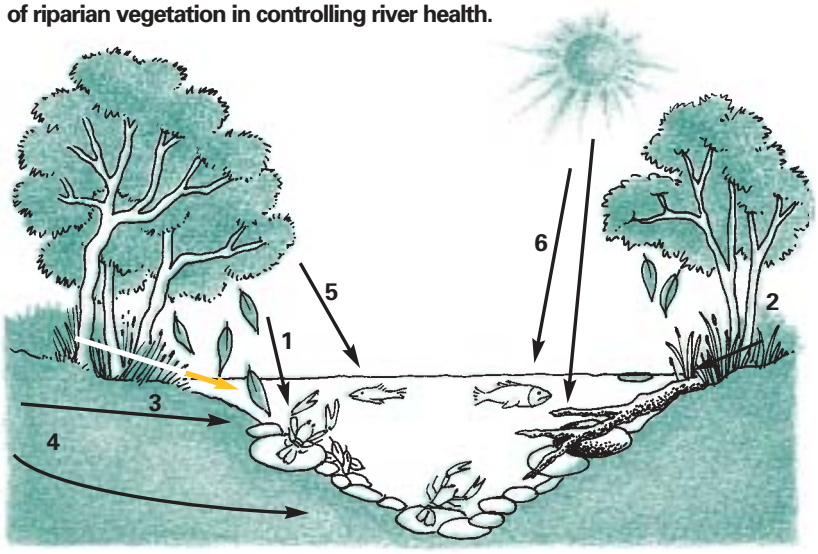
Recommended width

Ideally, two to three tree or tall shrub widths (10–20 metres) need to be maintained, though a minimum of one tree or tall shrub width (5–10 metres) will still provide inputs if it has a healthy crown overhanging the stream.

Explanation

Native riparian vegetation provides natural inputs (in terms of quality, quantity, and seasonal timing) of leaves, twigs, fruits, and insects which supports healthy aquatic food webs and ecosystems. Branches and whole trees that fall into the stream also provide habitat, shelter and a mix of flow velocities to produce different habitat conditions for fish and other aquatic animals. Tree roots in the water also provide habitat for stream animals.

Schematic representation of the ecological multiple roles of riparian vegetation in controlling river health.



1. Inputs of leaf litter from riparian vegetation.
2. Inputs of logs and branches (important habitat role).
3. Leaves and fine particles of organic matter washed in from surrounding catchment.
4. Dissolved organic matter in sub-surface flow and groundwater.
5. Terrestrial invertebrates falling from riparian vegetation.

Source: S. Bunn, 1998.

Two streams with varying levels of riparian vegetation cover over the stream. Instream life in the photo on the right (74%) will be significantly more healthy and diverse than that on the left.

In those cases where riparian vegetation has been extensively cleared it may take many years before some of these functions are restored (for example large pieces of wood falling into the stream), and other rehabilitation action such as the artificial replacement of wood into streams to create habitat may be necessary to achieve the desired results in a shorter period. It is sometimes possible to obtain trees from elsewhere in the catchment, for example where rivers have been de-snagged and the trees left on the bank, or from approved urban or mining developments, and use them as a short-term remedy while replanted riparian vegetation matures. The construction of engineered log jams is a recent successful development in Australia (this technique has been used more overseas), in which groups of smaller trees or logs are placed at one location and may be wired or bolted together to form a stable larger structure to control erosion and provide habitat complexity.

Native riparian vegetation performs several functions that contribute to creating fish habitat. These include shading to control water temperature, trapping of sediment and nutrients from upslope sources, and inputs of food in the form of leaves, twigs, fruit, and insects. The recommended widths for protecting different aspects of fish habitat are:

- water temperature moderation 5–30 metres;
- sediment removal 5–61 metres;
- nutrient removal 5–91 metres; and
- species diversity 5–106 metres (dependent on the species, see source reference for more detail)

Source: *Fisheries Guide for Fish Habitat Zones*, Bavins, M., Couchman, D. & Beumer, J. 2000, Department of Primary Industries, Queensland.

For more information

- ★ *Fact Sheet 4: Maintaining Instream Life*, Lovett, S. & Price, P. 2004, Land & Water Australia.
- ★ *Riparian Land Management Technical Guidelines, Volume 2*, Lovett, S. & Price, P. (eds), 1999, Land & Water Australia.
- ★ 'Managing high in-stream temperatures using riparian vegetation', Davies, P., Cook, B., Rutherford, K. & Walshe, T. 2004, *River and Riparian Land Management Technical Guideline Update Number Five*, Land & Water Australia.
- ★ 'Managing Wood in Streams', Cottingham, P., Bunn, S., Lovett, S. & Price, P. (eds), 2003, *River and Riparian Land Management Technical Guideline Update Number Four*, Land & Water Australia.

Management objective: Provide terrestrial habitat

Riparian function

Native riparian vegetation provides food inputs and terrestrial habitat essential for animals and plants that live in land adjacent to rivers and streams.

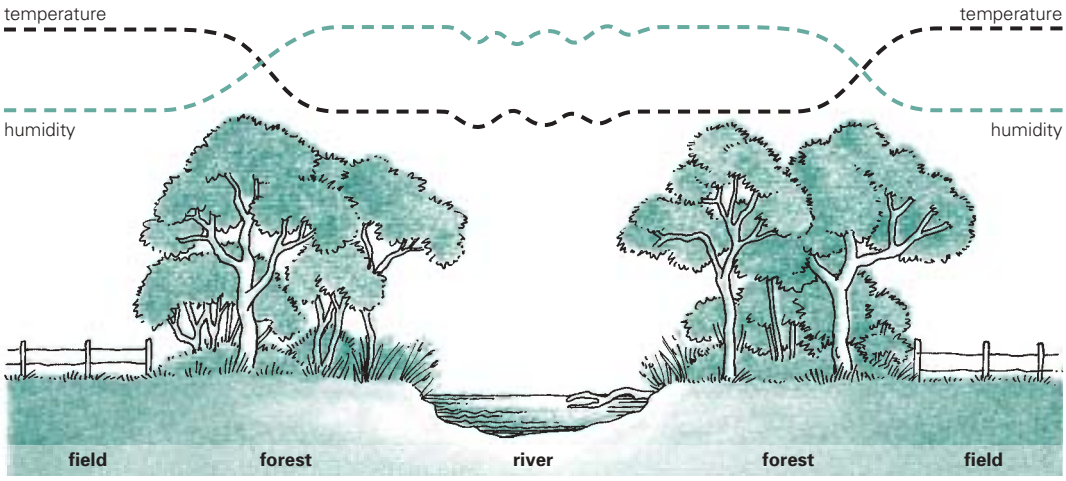
Recommended width

A width of at least 10 metres is required to provide habitat and passage for small animals. A minimum of 50 metres is required to provide a riparian corridor for larger animals (for example, large birds of prey). A width of several hundred metres may be necessary, depending on the terrestrial species, and if the corridor is required to be self-regenerating. Even within one group of animals, such as butterflies or birds, there will be large differences in the width required by different species depending on their requirements for food and shelter.

Photo Peter Walton Photography.

Explanation

Edge effects (in which exotic species, extreme weather conditions, or contaminants such as fertiliser and pesticides can enter native vegetation from 'outside' and cause damage and loss of ecological values), may reduce the habitat value of narrow corridors, but even narrow strips can be useful for some species as a source of food, protection from predators, or to enable some species to complete different parts of their life cycle in the stream and adjacent vegetation. Corridors of native riparian vegetation are particularly important in situations where the surrounding catchment has been substantially cleared. Greater width is likely to result in more desirable habitat for most species, as it reduces or prevents edge effects and invasion by exotic plants and animals, as well as being better able to withstand extreme climatic and natural events such as flooding.
A width of 80–100 metres is required for most birds and animals, but if this is impractical, consider islands of 50–80 metre width, with 20 metre corridors between them.



Riparian vegetation has a moderating effect on air temperature and humidity, creating a special microclimate for wildlife. Illustration Carolyn Brooks.

Riparian habitat should include big trees both living and dead, understorey species of trees and shrubs, and groundcover including grasses and other plants as well as logs, leaf litter and rocks. These are critical components for many wildlife species as they provide food and shelter at different times of the year. It is becoming apparent as more is learnt about Australian wildlife that continuous corridors of riparian vegetation also play a crucial role in the seasonal migrations of many species, for example between tableland and coastal areas.

For more information

★ *Fact Sheet 5: Riparian Habitat for Wildlife*, Lovett, S. & Price, P. 2004, Land & Water Australia.

Fish and Fish Habitat of the Queensland Murray-Darling Basin, 2002, Department of Primary Industry, Queensland.

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★ *Riparian Land Management Technical Guidelines, Volume 2*, Lovett, S. & Price, P. (eds), 1999, Land & Water Australia.

Reconstruction of Fragmented Ecosystems, Saunders, D., Hobbs, R. & Ehrlich, P. (eds), 1993, Surrey Beatty & Sons Pty Ltd.

Wildlife on Farms, Lindenmayer, D., Claridge, A., Hazell, D., Michael, D., Crane, M., MacGregor, C. & Cunningham R. 2003, CSIRO Publishing.

Wildlife Corridors and the Conservation of Biodiversity, Wilson, A. & Lindenmayer, D., 1995, Centre for Resource and Environmental Studies, Australian National University.

Tree hollows are valuable for wildlife. Photo Guy Roth.

Management objective: Manage stock to prevent damage to riparian areas

Riparian function

Uncontrolled access by stock to riparian areas can result in over-grazing and trampling of vegetation, leaving areas of bare soil and stock tracks that can cause erosion. Animal wastes foul the water for downstream users and can transmit diseases that reduce stock growth and production.

Recommended width

Fencing to control stock access to riparian areas should be constructed a minimum of 5 metres from the top of the bank; a greater distance is required where the bank is eroding and where periodic flooding occurs.

Explanation

Uncontrolled stock grazing in riparian land can lead to excessive run-off, bank erosion, loss of productive land, decline in important wildlife habitat, reduced water quality and damage to in-stream ecosystems. It is often not necessary to permanently exclude animals from riparian lands, but it is important to control their movement and to manage grazing pressure.

Fencing is by far the most common way of controlling stock access to riparian areas. Different types of fencing may be used depending on the type of stock being managed and the site characteristics. Plain or

Heavy livestock grazing in riparian areas can eventually result in near-total collapse of the native riparian vegetation cover. Source: modified from Thomas et al. 1979. Illustration Carolyn Brooks.

This riparian zone has been fenced out to restrict stock access. Once the area has been rehabilitated, stock may be permitted access for drought refuge or shelter in times of severe weather events. Photo Siwan Lovett.

barbed wires, mesh (e.g. Ringloc) or electric fences are all effective for different situation and at different costs. Alternatives to fencing may be considered, including the use of alternative watering points, shade, and feed supplements to change animal behaviour. Fencing should be planned in conjunction with either off-stream watering of stock through a reticulated supply, and/or development of designated watering points along the stream.

Where active erosion of the streambank is evident, a minimum of 10 metre set-back for any fence is recommended. Electric fences, which are easier and cheaper to replace following a flood or bank collapse, may be placed closer to the stream or the known flood level than mesh fences. A form of "lay-down" fence, that can either be manually dropped or that automatically lays down under flood pressure, could be considered for flood-prone sites.

Publicly-funded riparian fencing schemes may provide a greater proportion of fencing costs when a greater width is fenced off from open stock access, and often a minimum width of 20 metres from the water edge or from the top of the bank is recommended. The Save the Bush publication listed below also provides information about controlling feral animals such as rabbits in riparian areas once they have been fenced off.

For more information

★ *Fact Sheet 6: Managing Stock*, Lovett, S. & Price, P. 2004, Land & Water Australia.

Managing Farm Watercourses, Kit 6A Landholder's Guide, Goldney, D. & Wakefield, S. 1997, Save the Bush Central, West NSW.

Managing Streamsides: Stock Control, Fencing and Watering Options, Wright, D. & Jacobson, T. 2000, Tasmanian Department of Primary Industries, Water and Environment.

Managing waterways on farms, Brouwer, D. 1997, NSW Agriculture.

Streambank Erosion, Notes Information Series, Ziebell, D. 1999, Department of Primary Industries, Victoria.

★ available online at www.rivers.gov.au and in hard copy from CanPrint Communications 1800 776 616.

Management objective: Manage riparian areas to enable agricultural production

Riparian function

Riparian land is often a highly productive part of the landscape. It can be managed directly for commercial products such as timber or honey, or indirectly so that it improves production by providing habitat for pollinators or acting as a windbreak for commercial crops and domestic stock.

Recommended width

Varies according to management objective, but generally a minimum of 10–30 metres.

Explanation

For an efficient riparian windbreak, the length should be at least 20 times the width, and the longer the windbreak the greater the area sheltered. Use 10–30 metre wide multi-row windbreaks to maintain uniform porosity and maximise shelter effects for crops and animals. To provide habitat for beneficial animals, especially pollinators, use mixed local native species in multiple rows of 10–30 metre width. Mixed species help to maximise beneficial animals, especially native pollinators.

For growing and harvesting of wood products, (such as timber, poles, posts, charcoal, firewood or broombrush), the impact on riparian land may range from low, through to high on-site effects, depending on harvesting intensity and method. Adopting this management objective may require trade-offs against other objectives like streambank stability, biodiversity conservation and water quality. Do not fell trees within at least 10 metres of outside meander bends. Regulations exist in most States governing activities such as harvesting timber in riparian areas, with planning permits often required. Harvesting is generally not permitted within 10–40 metres from top of bank, though the actual width depends on the permanency of water body, slope and erodibility of soils. State regulations provide details.

Photo Canegrowers.

Windbreaks can catch spraydrift off crops such as cotton. Riparian windbreaks can be just as effective as those planted in paddocks, and have the added advantage of providing a range of other environmental benefits to riparian plants and animals. Photos Rachel Holloway.

Harvesting of non-wood products may be permitted within 10–100 metres of a stream, depending on the product. Harvesting non-wood products (such as seed, honey, foliage, bushfoods, essential oils, nuts, pharmaceuticals or other bio-based products) from riparian land may have little impact on the other values you wish to protect.

Riparian areas can be maintained to provide a buffer to spraydrift; a width of at least 30 metres is recommended. The buffer should consist of a variety of trees and shrubs planted to give canopy equivalent to 30–50% ground-cover, preferably slender species with rough foliage and height 1.5 times the height of pesticide release.

Riparian pastures often remain green longer due to better soils and moisture levels than the surrounding hill-slopes, and can be managed to cover feed droughts on other parts of the property. Widths vary according to situation, and grazing management to optimise production must be considered as part of the whole-farm plan.

For more information

★ *Managing Riparian Lands for Multiple Uses*, Robins, L. 2002, Rural Industries R&D Corporation.

★ 'Managing Riparian Land to Achieve Multiple Objectives', *RipRap, Edition 23*, Lovett, S. (ed.), 2003, Land & Water Australia.

Code of Forest Practices for Timber Production, 1996, Department of Natural Resources and Energy, Victoria.

The Australian Cotton Industry Best Management Practice Manual, 2000, Cotton Australia.

Management objective: Land clearing for agricultural or urban development

Riparian function

Special care is needed when clearing land within or adjacent to riparian areas to avoid damage to streams, water quality, and flora and fauna.

Recommended width

Legislation and/or regulations are in place in all States and Territories that restrict how close to a water body clearing can take place. The required widths vary from 20–200 metres depending on stream size and location, and the type of clearing proposed. Examples are given below.

Explanation examples

ACT: Under the *Land (Planning and Environment) Act 1991*, through the *Territory Plan 2002*, land fronting the Murrumbidgee and Molonglo rivers are zoned river corridors and management must be consistent with their respective Management Plan. For other rural land that goes to the water edge, a section of the lease Land Management Agreement will address the management of the riparian zone. Failure to comply with a Land Management Agreement will incur a penalty.

New South Wales: Under the *NSW Native Vegetation Conservation Act 1997*, clearing is generally not permitted within 20 metres of the bed or bank of a stream or any part of a lake. Areas within 20 metres can be cleared only in accordance with development consent, or, if permitted, under a regional vegetation plan. Advice is generally site-specific.

Northern Territory: Under the *NT Water Act 1992*, any interference with a waterway or obstruction of flow requires a permit. A clearing application must include details of riparian vegetation and the *Land Clearing Guidelines 2002*, Resource Management Guidelines for the Northern Territory, Technical Report 27/2002 recommends buffer widths according to the nature and order of the waterway. To avoid erosion during activities such as construction, disturbance of banks should be kept to a minimum. In severe cases, legislative provisions under the *Soil Conservation and Land Utilisation Act 1980*, can be enacted to help protect sensitive areas.

Queensland: The *Queensland State Policy for Vegetation Management on Freehold Land 2000* (Department of Natural Resources and Mines) requires that 50 metres each side of first and second order streams (gullies and small streams) be left uncleared, 100 metres each side of third and fourth order (mid-sized) streams, and 200 metres each side of fifth order and larger streams (rivers).

South Australia: Under the *SA Water Resources Act 1997, Watercourses Section 9 Permits*, (Fact Sheet 27), a permit is required to alter a waterway in any way. Staff from the local natural resources management agency can provide advice about the width of riparian area that should be protected and the appropriate plant species to be used in the process. Where possible, the riparian zone should be fenced off if stock are on the property. Riparian vegetation is recommended to:

- slow overland movement of water allowing the settling of soil before water enters a watercourse, thereby reducing sediment deposits into the watercourse;
- slow flood waters;
- stabilise watercourse banks, reducing erosion;
- provide shade to watercourse to reduce water temperature and algal blooms; and
- provide habitat for animals living on land and in the water.

Tasmania: The *Tasmania Land Use Planning and Approvals Act 1993, (Wetlands and Waterway Schedule)* has variable widths, depending on the particular Planning Scheme, which, in turn, has to be consistent with State Policies. However, removing vegetation within 30 metres of the outer boundary of permanent wetlands, waterway or shoreline or estuary is generally prohibited. Local government Planning Schemes must be consistent with Tasmania's Resource Management and Planning System.

Victoria: Under the *Victoria Planning and Environment Act 1987*, a permit is required where proposed activity is within 30 metres of a watercourse.

Western Australia: The *Western Australia Public Open Spaces in Residential Areas 2002, Policy No. DC 2.3*, in general does not permit clearing within 30 metres of a recognised watercourse or foreshore. Width varies according to size of watercourse or body of water and condition of the banks.

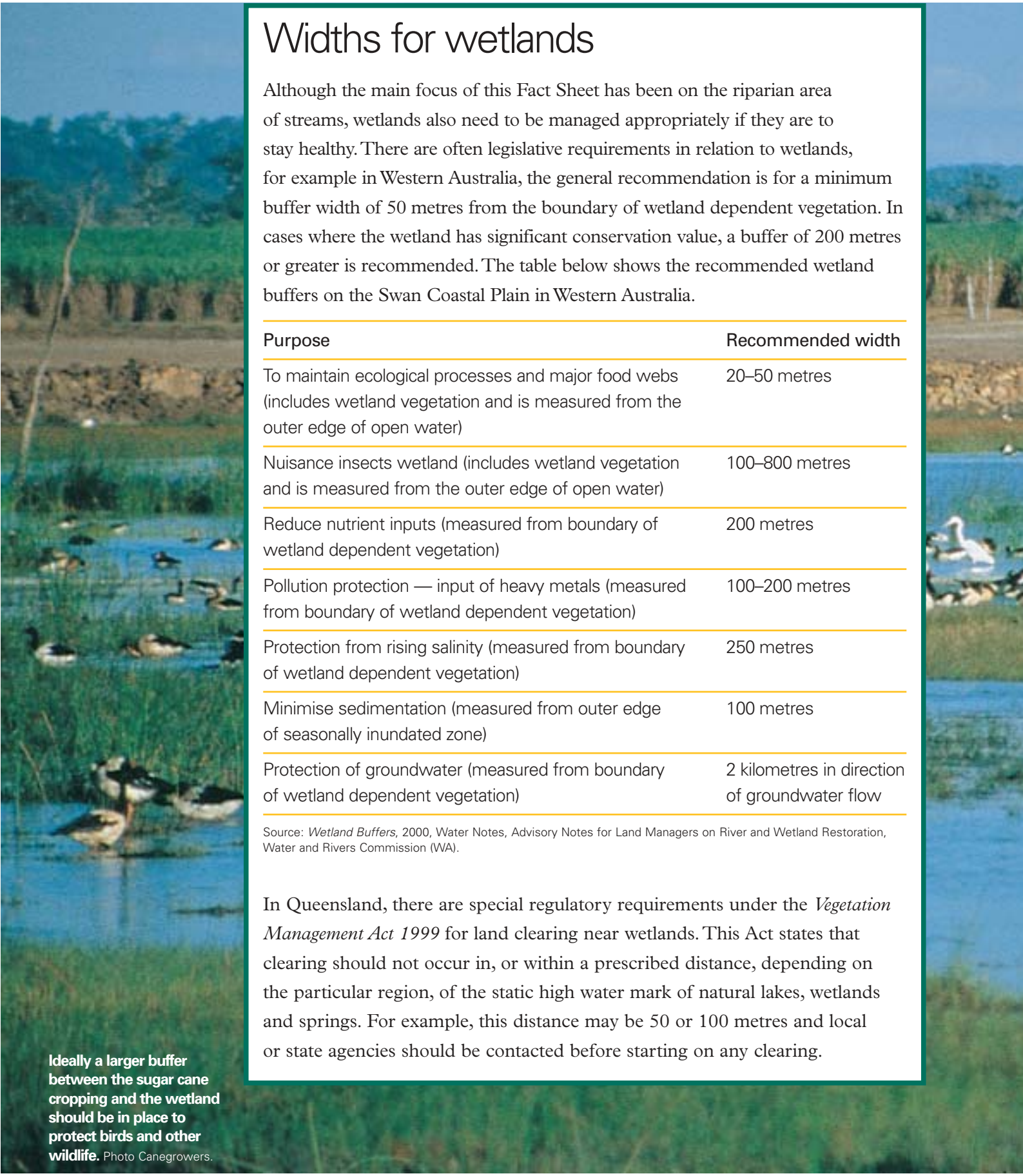
Photo Mallee Catchment Management Authority.

Summary table

The following table provides a summary of the MINIMUM widths that are considered necessary to achieve particular management objectives. The actual width required should be determined for each situation by reference to the condition of local riparian areas and through seeking technical advice. Otherwise, there is the risk that objectives will not be met and resources wasted. As a general rule, wider is better and will last longer. When use and management of riparian areas is planned carefully as part of the whole-farm plan, it is generally possible to achieve increases in both productivity and environmental condition, so going wider is a benefit, not a cost — especially when multiple objectives are being achieved.

Management objective	Recommended minimum width
Improve water quality	5–10 metres
Reduce streambank erosion	5–10 metres
Maintain natural light and temperature levels	5–10 metres
Provide food inputs and aquatic habitat	5–10 metres
Provide habitat for fish	5–30 metres
Provide terrestrial habitat	10–30 metres
Manage agricultural production	5–10 metres
Land clearing in riparian areas	See relevant State/Territory regulations

Photo CSIRO Ecosystem Services Project.



Ideally a larger buffer between the sugar cane cropping and the wetland should be in place to protect birds and other wildlife. Photo Canegrowers.

Widths for wetlands

Although the main focus of this Fact Sheet has been on the riparian area of streams, wetlands also need to be managed appropriately if they are to stay healthy. There are often legislative requirements in relation to wetlands, for example in Western Australia, the general recommendation is for a minimum buffer width of 50 metres from the boundary of wetland dependent vegetation. In cases where the wetland has significant conservation value, a buffer of 200 metres or greater is recommended. The table below shows the recommended wetland buffers on the Swan Coastal Plain in Western Australia.

Purpose	Recommended width
To maintain ecological processes and major food webs (includes wetland vegetation and is measured from the outer edge of open water)	20–50 metres
Nuisance insects wetland (includes wetland vegetation and is measured from the outer edge of open water)	100–800 metres
Reduce nutrient inputs (measured from boundary of wetland dependent vegetation)	200 metres
Pollution protection — input of heavy metals (measured from boundary of wetland dependent vegetation)	100–200 metres
Protection from rising salinity (measured from boundary of wetland dependent vegetation)	250 metres
Minimise sedimentation (measured from outer edge of seasonally inundated zone)	100 metres
Protection of groundwater (measured from boundary of wetland dependent vegetation)	2 kilometres in direction of groundwater flow

Source: *Wetland Buffers*, 2000, Water Notes, Advisory Notes for Land Managers on River and Wetland Restoration, Water and Rivers Commission (WA).

In Queensland, there are special regulatory requirements under the *Vegetation Management Act 1999* for land clearing near wetlands. This Act states that clearing should not occur in, or within a prescribed distance, depending on the particular region, of the static high water mark of natural lakes, wetlands and springs. For example, this distance may be 50 or 100 metres and local or state agencies should be contacted before starting on any clearing.

Variations on recommended widths

Recommendations in this Fact Sheet are arranged according to the desired function of the riparian zone. However, site characteristics should also be considered. These include slope, soil texture and erodibility, drainage area, bank height, adjacent land use and existing vegetation. Each characteristic can influence the width required to achieve different management objectives, so it is important to consult locally specific information and expertise on the characteristics of your property, before making decisions about how best to manage your riparian areas.

Regular sampling of the wetland areas enables water quality to be monitored.

Photos David Kelly (above) and Ross Digman (below).

Useful government websites

There are a number of legislative requirements in relation to riparian vegetation. Before starting on a project or works, it is recommended that the relevant state representatives should also be contacted, as requirements are constantly being changed and updated. The websites below are a list of the most relevant government agency in each State or Territory.

ACT	Environment ACT Website: www.environment.act.gov.au
NSW	Department of Infrastructure, Planning and Natural Resources Website: www.dipnr.nsw.gov.au
NT	Department of Infrastructure, Planning and Environment Website: www.ipe.nt.gov.au
QLD	Department of Natural Resources, Mines and Energy Website: www.nrme.qld.gov.au
SA	Department of Water, Land and Biodiversity Conservation Website: www.dwlbc.sa.gov.au
TAS	Department of Primary Industries, Water and the Environment Website: www.dpiwe.tas.gov.au
VIC	Department of Sustainability and Environment. Website: www.dse.vic.gov.au
WA	Department of Conservation and Land Management Website: www.calm.wa.gov.au
	The Department of Environmental Protection and the Water and Rivers Commission are now operating as the Department of Environment. Website: www.environment.wa.gov.au

This Fact Sheet summarises current information on recommended riparian widths provided by national and State/ Territory research and government organisations. If you would like further information about any of the Land & Water Australia publications, they are all available on the www.rivers.gov.au website, or can be ordered in hard copy (most of them are free). Other publications listed can be accessed via the relevant State/Territory website, or government shopfront.

This Fact Sheet is intended to raise awareness about the different widths required to achieve particular management objectives. Ideally, riparian areas should be protected so that they can perform the full range of functions listed here, as this enables economic, environmental and social value to be gained from these highly productive parts of the landscape.

Photo Ian Rutherfurd.

FACT SHEET 13
BACK PAGE

These **Fact Sheets** are grouped according to whether they deal with riparian land, in-stream issues, river contaminants or other matters. They aim to set out the general principles and practices for sound management. Other information that focuses on local conditions and management issues is available from state government agencies, local governments, catchment management authorities, rural industry bodies and community organisations. Together, this information should assist users to understand the key issues in river and riparian management, and enable them to adapt general management principles to their particular situation, and to know where to go for advice specific to local conditions.

Other relevant Fact Sheets

1 Managing riparian land
2 Streambank stability
3 Improving water quality
4 Maintaining in-stream life
5 Riparian habitat for wildlife
6 Managing stock
7 Managing woody debris in rivers
8 Inland rivers and floodplains
9 Planning for river restoration
10 River flows and blue-green algae
11 Managing phosphorus in catchments
12 Riparian ecosystem services

Further information on river and riparian management can also be found at the Land & Water Australia 'River Landscapes' website.

www.rivers.gov.au

This website provides access to projects, fact sheets, guidelines and other information designed to assist people to better manage river and riparian areas across Australia.

River Landscapes

Prepared by Phil Price, Siwan Lovett and Jinnie Lovett and produced by Land & Water Australia's National Riparian Lands R&D Program.

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April 2005

Product number PF040748

Publication data
Price, P., Lovett, S. & Lovett, J. 2004, 'Managing riparian widths', Fact Sheet 13, Land & Water Australia, Canberra

Cover illustration from River Landscapes, a painting by Annie Franklin

Design by Angel Ink, Canberra
Printed by Pirion Pty Limited, Canberra