FACT SHEET 4

Maintaining in-stream life

4

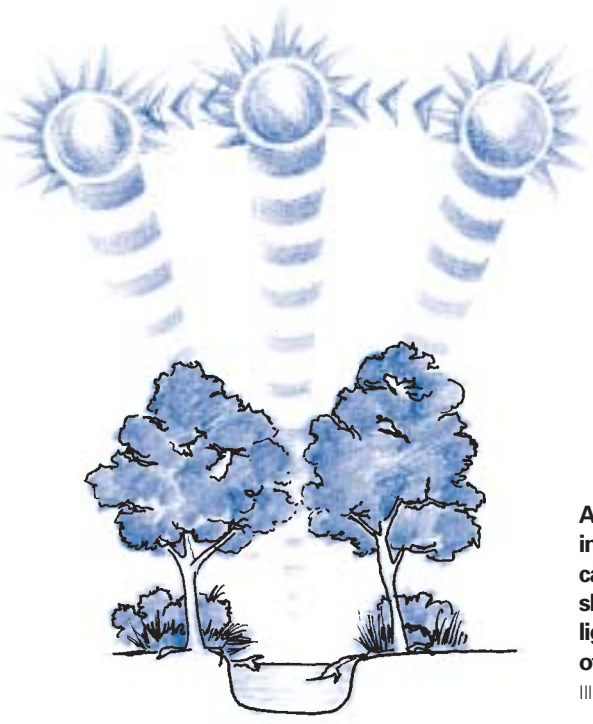
RiverLandscapes

This Fact Sheet is the fourth in a series dealing with the management of riparian land.

Rainfall across a landscape moves through drainage lines, intermittent creeks and small streams to the major river of the catchment. During its journey, the water picks up eroding soil, nutrients, salt or other contaminants, and moves them into the river system. It also transports food, in the form of nutrients, leaf litter, fine particles of organic matter and other dissolved substances, for aquatic plants and animals. The close relationship between how land is managed and the impacts it has on in-stream life means that the two must be considered together when making any management decisions.

The relationship between a river system and its catchment is linked most strongly in riparian areas. Vegetation exerts a powerful influence on where the river is located in the landscape, on in-stream energy production and on the type and quantity of food matter and nutrients in the stream.

Photo MDBC.



A small stream with intact riparian vegetation can be completely shaded, regulating the light and temperature of the stream.
Illustration The Idea to Here.

How riparian vegetation influences in-stream life

Shading

In steep landscapes where streams are narrow, the channel may be partly shaded by adjoining hills and the streambank itself. More importantly, where channels are less than about 10 metres in width, they may be partly or completely shaded by adjoining riparian vegetation. Recent research has shown that reduced light intensity prevents excessive growth of nuisance plants and algae, including toxic blue-green algae, in river systems. The dim or patchy lighting resulting from intact riparian vegetation also assists in providing habitats for both predators and prey within the stream.

Once natural riparian vegetation is widely cleared for agricultural or urban development, light intensity within the water column increases greatly. This disturbs the natural ecosystem, and if combined with nutrient pollution from agricultural or urban run-off, can lead to excessive growth of algae or massive growth of water plants. This slows the stream flow, causing sediments to accumulate and resulting in shallower, broader stream channels and increased erosion of banks. It can also block the channel and increase the likelihood of flooding and erosion of valuable agricultural land. Excessive in-stream growth eventually decomposes and this leads to a decrease in oxygen, fish kills, and further loss of native species and reduction in water quality. Some blue-green algae are highly toxic to both stock and humans, and few aquatic animals can consume introduced water plants or blue-green algae.

BEFORE
Para Grass (or introduced plant) invading a stream in north Queensland so that the water is no longer visible. Photos this page David Wallis.

REHABILITATION
Rehabilitation of the area in progress with replanting of native species a key component.

Temperature

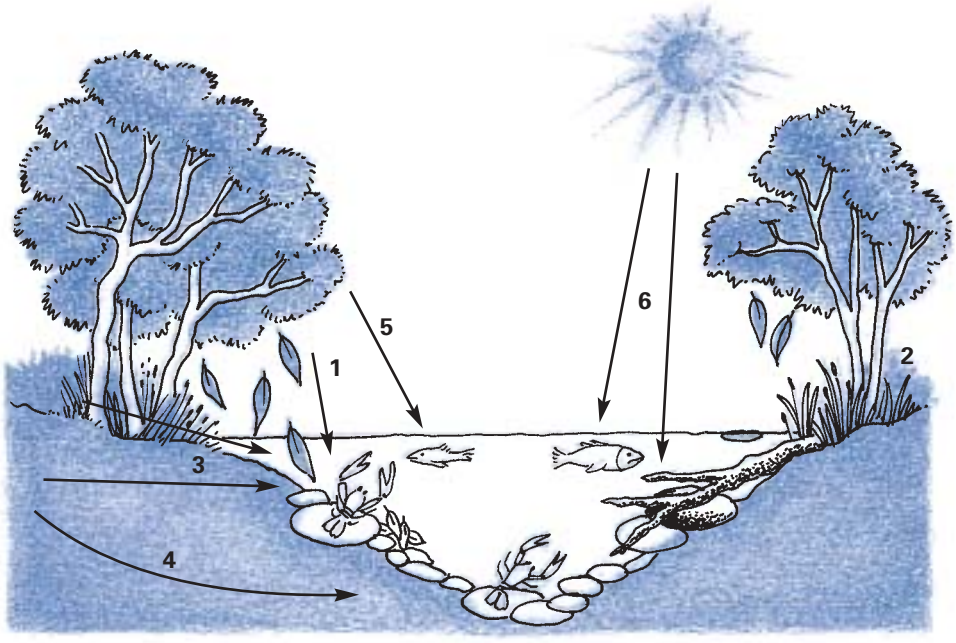
As well as reducing light intensity, shading from natural riparian vegetation also acts to maintain lower water temperatures, reducing the daily maximum by as much as 10°C. This is important, as many native plants and animals are sensitive to wide fluctuations in temperature and are unable to grow, reproduce or complete parts of their lifecycle when temperatures rise above a certain point.

It has become clear from recent research that light intensity, shade and nutrient concentrations interact to exert a powerful controlling influence on the health of in-stream ecosystems. High nutrients, high temperatures and high light intensity can result in a complete switching of these ecosystems from a healthy to a degraded state, with consequent loss of valuable species and disturbance of the whole foodchain. Once this change has occurred, often through a combination of catchment development and the over-clearing of riparian vegetation, it is difficult to return to a more-natural, healthy state.

AFTER
Eliminating the exotic Para Grass by shading with native plants provided natural control of weeds due to shading and regulation of stream temperature by the tree canopy.

Food sources for aquatic plants and animals

Natural streamside vegetation is a vital source of leaf litter, flowers, insects and other organic debris which drop into the water and are essential food for many aquatic plants and animals. These riparian inputs are a major component of the diet of many species of native fishes and other aquatic vertebrates, such as turtles. Riparian fruits can be especially important in tropical and sub-tropical regions, and some native fish feed exclusively on the insects and other land animals which fall, or are washed or blown, into the water. Leaves and fine twigs falling into the water provide the basic food source for a complex web of life that, in turn, supports larger animals, such as fish. Many animals spend different parts of their lifecycle on the land and in the water. This means that there is a close connection between in-stream health and the health of adjacent land-based ecosystems.



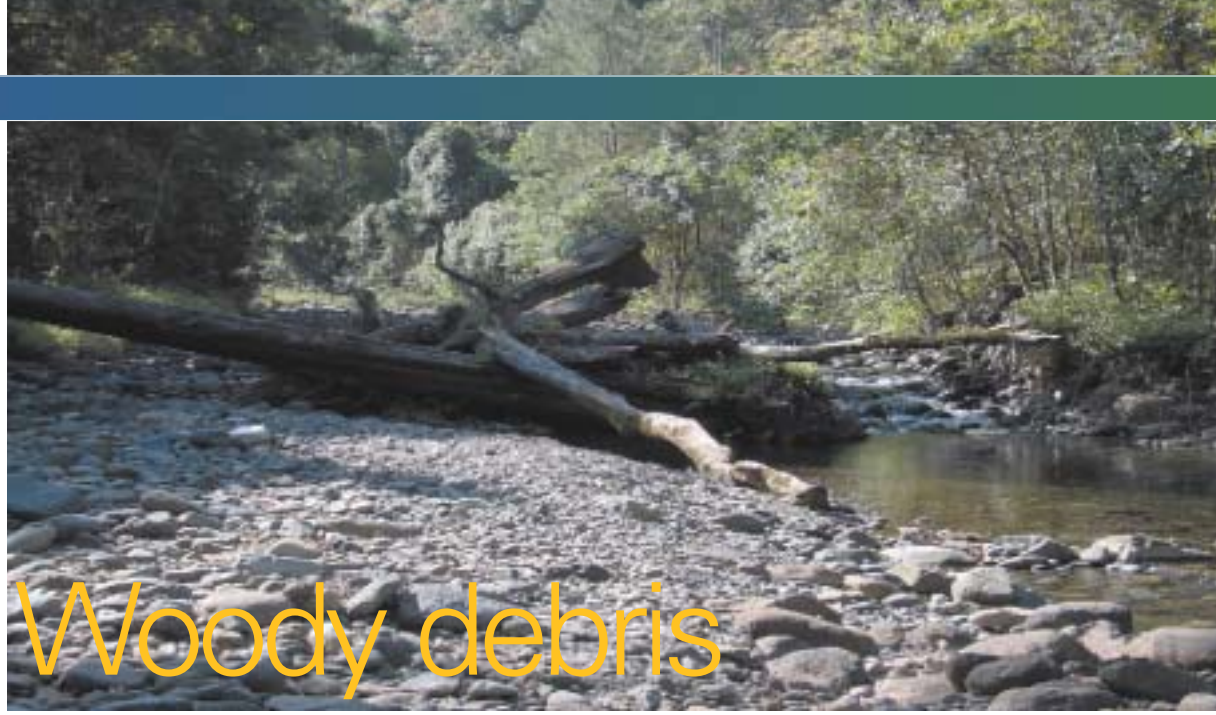
Food and energy inputs to the stream from the riparian zone.
Illustration Carolyn Brooks.

1. leaf litter from riparian vegetation
2. logs and branches
3. leaves, fruits and other organic matter washed in from surrounding catchment
4. dissolved organic matter in groundwater flows
5. insects falling from riparian vegetation
6. aquatic plants and microalgae stimulated by sunlight

The riparian inputs that enter streams in the upper tributaries of a river system may be gradually processed to become an essential food source in the lower reaches of the river. This means that there is a strong connection between the health of the upper reaches of a river system and important fisheries and other species in its estuary and in-shore regions.

Bank stability

Healthy riparian vegetation helps to stabilise and protect streambanks from erosion — this is covered in more detail in Fact Sheet 2 in this series. Stable undercut banks, usually protected by the roots of native riparian species, provide shaded habitat for fish, eels and other aquatic animals.



These natural log jams provide important habitat for fish, as well as creating diversity in the streambed by forming deep pools and holes. Photo Andrew Brooks.

Woody debris

The riparian zone is home to a wide variety of organisms. Photos top to bottom. Hans Wapstra, Ross Digman, MDBC.

Woody debris

From time to time, branches, large limbs and even whole trees fall into the stream or river, remaining where they fall or being washed downstream. Whatever their fate, this large, woody debris is an important natural component of most river systems.

Tree trunks and large limbs, or accumulations of smaller woody debris, can slow the flow of water in small streams, thereby creating a deeper pool which supplies vital habitat to aquatic plants and animals in dry times. Logs and branches resting on the streambed, trap and retain accumulated leaf litter and fine particles. This is especially important in small streams as it is a means of retaining nutrients in the upper reaches long enough for them to act as food for stream animals.

Tree branches and trunks also provide niches and habitats for small invertebrates. These shred and consume the leaves and fine litter and, in turn, become food for larger animals and fish. In sandy rivers, logs provide the only stable base for microscopic plants and animals to grow and support the foodchain. Larger branches and trunks also provide habitat and refuge for important fish species. The Mary River Cod, for example, requires submerged hollow logs in which to lay and nurse its eggs.

Filtering nutrients and sediments

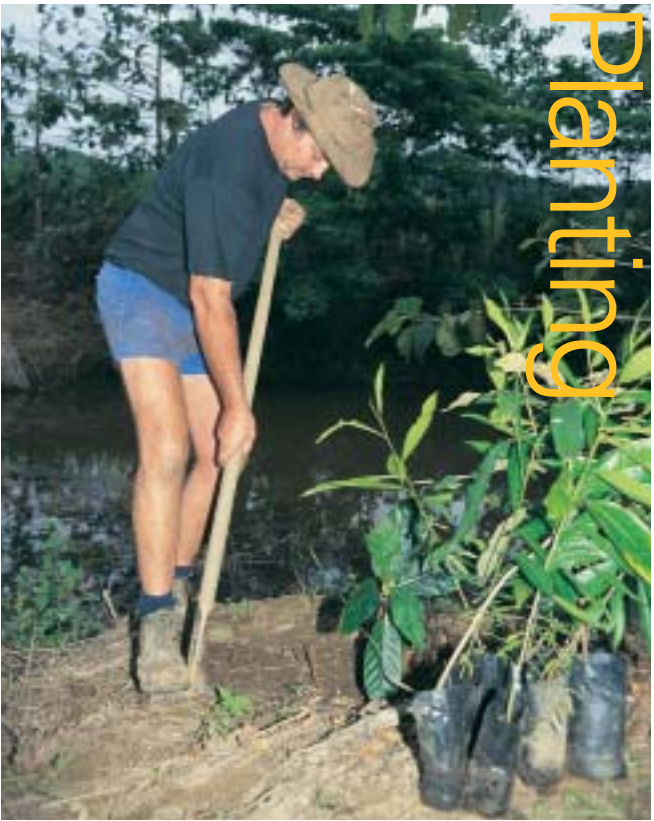
Fact Sheet 3 in this series discusses the important role of riparian vegetation in trapping and filtering sediment and nutrients from eroded soils. This is particularly important where a catchment is used for intensive agriculture or urban development, as riparian areas can maintain or improve water quality and reduce the amount of nutrients available in the stream for excessive growth of plants or algae. Sediments entering the stream can settle out, blanketing the streambed and reducing habitats, spawning sites and food sources for fish.

Planning riparian management for river ecosystems

Because the riparian zone is influenced by activities elsewhere in a catchment, riparian management to protect river ecosystems should become an integral part of planning and management on all properties with a riparian frontage. There are three main management actions to be considered.

Retention and management of riparian vegetation

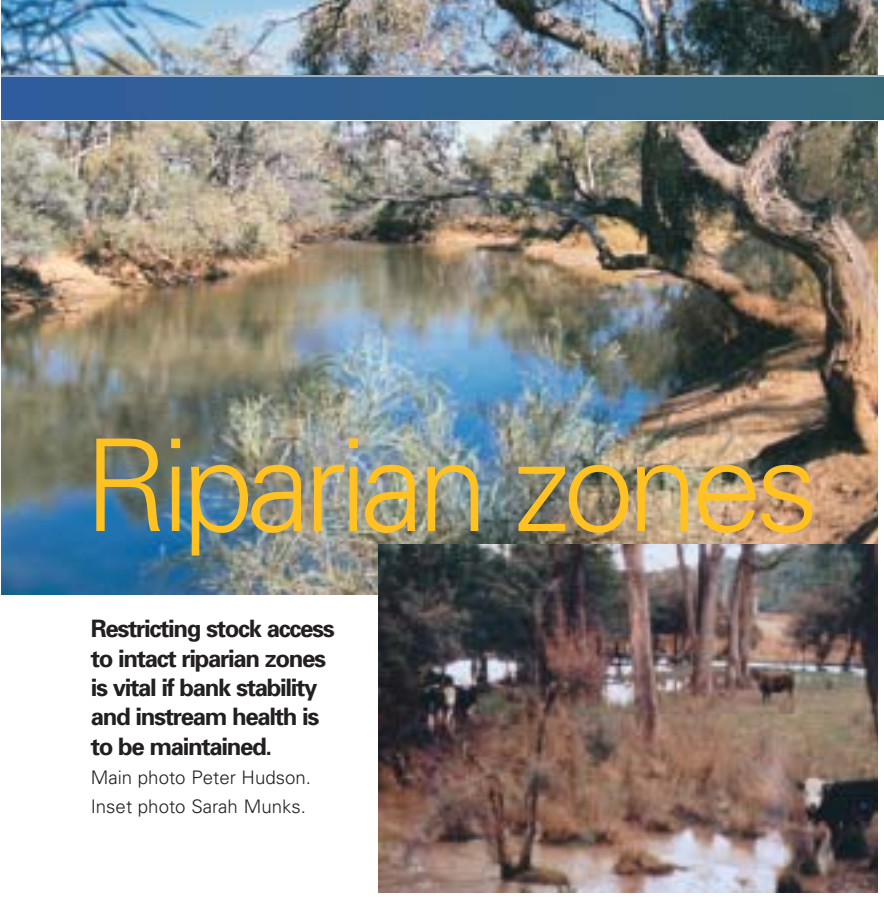
In most small tributary streams, even a narrow strip of native trees and shrubs will benefit the stream ecosystem by shading the channel. Retaining healthy riparian vegetation does not have to be a net loss to farm productivity, as the area can be strategically used for grazing or, in some areas, for agroforestry or forage production. Combinations of retained or replanted native vegetation to provide shade and maintain low water temperatures, and a grass filter strip, will have little impact on overall farm productivity but lead to very substantial improvements in the health of the river.



By planting trees along the streambanks multiple benefits can be achieved. Photo CANEGROWERS.

In many regions, individual landholders and Landcare or rivercare groups are actively replanting native vegetation along riparian lands. In many cases, the aims are to protect banks and decrease rates of erosion, and to overcome problems of excessive growth of aquatic weeds and algae. By replanting native vegetation along the streambanks, landholders hope to recreate the shade, low temperature and low nutrient conditions under which weeds and nuisance algae can no longer survive.

Recent work has shown that for streams which run roughly east-west, it is particularly important to replant the northern bank as this will provide the maximum degree of shade when funds for revegetation are limited. It has also been shown that if the aim is to reduce light intensity to something approaching natural conditions, around two-thirds of the natural riparian canopy needs to be achieved over time.



Riparian zones

Restricting stock access to intact riparian zones is vital if bank stability and instream health is to be maintained.
Main photo Peter Hudson.
Inset photo Sarah Munks.

Managing stock access to streams

Uncontrolled stock access to riparian land leads to baring of the soil by over-grazing, and the development of animal tracks and pads. Both result in increased rates of erosion and damage to the river ecosystem. In addition, stock directly foul streams. Controlling and managing stock access and grazing pressure is probably the most important single management action if landholders wish to maintain their riparian vegetation, and thereby in-stream life, in a sound and healthy state.

The issue here is not necessarily to exclude stock altogether, but rather to control the timing, duration and intensity of grazing pressure. Issues related to stock access to riparian land are dealt with in Fact Sheet 6 in this series.

Planned management of woody debris

In the past, many river management agencies and groups undertook programs to remove all snags and large debris from their river systems, believing that they impeded flood flows or caused increased rates of erosion by directing flows against riverbanks. However, woody debris also has an important role in the ecological health of river systems. The removal of woody debris from long sections of some of our rivers appears to have been a major cause of reduction in native fish stocks. Fortunately, recent research has shown that a river channel must be substantially blocked by woody debris before it significantly influences the conveyance of floodwaters.

It has also been shown that reorienting fallen tree trunks so that they form an angle of around 40° to the riverbank prevents flood flows being directed onto the banks. Even where the angle is greater than this, debris may be lopped or reoriented as a preferable alternative to removing it completely. In southern parts of Australia, there are now active programs to carefully and selectively replace woody debris in the river channel. This is an expensive option, and one which careful planning can avoid. The management of large, woody debris in stream channels is discussed in more detail in Fact Sheet 7 in this series.

FACT SHEET 4
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
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
13 Managing riparian widths

Numbers 1–7 of these Fact Sheets are based on the previous *Riparian Management* series produced in the 1990s. The authors involved in the development of the earlier series were: Michael Askey-Doran, Stuart Bunn, Peter Hairsine, Ian Prosser, Ian Rutherfurd, Brian Finlayson, Ian O'Neill, Chris Gippel and Wendy Tubman.

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

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May 2002, reprinted June 2004

Product number PF020256

Publication data
Price, P. and Lovett, S. 2002, 'Maintaining in-stream life', Fact Sheet 4, Land & Water Australia, Canberra

Cover illustration from River Landscapes, a painting by Annie Franklin

Design by Angel Ink, Canberra
Printed by Goanna Print, Canberra