

# Riparian vegetation appraisal tool

Riparian vegetation plays a critical role in maintaining a healthy watercourse. It improves water quality by trapping sediment and nutrients, and stabilises banks by binding soil particles and absorbing the forces of flowing water. It also provides habitat for birds, fish and other organisms living in or near the water.

The ability of riparian vegetation to provide these environmental functions is diminished or lost when it is cleared, highly modified, or poorly managed.

This appraisal tool has been designed to assist dairy farmers in subtropical Australia to better appreciate the impact of past and current farm management practices on riparian vegetation. Use of the tool on different stream sections, or on the same stream section over a period of time, will provide a basis on which to evaluate management practices.

There are three parts to this document.

**Section A** provides an introduction to six important features of riparian vegetation, **Section B** provides specific assessment guidance, and **Section C** provides a score sheet and recommendations on findings.

## Section A: Six important features

The key features to observe when studying the health of your riparian vegetation are illustrated in Figure 1.

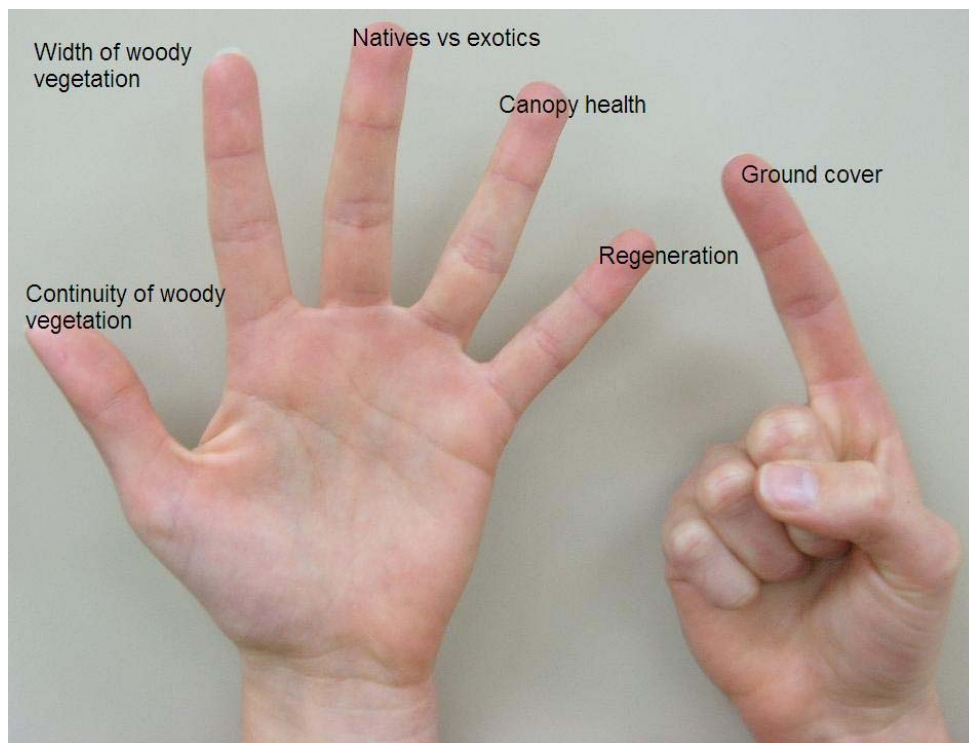


Figure 1: The six features to observe when appraising a riparian zone.

## Feature 1. Continuity of woody native vegetation

A continual band of native trees (canopy vegetation) and shrubs along a stream is an important feature of a riparian zone. This woody vegetation protects the bank against erosion and provides shade, woody debris and food sources for aquatic organisms. It also provides a habitat for birds, insects and other land-based organisms.



Figure 2. Poor continuity (left) versus a high level of continuity (right) of native riparian vegetation on Warrill Ck., South East Queensland.

### *What about exotic woody vegetation – does it contribute to continuity?*

Native vegetation should dominate stream bank vegetation; however, this is not always the case. Chinese elm, camphor laurel and, to a lesser extent, willow, are exotic trees that are commonly found along stream banks in the subtropical dairy zone. These trees do make a significant contribution to stream bank stability. However, they frequently dominate all other vegetation, and the deciduous nature of elms and willows has undesirable impacts on stream ecology. Existing native vegetation should be protected from invasion by exotics, and, where possible, exotic woody vegetation should be replaced with native woody vegetation.

## Feature 2. Width of riparian vegetation

The width of riparian vegetation is an important indicator of stream health. This is because wider zones generally have a greater capacity to provide habitat for native fauna, maintain plant biodiversity, and trap sediments and nutrients moving from higher in the landscape.

Where overland flow is expected, a grass buffer area located adjacent to the wooded zone will increase the opportunity for trapping sediment and nutrients before they enter the stream.

### *How wide is wide enough?*

At a **minimum**, the riparian zone should be wide enough to stabilise stream banks, provide shade and organic matter inputs to the stream, and buffer the watercourse from adjacent land practices. To achieve these goals, riparian forest (trees, shrubs and ground flora) will typically need to extend over the stream bank and 5 to 10 m onto the floodplain. Where overland flow is expected to occur, there should be an additional 5 to 10 m wide grass filter strip to trap sediment, nutrients and other contaminants.

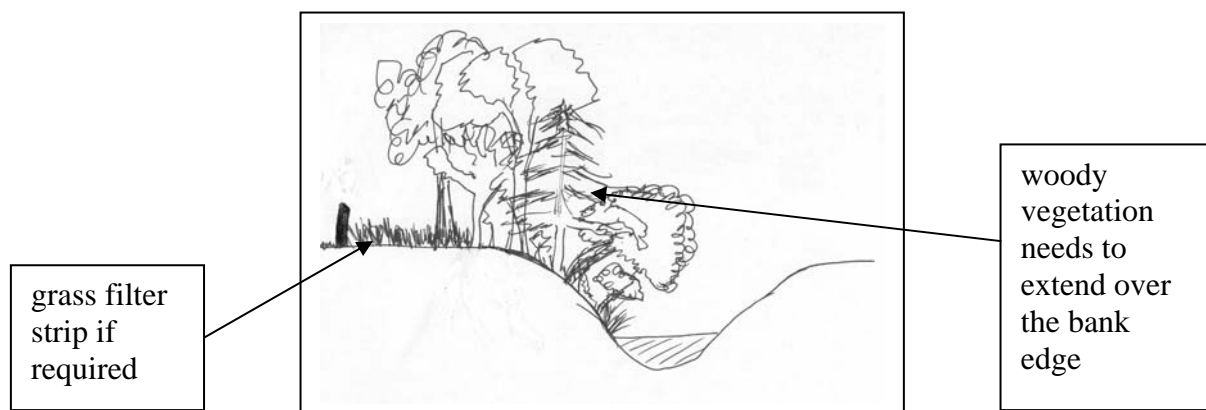


Figure 3. At a minimum, riparian forests need to shade and provide organic inputs to streams, be wide enough to stabilise banks, and be combined with a grass filter strip if overland flow is expected.

On high, steep or unstable bank sections, for example, on outer bends, a wider zone (10 to 20 m) of multistorey vegetation (trees, shrubs and grasses) will be required, plus a grass filter strip if necessary.

If the objective is to provide terrestrial habitat for animals and plants that live in land adjacent to streams, wider corridors of **40 metres or greater** will typically be required.



Figure 4. A riparian zone in North Queensland, wide enough to stabilise the banks, provide shade and organic matter inputs to the stream, and buffer the watercourse from practices on the adjacent grazed, low-input, legume-grass pastures.

**Further information** can be found from the excellent riparian management fact sheet produced by Land & Water Australia, *Managing riparian widths*, Fact Sheet 13 of the River Landscapes series, [www.rivers.gov.au/publicat/factsheets.htm](http://www.rivers.gov.au/publicat/factsheets.htm).

### Feature 3. Proportion of natives versus exotics

Although some exotic species provide benefits of bank stabilisation and shading of the watercourse, they have a tendency to dominate the zone, reducing biodiversity and altering the habitat and food sources that native vegetation can provide. Canopy vines such as cats claw creeper can be extremely destructive of remnant native trees and shrubs.

Listed below are some of the most prevalent and invasive exotic species found in the riparian zone on northern dairy farms.

Trees: Chinese celtis/ Chinese elm (*Celtis sinensis*), broadleaf pepper tree (*Schinus terebinthifolia*), camphor laurel (*Cinnamomum camphora*).

Vines: Cats claw creeper (*Macfadyena unguis-catii*), madeira vine (*Anredera cordifolia*), balloon vine (*Cardiospermum grandiflorum*), asparagus fern (*Asparagus africanus*).

Shrubs: Lantana (*Lantana camara*), African boxthorn (*Lycium ferocissimum*), wild tobacco tree (*Solanum mauritianum*), castor oil (*Ricinus communis*).

Ground flora: Lippia (*Phyla canescens*), mother of millions (*Bryophyllum delagoense*), para grass (*Brachiaria mutica*).

#### **Feature 4. Canopy health**

When a tree is healthy, new growth appears all through the crown, particularly at the tips of the twigs and branches. However if the tree is not healthy, the crown will begin to lose its ability to produce new growth. Tree crown condition is a useful indicator of forest health. Crown dieback indicates stress or poor health and can be caused by a number of factors, including old age, drought, insect attack, disease, and changing soil chemistry and structure. Crown dieback is indicated by irregular foliage coverage, gaps in the canopy, new growth from growing points lower down the branches rather than from branch tips and twigs, and ultimately the presence of dead trees/spars. Although death of trees is a natural process and dead branches provide nesting opportunities for birds, extensive dieback indicates a declining health of the riparian zone.



Figure 5. Severe dieback in older *Casuarina* trees, Mary River near Conondale. (Photo: FR Wylie)

#### **Feature 5. Regeneration**

Multiple generations of trees provide evidence that the long-term health of the riparian zone is assured. Juvenile trees are often referred to as recruitment trees, as they are the plants that will make up the canopy in the future. If only older trees are present



within the zone, there is less chance that the health of the riparian vegetation will be maintained in the long-term after those trees die.

Regeneration is assessed by comparing the stem size of each of the canopy species present. The presence of various stem sizes indicates that a healthy regeneration process is occurring.

Stock access can damage seedlings through grazing and trampling, causing regeneration to be diminished or non-existent. Some seedlings and juvenile trees need the protection of an understorey and other trees to flourish.



Figure 6. The presence of juvenile trees in this riparian area of a grassy woodlands community is a positive sign for the site's long-term health.

### **Feature 6. Ground cover and grazing animal disturbance**

Ground cover in the form of both living and dead plant material is important for protecting soil from erosion, maintaining bank stability, trapping sediment and nutrients before they enter streams, and providing habitat for fauna.

Grazing stock reduce ground cover by directly grazing herbaceous material and trampling vegetation on banks. They also cause the establishment of cattle tracks, which concentrate flows of water and exacerbate erosion. Stock need to be managed to minimise their impact on the riparian zone and on the gullies entering streams.

Of particular importance is the ability to exclude cattle from riparian areas when they are most vulnerable to damage. This has been found to be when they are either very wet or very dry. Wet river and creek banks are particularly vulnerable to trampling by stock, while during very dry periods, livestock will tend to overgraze grass filter strips and compete with native fauna for the critical food and shelter reserves that are provided by this zone.






Use of the riparian area as a shade, watering and loafing area will reduce ground cover through grazing and trampling by stock. It will also increase the risk of direct fouling of watercourses. The development of alternative shade and watering areas away from the riparian area should be a high priority.



Figure 7. Use of land close to streams for loafing should be avoided to reduce loss of ground cover by grazing and trampling and the risk of contamination of waterways.

## Section B: Specific assessment guidance

**Rationale:** The tool uses a mixture of criteria to assess the state of the riparian zone. It is not intended to provide an overall quantitative ‘condition score’, but rather, a general indication of state when six main features are considered. A traffic light analogy is used, where:

-  indicates a riparian zone that is in very good condition (keep going);
-  indicates a degrading riparian zone requiring changes (pause, adjust management practices), and;
-  indicates a very degraded zone requiring major restoration (stop, major changes required).
-  and  are also used to describe conditions that lie between dark green and yellow, and yellow and red, respectively.

The emphasis in using this tool is on increasing understanding and awareness of the main issues impacting riparian vegetation management, rather than as a strict assessment instrument.

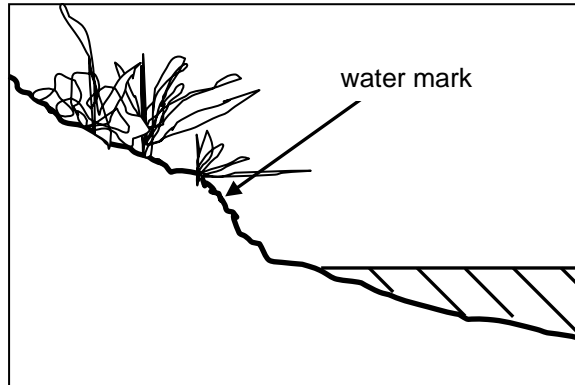
### Guidelines on use:

- Read through Section A so you have an understanding of the reasoning behind the different assessment criteria.
- Use the diagrams, photos and descriptions provided as a guide in Section B to determine which answer best describes your riparian zone.
- Use the Score Sheet in Section C.

### General approach:

- Select a representative section of the stream, which should be no less than 100 metres in length.
- Ideally, conduct the assessment at a number of different sites on the same stream.
- If only one site is selected, pick an area that is typical of the stream, not just an area that is easily accessible.
- Assess the width of riparian vegetation as described below.

When assessing the width in proportion to the channel, standardise channel width by measuring at the water mark. The water mark is the mark left on the bank at the normal inundation level for the stream. It is usually indicated by the edge of the terrestrial grasses and other vegetation which cannot tolerate frequent inundation.



## Feature 1. Continuity of vegetation

For vegetation along the bank to be considered 'continuous', the woody vegetation should provide a canopy (cover) that is at least 5 m wide. Check this width by looking up; most streams with a single or double row of trees will have 5 m of canopy. Note that some value is given to exotic vegetation because of its contribution to bank stability.



- Woody vegetation along the bank is continuous; there are no significant breaks and no exotic trees/shrubs.



- Woody vegetation is almost continuous; there may be one or two gaps or some exotic trees/shrubs present.



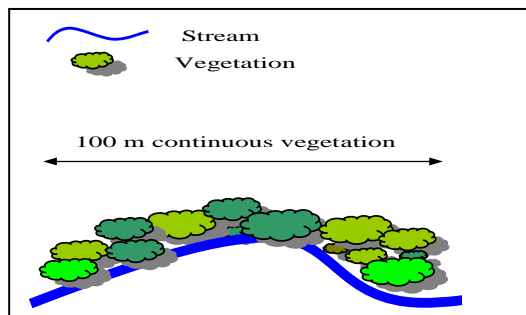
- Woody vegetation is broken up. Gaps are clearly noticeable but vegetation is still more dominant than gaps, *or*
- woody vegetation is continuous but exotic trees and shrubs are dominant.



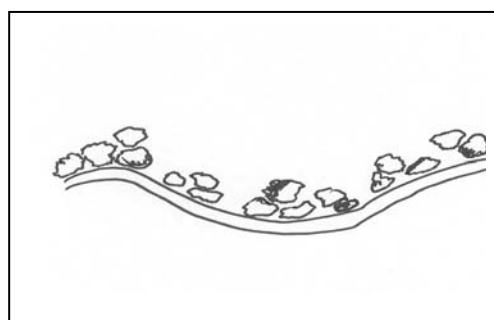
- Woody vegetation is discontinuous with gaps dominant, *or*
- woody vegetation is almost continuous but dominated by exotic trees and shrubs.



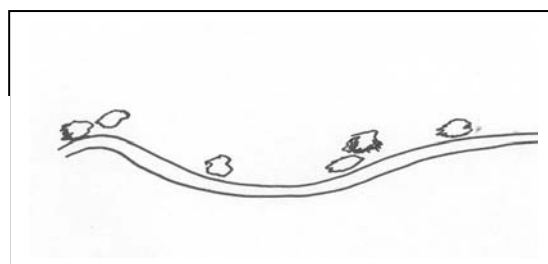
- Nil or very sparsely wooded with native vegetation or exotics.



Continuous woody vegetation



Woody vegetation broken up but still more dominant than gaps



Nil or sparsely wooded



Good continuity of woody vegetation



No continuity in woody vegetation. This has contributed to an unstable and widening stream channel.



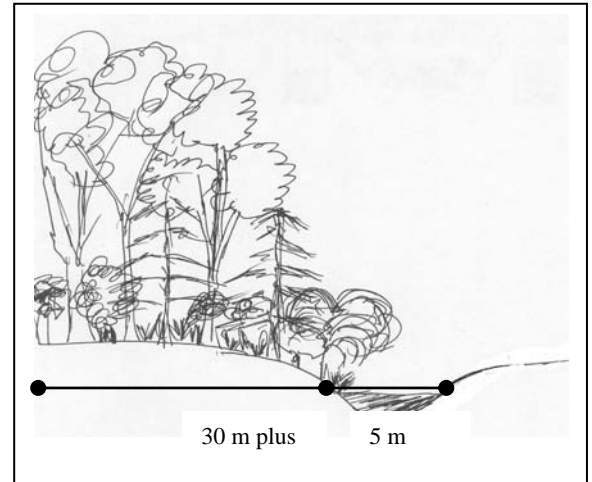
## Feature 2. Width of the riparian zone

In this assessment, except for condition ●, the width of the riparian zone includes the wooded zone and associated grass buffer strip, if present.



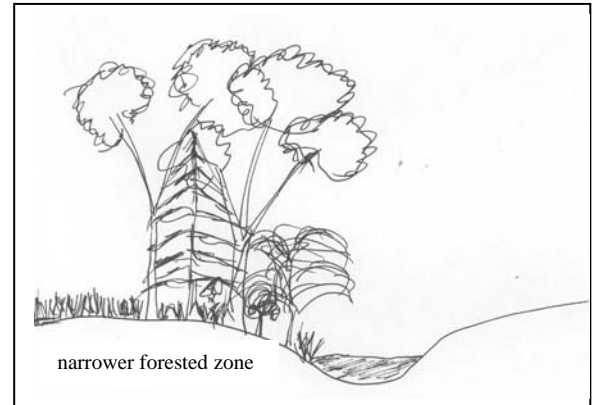
- good habitat opportunities
- successful bank stabilisation
- effective buffering of the watercourse from adjacent land practices.

Typically, a range of native plant types and forms (trees, shrubs and ground flora) extending at least 30 m from the channel edge of narrow streams, or 3 times the stream width on streams wider than 10 m. Due to the large width, a separate grass filter strip generally not required. Gullies entering the stream are well grassed.



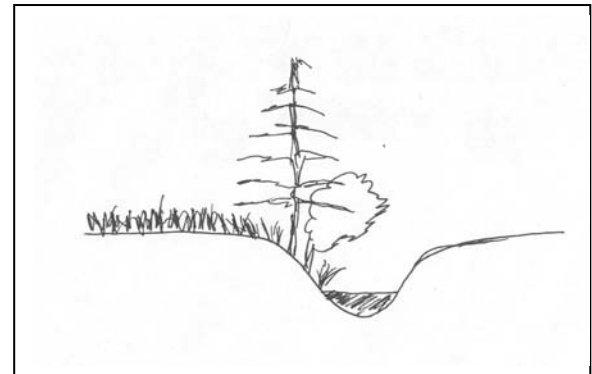
- some habitat opportunities
- successful bank stabilisation
- effective buffering of the watercourse from adjacent land practices.

Riparian forest typically extends **over the stream bank** but less than the width described above. A grass filter strip is maintained where overland flow is expected. Gullies entering the stream are well grassed.



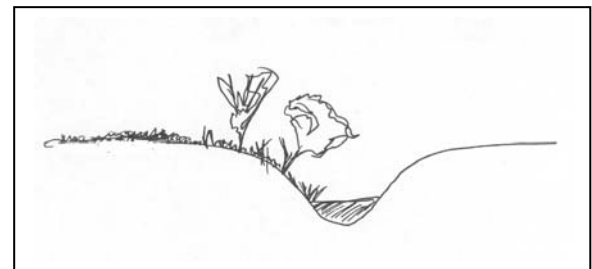
- limited habitat opportunities
- bank stability under threat with limited woody vegetation
- grass-dominant zone buffers watercourse effectively.

Riparian forest is typically restricted to **within stream banks**; however, a lightly-grazed grass buffer extends beyond the stream banks.

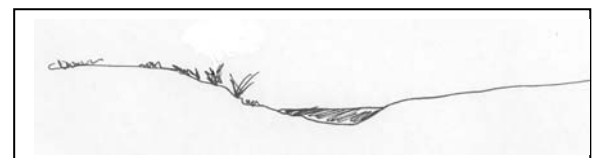


- bank stability under threat
- some buffering of the stream from adjacent land practices.

Riparian forest is highly depleted and grass buffer is not adequately managed to protect watercourse from adjacent land practices.



Forested verge is absent; no effort is being made to manage the interface between the water and land.



### Feature 3. Proportion of natives to exotics



Exotic plant species are absent or only constitute a very small proportion of the plant population in the riparian zone.



Exotic plant species are noted in the vegetation layer/s but can be managed through routine riparian management and do not pose a long term threat.



Exotic species are clearly present in the riparian zone and making a significant contribution to vegetation presence. A concerted effort will be required for their removal.



Exotic species dominate the riparian zone. A high level of action will be required for their removal. Revegetation of sections of the zone with native species will be required.



Exotic species completely dominate the riparian zone. Extensive replanting with natives will be required on removal of these species.



Red bottlebrush and she-oaks dominate this riparian vegetation. There is limited presence of exotic shrub and vine species.





A concerted effort will be required to remove the cats claw creeper (yellow flower) in this riparian zone.





Chinese elm (*Celtis sinensis*) completely dominates this riparian zone. To remove and replace with native vegetation will be a major rehabilitation task.


#### Feature 4. Canopy health

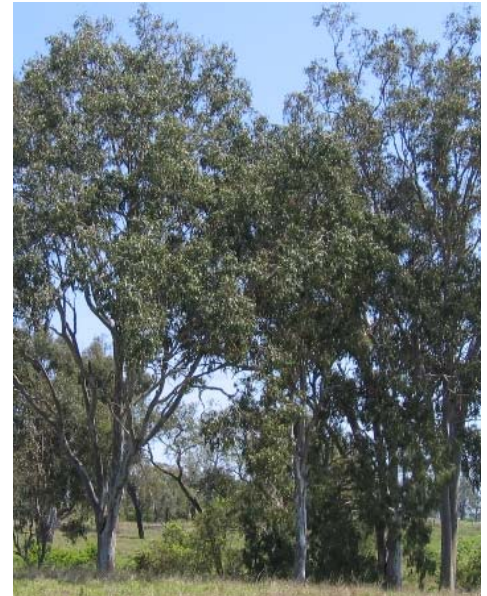
 The tree canopy is regular and intact, new growth appears all through the crown and there are few, if any, standing dead trees.

 The tree canopy is slightly irregular and there may be some gaps, with a few standing dead trees.

 There are indications of a lack of canopy vigour, minor crown dieback is noticeable and dead or near-dead trees may be present.

 Tree canopy is sparse, there is clear evidence of dieback and there are many standing dead trees present.

 Tree canopy is very sparse. Shrubs and/or grasses are prevalent.



Forest red gums (*Eucalyptus tereticornis*) are a common canopy species in the riparian zone. Here they show good canopy health along Warrill Ck, West Branch.



Dieback in *Casuarina* trees on Purga Ck. Other canopy vegetation shows relatively good health.



Serious dieback of eucalypts, attributed primarily to historic clearing and rising salinity in a sub-catchment of the Condamine River.



## Feature 5. Native species regeneration



An abundance of various stem size classes, including canopy seedlings.



A variety of stem sizes is present, with a frequent occurrence of canopy seedlings



Variation in stem size class is present, with canopy seedlings frequent.



The occasional presence of canopy seedlings



Little variation in stem size class, with occasional canopy seedlings.



Stem size class uniform with few canopy seedlings.



Canopy seedlings absent



Few canopy stems present, or of a uniform size, and an absence of canopy seedlings.



## Feature 6. Ground cover and animal disturbance



Gullies entering the stream and buffer strips adjacent to the forested zone have good grass cover, there is little or no evidence of cattle tracks in the zone, and banks do not suffer from trampling.



(L to R) Well-grassed buffer strip; rainforest stream showing no evidence of cattle disturbance; well-grassed gully.



Evidence of overgrazing in the grass buffer and gully areas (stock tracks forming, some bare areas) and/or evidence of animal disturbance in the forested zone (tracks, some bank damage/pugging, trampling of vegetation). High potential for remediation with changes to management practices.



There is full disturbance of ground cover in grass buffer areas/gullies/stream banks, due to very intensive land use practices such as supplementary feeding, lounging, or continuous overgrazing. It may take several years and/or substantial rehabilitation effort to overcome the damage.



(L to R) A high level of disturbance caused by grazing animals alongside streams and gullies.

## Section C: Score sheet

### 1a. Description and location of stream reach assessed

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b. Date of assessment \_\_\_\_\_

c. Assessed by \_\_\_\_\_

### 2. Your assessment of each riparian feature. Please mark the appropriate colour rating.


	Vegetation continuity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Riparian zone width	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Natives versus exotics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Canopy health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Native species regeneration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Ground cover and animal disturbance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>


### 3. What does this tell us about the condition of the stream section appraised?


If you scored:

 **for 'riparian zone width' and  for other features**, your stream section is providing *outstanding* environmental function. Maintain this great condition by controlling any invasive weeds as they appear and managing stock access.

 **for 'riparian zone width' and mostly  for other features**, your stream section is providing *very good* environmental function. Consider strategies you could use to build on this good foundation to enhance the environmental function even further.

 **for most riparian features**, your stream section is providing *some environmental function*; however, the warning light is on. Changes to current management practices are needed to halt further decline in the quality of streamside vegetation. Things to consider: manage livestock access to encourage natural regeneration (off-stream watering, fencing, nil or restricted access), seek technical advice on any areas badly degraded, and control woody and invasive weeds.

 **for most riparian features**, this stream section is on the edge of the 'red zone' and management changes are definitely needed to improve functioning. Seek advice on what changes you can make to management that will give relatively large benefits for your input costs in time and materials. And, before undertaking on-ground works that are going to be particularly costly, consider whether these inputs would be better spent protecting other sections of stream that are in better condition. Prevention is generally better than cure.

 **for most riparian features**, this section of stream is in very poor condition. Consider recommendations above, making sure you seek technical advice on what will be the most effective strategies to remediate streamside vegetation.

## Useful contacts and sources of further information on riparian vegetation management

Organisation	Information Available	Internet	Contact
Regional NRM groups	Technical advice, funding	<a href="http://www.seqcatchments.com.au">www.seqcatchments.com.au</a> <a href="http://www.bmrg.org.au">www.bmrg.org.au</a> <a href="http://www.condaminecatchment.com.au">www.condaminecatchment.com.au</a> <a href="http://www.fba.org.au">www.fba.org.au</a> <a href="http://www.fnqnrnm.com.au">www.fnqnrnm.com.au</a>	SE Qld: p 3211 4404 Wide Bay Burnett: p 4181 2999 Darling Downs: p 4620 0102 Central Qld: p 4999 2800 North Qld: p 4043 8000
Department of Natural Resources and Mines, Queensland	Fact sheets on managing stock around waterways, stream bank erosion and stream bank planting guidelines	<a href="http://www.nrw.qld.gov.au">www.nrw.qld.gov.au</a>	p 131 304
Land and Water Australia	Riparian management fact sheets, guidelines and manuals	<a href="http://www.rivers.gov.au/publicat/factsheets.htm">www.rivers.gov.au/publicat/factsheets.htm</a> <a href="http://www.rivers.gov.au/publicat/guidemanuals.htm">www.rivers.gov.au/publicat/guidemanuals.htm</a>	p (02) 6263 6000

### Key references

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MacLeod ND (2002) Watercourses and riparian areas. In 'Managing and Conserving Grassy Woodlands', Ed KM Heard, pp 143-176, CSIRO, Collingwood, Victoria.

Price P, Lovett S, Lovett J (2004) Managing riparian widths. Fact Sheet 13, River Landscapes series, Land and Water Australia, Canberra.