RIPRAP

LWRRDC'S RIPARIAN LANDS MANAGEMENT NEWSLETTER

A COMPONENT OF THE RIVER RESTORATION AND MANAGEMENT PROGRAM

MANAGING the riparian zone within a total farm system

Managing the riparian zone within a total farm system

Riparian zones are the vital transition areas between land and water. The natural vegetation on riparian land usually reflects the better soils and more moist conditions found in the lower parts of the landscape. Riparian land also plays an important role in the lifecycle of many native animals and plants. These zones are highly productive and, as a result, are often heavily cleared and used for intensive cropping (for example, sugar cane, bananas, cereals), intensive grazing and intensive irrigation.

The productivity of riparian land makes it vulnerable to overuse and to practices that cause it to deteriorate, such as over-clearing and uncontrolled grazing. Good management of riparian lands is not a substitute for good land management practices elsewhere in a catchment. However, it is increasingly being recognised by landholders that integrating riparian management into their overall farming system, is essential to achieving long-term ecological and economic sustainability on their properties.

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Land & Water Resources Research & Development Corporation

EDITION 12, MARCH 1999

CONtents

RIPArian lands:

WHERE LAND AND WATER MEET

From the Editor

This edition of RipRap looks at the benefits that landholders can gain from managing their riparian zones as part of a total farm system. It also examines the work that is being done by Gary Brierley and Kirstie Fryirs on identifying the 'recovery potential' of a particular reach of river or stream. This work enables us to focus attention on those parts of the river and riparian zone that will respond best to rehabilitation activities. The result is that Gary and Kirstie's work can be used by landholders to identify and develop cost-effective river and riparian management strategies that will reap optimum ecological and economic benefits.

Other news and events in the area of river and riparian management include the soon to be released Rehabilitation Manual for Australian Streams. The manual will be available via the internet and we would like your comments and feedback so that we can refine the document and make it even more useful and relevant for people working 'on the ground and in the river'. Full details can be found on page 15. The beautiful River Landscapes poster and brochure is now available in each State and Territory, and page 16 has the agencies you need to contact to get your free copy. Work has also begun on a new internet site for our Riparian Lands program, and I will be able to give you the site address in the next edition of RipRap.

As you can see, there is a lot happening in river and riparian management. 1999 will be a year in which we continue to investigate, implement and hopefully inspire people to work in this important area. I hope you enjoy this edition and welcome any feedback and comments you have on future themes for RipRap. Happy reading!

Land & Water Resources Research & Development Corporation

This publication is managed by the Land and Water Resources Research and Development Corporation (LWRRDC), GPO Box 2182, Canberra ACT 2601.

LWRRDC's mission is to provide national leadership in utilising R&D to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources. The Corporation will establish directed, integrated and focused programs where there is clear justification for additional public funding to expand or enhance the contribution of R&D to sustainable management of natural resources.

LWRRDC's Home Page is: www.lwrrdc.gov.au

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RipRap is published four times a year. Contributions and comments are welcomed and should be addressed to the Editor.

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MANAGING the riparian zone

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Why should I manage my riparian zone differently to other parts of my property?

The answer to this question is simple—although the riparian zone is highly productive, it is also a special part of the landscape, often requiring a different approach to management. Inappropriate management of riparian land can be economically and environmentally costly to both the landholder and neighbours.

Although the answer is simple, selecting management practices that match land-use with capability while maintaining productivity, is a more difficult process. Many of the benefits that can be gained from sustainable management of the riparian zone are not recognised as being economically beneficial in the short-term.

However, through further research and development, it is becoming clear that landholders interested in change, are identifying a range of economic benefits that make alternative land-use and management practices common sense.

Erosion

Management issue It is estimated that at least $50 million is spent each year on preventing or remedying streambank erosion in Australia. Overclearing and intensive use of catchments and riparian land results in more water moving quickly off the land surface in times of heavy rain. This can lead to peak stream flow and floodouts, stripping of topsoil and accelerated bank erosion which can result in the loss of valuable agricultural land.

Benefit The trees, shrubs and hardy perennial grasses characteristic of the riparian zone stabilise banks with their root systems and protect the ground during heavy rains. Vegetated banks can withstand up to three times the flows that a bare bank can handle without eroding.

Water quality

Management issue Sediment and some nutrients (particularly phosphorous) are carried to streams in the overland flow of water. The clearing of agricultural land, soil disturbance during forestry operations or urban development, and bare areas such as gravel roads and stock paths, can lead to substantial increases in the amounts of sediment (gravel, sand, silt and clay) entering streams and rivers.

Livestock drinking water is contaminated by the animal's own waste when free access to streams is allowed. Leptospiriosis and bovine virus disease can easily be transferred under these conditions. The more their water is polluted with silt, manure, algae and other unpalatable substances, the less water livestock tend to drink and the less milk and beef they produce.

Benefit Vegetation, leaves and twigs trap sediment and fertilisers in riparian zones, keeping them from reaching streams where they can pollute water for livestock and household needs. Studies in Australia have shown that both natural vegetation and grassy filter strips can trap around 90% of the sediment moving from upslope. Riparian zones can be equally effective in trapping or absorbing nutrients.

An intact riparian zone contributes to the supply of good quality water. This can play a critical role in the health and productivity of livestock, particularly during hot dry periods when animals' water demand is much higher.

Crop and pasture management

Management issue Working that extra 10 metres of land at the water's edge can cost more than can be gained in crop or forage production. Heavy farm equipment weakens the bank and destroys deep-rooted shrubs and trees. As the soil slumps into the water, valuable crop and pastureland is lost. In addition, runoff is free to carry fertilisers and hebicides into the water, along with topsoil.

The same drawbacks apply to working around wetlands, which are just as important for protecting your water supplies. Livestock can get bogged in the mud and have difficulty reaching the water. Mud-caked udders make it difficult for calves to nurse and increase the incidence of mastitis in milking cows.

Benefit The roots of trees, shrub and grass growing on riparian zones anchor streambanks. They help control cropland erosion by providing a protective cover against the erosive forces of water, wind and frost. Agroforestry or other perennial crops may be more profitable alternatives on riparian land.

Wetlands are often recharge areas that maintain local groundwater levels in dams. They also store water and release it slowly, reducing flows and erosion. With careful management and an adequate buffer zone, natural wetland activity can continue unaffected beside cropped fields.

By fencing the stream corridor you can divide your pasture to enable rotational grazing. The riparian zone can be a part of this system, with livestock moved to optimise forage utilisation and allow regrowth. In this way you do not lose the riparian zone, but incorporate it into your total farm system—it just becomes a different type of paddock.

continued over

Weed and pest management

Management issue The disturbance created by livestock through the grazing of plants and opening up of bare ground, together with increased nutrient levels from animal manure and urine, create an ideal situation for the establishment of weeds. Weeds may also be spread directly by livestock, either through attachment to hair or skin, or through their manure. Troublesome weeds can spread from riparian land onto adjacent farmland.

Benefit In some sugarcane regions of Queensland replanting of native species on the riparian zone solved two problems at once. It shaded out the para grass which was choking water channels, causing increased flooding and high water tables, as well as shading out weed species favoured by two species of native rats which attack the base of cane shoots. In this way, careful management of the riparian zone enhanced both productivity and ecological sustainability.

Plant and animal biodiversity

Management issue The overclearing of native riparian vegetation can be devastating for many native species. It may result in invasion by weeds and feral animals, disrupt corridors for wildlife movement and dispersal, and result in a local decline or extinction of species. Loss of species and absence of structural diversity within natural riparian vegetation leads to a loss of plant and animal biodiversity.

BENEFITS identified by farmers

- Properly managed riparian zones can keep you in fence posts, firewood and native plants adding to the value of your property
- Stock are safe from floods—losses greatly reduced
- Shelter for stock
- Time saved rounding up stock
- Streambank and floodplain erosion causing loss of productive land is reduced
- Reduction in the need to carry out erosion prevention works to save land and/or structures such as bridges
- Benefits to the environment (return of fish and birds)
- Improved lifestyle—not so tied to the property
- Safer working environment
- Improved property appearance and resale value
- Improved drinking water
- Improved recreation zone
- Improved pest and weed management

Benefit An intact riparian zone provides habitat for diverse plant and animal ecosystems. Such zones are vital for the maintenance of plant and animal biodiversity.

Recreation and aesthetic values

Management issue Uncontrolled stock grazing of riparian zones to river banks, and the associated damage, is one of the prime causes of river degradation and consequent devaluation of areas from an aesthetic and tourism perspective. Another important value which can be affected by stock is the potential decrease in recreational fishing due to deterioration in water quality and aquatic habitat caused by stock access.

Benefit Sound management of the riparian zone can promote the maintenance or restoration of the natural beauty of the riverine environment, including the rich ecosystem that it supports. Economic benefits associated with tourism and recreations such as fishing and canoeing, also accrue from the sustainable management of riparian systems.

Summary

In summary, managing the riparian zone differently does not have to result in a net loss to farm productivity. Riparian zones protect cropland from erosion, safeguard water quality, ensure reliable stream flow and provide some of the most productive fish and wildlife habitat. The key to sustainable management of the riparian zone is to treat and manage it as a sensitive zone that requires a different management approach from all other areas of the property. Case study one shows how one farmer has realised many of the benefits outlined in this article, and has made his property more productive both ecologically and economically.

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CASE STUDY 1

'OONOOIE': managing the riparian zone within a total farm system

Environment

Oonooie is a cane farm six kilometres from Sarina on the central Queensland coast. Average rainfall is 2500 mm per year. The farm has white sodic type soil of very poor quality, but with the right management will produce good yields.

Case study details

Keith Schmidtke and his family purchased Oonooie in 1980, and their goal was to make the property sustainable. The total property area is 200 hectares with 150 hectares under cane. Many management issues faced the Schmidtke's when they took on the property, with erosion, weeds, rats and shrinking riparian areas key challenges. Each of these problems were addressed by the Schmidtke's adopting solutions that recognised the importance of managing their property as a total farm system.

Strategies and treatments

Management of erosion was the most visible and costly problem facing the Schmidtke's, with the white sodic soil characteristic of the area highly erodible. Every time it rained, and particularly during storms, the loss of top soil was significant. Previous owners had used burning as a primary management tool, and the land had been burnt so often in the past that most of the riparian vegetation had been destroyed. This led to the formation of numerous blind gullies, about 60 to 70, in 150 hectares. One gully in particular, was 400 metres long by 6 metres deep at one end.

Because of the erodible soil type, the top soil was stripped, the gully filled with clay (which was excavated from a new dam site) and the top soil replaced and planted with pangola grass for ground cover. Fifteen thousand cubic metres of fill was used in the large gully. All other gullies on the property were treated the same way, with a total of 300 000 cubic metres of soil being used.

In order to control moisture loss from dams and prevent bank erosion, an extensive tree planting program commenced in 1982. Four thousand trees were originally planted, with the majority of extra trees now on the farm as a result of natural regrowth. The Schmidtke's found that by not burning, controlling weeds such as lantana, and using some chemicals to clean up problem areas, native trees revegetated the area.

Gradual encroachment into the riparian zone by cultivation was another issue addressed by the Schmidtkes. The problem of encroachment occurs over a period of years, with every year resulting in extended cultivation and moving crops closer and closer to the edge of the creek bank. The Schmidtke family halted this problem and moved all the cane fields back from the creek bank to create wider riparian zones.

Remnant vegetation was also left along watercourses to decrease erosion and consequent siltation of that water course. These areas are protected as much as possible, and encouraged to spread to other degraded areas of the water course to help with bank stabilisation and the

Keith Schmidtke was the 1997 Mackay Environmental Farmer of the Year

'What a great scene to live with. You wake up in the morning with kookaburras laughing in the trees, magpies and butcher birds warbling their song for all to hear, and there are scrub turkeys and flocks of ducks and kangaroos and wallabys. Surely this alone is enough reason to take care of our riparian area, but when we add all the other benefits … what better picture of a wonderful lifestyle can I paint?'

Keith is featured in the NFF publication 'Hand in Hand: farming sustainably'.

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reduction of siltation and fuel loads. This has not only improved the health of the riparian areas, but has improved safety, as a buffer of trees stands between the tractor and the creek bank, rather than a badly eroded drop off.

The management of rats was another significant problem that the Schmidtkes had to deal with. Hot fire through most introduced species of grass leads to profuse seed production next season that, in turn, provides sufficient protein for the prolific breeding of rats. By not burning, Keith has eliminated the majority of grass seeding. Through green cane harvesting and some chemical spraying, the rat problem has now been controlled.

Monitoring and performance

The strategies and treatments put into effect at Oonooie have had a marked effect. A continuous strip of trees and shrubs now runs throughout the property providing a corridor for birds and animals, as well as acting as a sediment trap and preventing erosion. A good canopy cover shades out unwanted introduced plants and keeps grass down. Erosion on the property has become a manageable issue, with the repair of the gullies not only halting a worsening problem, but also resulting in 24 hectares of productive cane land being reclaimed.

Water quality in the creeks on the property has also been vastly improved. During rain, the combination of green cane trash blanketing and the good riparian cover filters and traps sediment from entering the creeks and gullies. Previously, those areas where the riparian areas were burnt off every year resulted in a large amount of sediment entering the creeks, with the water becoming muddy and sloppy.

Summary

The Schmidtkes worked out that the cost of repairing the gullies and badly eroded areas was only half the amount needed to purchase extra land. They have not only increased production overall by gaining good sustainable cane land, but have also achieved long rows of flat country with no gullies, which is more economic to farm. The Schmidtkes believe this makes sound financial sense, as well as having environmental benefits. Overall they believe the cost of restoring the area was very minor when compared to the benefits accomplished from it.

Keith intends to farm his property until he retires, and intends to stay at Oonooie after retirement. He endeavours to keep the whole area, especially the riparian areas, looking as beautiful as possible. The riparian areas, he argues, function the way nature designed them—for erosion control, fish habitat, wildlife corridors and stream bank stability. Keith puts into his own words the results of the work that has been undertaken at Oonooie.

'What a great scene to live with. You wake up in the morning with kookaburras laughing in the trees, magpies and butcher birds warbling their song for all to hear, and there are scrub turkeys and flocks of ducks and kangaroos and wallabys. Surely this alone is enough reason to take care of our riparian area, but when we add all the other benefits—rat control, fish habitat, good water quality in the creeks, erosion control of creek banks, no siltation of creek beds and aesthetic appeal, what better picture of a wonderful lifestyle can I paint?'

Lesson to be learnt

Keith's practices not only benefit the environment, but also make good economic sense.

CANEGROWERS

CANEGROWERS and riparian management

Six thousand, five hundred cane growers grow sugarcane in Queensland over 2100 kilometres of coastline and across 22 catchments. Most Queensland cane farms are owned and operated by family partnerships, with all growers belonging to Canegrowers. Canegrowers, as the voice of the Queensland cane growing industry, has 15 district offices and an office in Brisbane that works to implement state policy, as well as represent the industry on all issues, including environmental issues.

In 1995, Canegrowers commissioned an extensive and independent environmental audit. The audit was undertaken to determine how current cane growing practices are impacting on the environment. The audit included an assessment of the state of riparian vegetation, with the finding that growers can manage riparian areas better, and that large areas should be revegetated.

This revegetation is already happening, as individual growers get involved in tree planting schemes. The Trees for Rats program, an industry initiative supported by the Bureau of Sugar Experiment Station has been an outstanding success. This included the publication of a booklet *Is there a rat in your hip pocket* that explains the value of riparian vegetation in shading-out grassy vegetation, which is a breeding ground for rats that can be a major pest of cane.

In order to accelerate this process and involve more growers, Canegrowers developed an ambitious revegetation initiative whereby one million trees would be planted in cane growing areas including along waterways. This project will be submitted for funding from the Natural Heritage Trust in various forms, as stand-alone projects by local ICM and Landcare groups who would like to see the target of one million trees reached. Canegrowers will support these proposals wherever possible.

Canegrowers has an ambitious Environment Management Strategy that aims to address environmental issues in a timely and efficient manner. We believe our industry is making solid progress.

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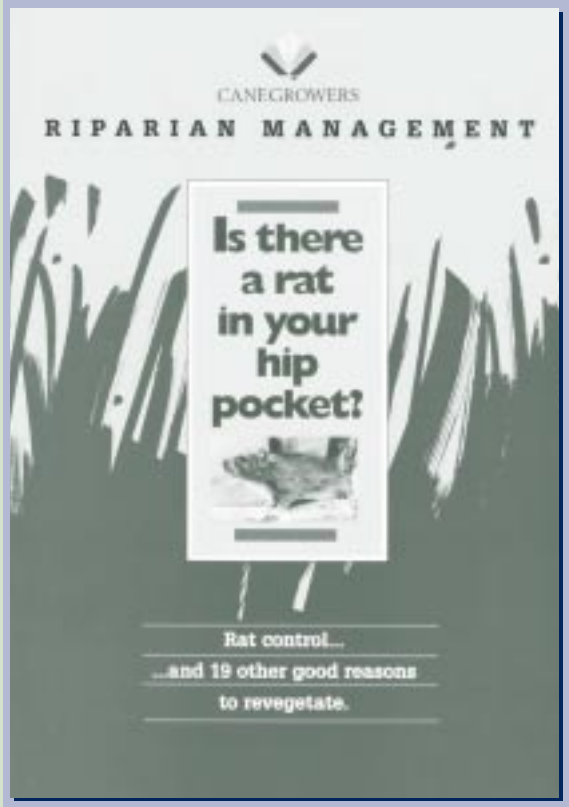

Is there a rat in your hip pocket?

This brochure

- sets out the advantages of protecting existing riparian vegetation and re-vegetating riparian land;
- gives answers to frequently asked questions about riparian management;
- provides an introduction on how to go about revegetating these areas;
- discusses the financial costs and benefits involved;
- lists who to go to for further help and advice.

For your free copy contact

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or CANEGROWERS

Getting a GRIP

Getting a grip provides short, sharp research notes that can be practically applied in day-to-day natural resources management.

"Ecoman and Dr Earth Getting a Grip" by Morgan Kurrajong and Ed Radclife.

Dryland salinity impacts on riparian health: assessment, planning and R&D gaps

National DRYLAND SALINITY Program

Two issues dominate much of the national effort and investment in landscape rehabilitation: dryland salinity and riparian health. The conjunction of these two issues across southern Australia highlights the difficulty in separating considerations of stream and upland management, and creates a particularly challenging set of research and remediation needs.

To date, much of the focus on the impacts and risks of dryland salinisation have been on losses of land from primary production or decreased quality of water supplies. This is slowly changing, with downstream impacts of stream salinisation on the riverine/riparian environment now recognised as a major consideration in assessing the costs and benefits of salinity control.

The nature of these impacts result from changes in both groundwater levels and associated waterlogging, as well as the concentration of salts at the surface of riparian areas and in-stream. The extent of this impact varies geographically, but is most widespread and devastating in the wheatbelt of Western Australia. The beds and banks of 80% of the region's rivers and streams are seriously degraded, and the degradation of wetlands is well advanced though largely unrecorded. This degree of salinisation of the riverine environment is associated with an outbreak of salinity over only about 10% of the landscape; land salinisation is expected to rise as high as 40% in the coming decades. In landscapes with such dire trajectories in land salinisation, the prognosis for protecting or restoring rivers is poor. In other locales, riparian systems at risk of salinisation are potentially more amenable to protection due to their specific hydrogeological and hydrological settings.

A major gap in our understanding is what the critical groundwater depths, salinities, and flooding frequencies are for specific riparian ecosystems. Without this quantitative definition of the ecohydrological niche or tolerance, it is hard to define groundwater or streamflow management targets, or reasonable community expectations for riparian protection or restoration. A second major technical gap is knowledge about the likely extent of salinisation with time for a given land use or climate scenario. Without this knowledge, works aimed at riparian protection may underestimate the eventual extent of salinity impacts and thus be either inefficient or ineffective. Finally, there is no general framework available to assess the likely effectiveness of engineering works (for example, groundwater pumping, surface drainage) on restoring riparian areas under threat from salinisation.

CSIRO, in partnership with state agencies and the WA Salinity Action Plan, have identified downstream ecosystem impacts as a priority area in salinity R&D, and are currently formulating proposals to address this serious research gap.

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Photo by Nick Schofield

The National Remnant Vegetation R&D Program: lessons for riparian vegetation management

In 1994, the Australian Nature Conservation Agency (now part of the Biodiversity Group of Environment Australia) and LWRRDC established a national program of research and development to devise improved methods of managing bushland. The program's focus is on the highly cleared regions of southern Australia. The aim of the program is to assist government agencies, community groups and landholders to better manage and protect remnant native vegetation through the application of improved knowledge and understanding gained from research. The program has funded projects covering three main themes:

- the ecology of remnant vegetation;
- socio-economic and policy research; and
- a series of state-based pilot projects to develop vegetation management plans at a regional scale.

The program has a strong emphasis on practical outcomes in managing remnant native vegetation and also seeks to form better links between vegetation managers and researchers. One of the projects from this program is discussed below and has important implications for riparian zone management.

If you are interested in finding out about the program more generally, please contact Dr Jann Williams.

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MANAGING RIPARIAN VEGETATION on cattle properties in south-east Queensland

The continued sustainability of sub-tropical eucalypt woodlands is an issue facing beef producers and conservationists alike in south-east Queensland. Strategies are urgently required that will retain the future productive potential of the land whilst still promoting a rich diversity of species in the landscape.

The Grazed Landscapes Management Project has defined some 'ideal' strategies for sustainability through the development of a set of principles suitable for use by livestock producers.

continued next page

Auburn River.
Permanent waterholes are attractive to both domestic livestock and wildlife and are particularly important refuges during droughts.

There should be a minimum 30% woodland or forest cover on properties.

MANAGING RIPARIAN VEGETATION continued

The six main principles cover management of the property as a whole—soils, pastures, trees, wildlife and watercourses. Within these principles are a number of thresholds that suggest limits of management and use, beyond which serious ecological damage is likely to occur.

For example, in terms of trees in the landscape, the thresholds are defined as:

'There should be a minimum 30% woodland or forest cover on properties'; and

'To be viable in the long-term, woodland patches should be a minimum 5–10 hectares.'

Watercourses have been identified as requiring special management as they are particularly important to ecosystems and grazing enterprises. The key principles for watercourses in these systems are:

~ livestock should be excluded from watercourses to reduce soil erosion and maintain the quality of water;
~ vegetation should not be cleared up to the edges of watercourses; and
~ control of exotic species in riparian zones is important.

Salty Waterholes Creek. Clearing to the high bank has significantly reduced the value of this stream for wildlife habitat.

Little Oaky Creek. Rehabilitation of the bankside vegetation with a mixed scrub layer and wider buffers would improve its value as a corridor to the timbered area in the distance.

Emu Creek. Excessive clearing and heavy livestock traffic has severely degraded the streambanks and riverbed.

The principles will be further defined on a practical level through ongoing dialogue between producers and the project team. Project experiments (plot experiments, tree and pasture surveys, plant biodiversity survey) will also serve to strengthen the rationale behind the strategies.

To be viable in the long-term, woodland patches should be a minimum 5–10 hectares.

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CASE STUDY

HELPING your river system to recover: effectively prioritising river rehabilitation strategies based on recovery potential

For those of us working on the land and in the catchment, limited resources means that we have to be able to prioritise river and riparian rehabilitation strategies. Recent research conducted by Kirstie Fryirs and Gary Brierly is assisting the prioritisation process by focusing on the 'recovery potential' of a river reach. This new and exciting approach means that farmers, catchment management committees and natural resources management agencies can target their resources so that the best environmental and economic outcomes can be gained.

Recovery potential and river rehabilitation

In its simplest terms, river rehabilitation is likely to be most successful in those reaches that are recovering naturally. By working with the natural processes and structures occurring along these reaches, river rehabilitation strategies will be most cost effective and require minimal ongoing maintenance. By using insights from fluvial geomorphology, we are able to determine whether a river reach has the ability to recover, or whether it is becoming more degraded. This is termed the *recovery potential* of a reach.

As recovery is a natural process that occurs as a river reach adjusts to a disturbance, the most effective strategies for river rehabilitation should be viewed as a process of *recovery enhancement*, in which management efforts strive to help the river to adjust naturally. When reaches are placed within their catchment context, analysis of recovery potential provides an appropriate long-term, integrative approach to river rehabilitation.

Geomorphologists have been discussing the concept of river recovery for over a decade. However, approaches that predict stages of river recovery are not yet used routinely in river management practice. The manner and rate of river recovery, if indeed it is attainable, depend on the type of river under consideration, the conditions under which it operates and, in many instances, the position of a reach within the catchment.

Identifying stages of degradation and stages of recovery as a basis for management

The 'river styles' framework developed at Macquarie University by Dr Gary Brierley and Kirstie Fryirs, and funded by LWRRDC, provides a baseline assessment of contemporary river character and behaviour throughout a catchment. Individual river styles are a representation of a particular character and behaviour. Importantly, they do not measure condition, and degraded and recovering deviations of each river style do occur. To determine where the reach fits along the degradation or recovery pathways (see Figure 1), it is necessary to identify and describe the evolutionary steps through which each river style will adjust. This enables an assessment to be made about whether the reach in question sits on a recovery pathway and has the potential to recover, or whether it sits on the degradation pathway and will become more degraded.

Given the lag time between the initial disturbance (often up

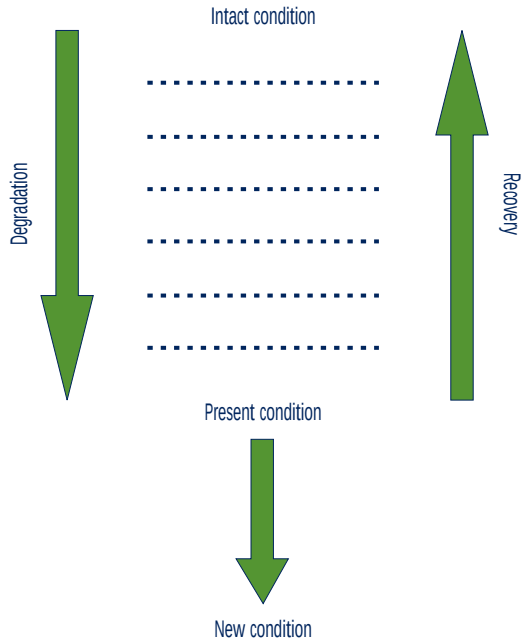


***Figure 1**. The pathways of river degradation and river recovery are quite distinct. Recovery is not simply a reverse of the degradation process. Given the changed conditions under which many river systems now operate, intact conditions will not be re-established and in some cases an entirely new condition results.*

to 150 years ago) and the final stages of degradation, many systems in southeastern Australia are still adjusting to disturbance. In other areas, however, some systems have pathways of degradation that have largely slowed, and these systems are now showing signs of recovery. Importantly, other reaches have the ability to recover back towards an intact condition (see Figure 1). In contrast to this situation are those river reaches that will never recover to a pre-disturbance state and a new condition will develop.

The latter scenario has been documented for numerous river systems in Australia. These systems have been altered to such a degree since European settlement, that they now have an entirely different character, and operate under a different set of conditions (in terms of water and sediment transfer, and riparian vegetation cover) to those that characterised the pre-European landscape.

Reaches that display natural recovery potential have the greatest likelihood of rehabilitation success. These are the reaches in which the most cost effective, sustainable returns will result. Economically viable returns are unlikely to result from extensive rehabilitation of degraded reaches. These reaches are best left to adjust naturally until they show signs of recovery. Only then will river rehabilitation be successful. Hence, determining the reaches in the catchment that are in an intact, recovering or degraded condition, will help guide river managers to those sections of the catchment with the greatest likelihood of rehabilitation success.

Prioritorisation and management strategies

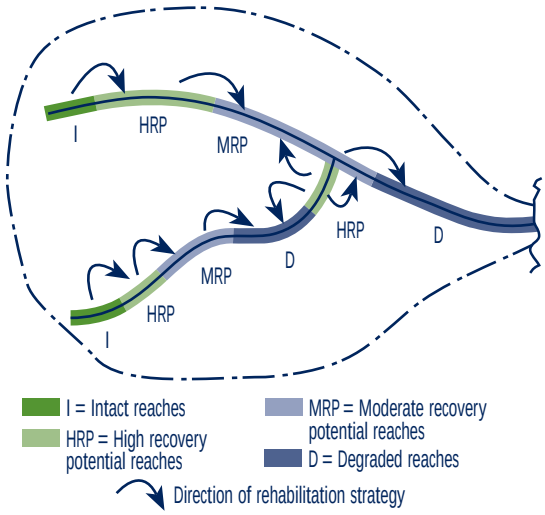
The most cost effective river rehabilitation strategies are designed and implemented within a catchment framework, working outwards from intact reaches to the most degraded reaches within the catchment. In the prioritorisation strategy developed in the river styles approach:

1. conservation precedes rehabilitation;
2. emphasis is placed on reaches that show signs of recovery; and
3. more difficult tasks are undertaken in the more degraded parts of the catchment.

Reaches that display natural recovery potential have the greatest likelihood of rehabilitation success. These are the reaches in which the most cost effective, sustainable returns will result.

Those reaches in good condition form the foci for extension of vegetation and river structure strategies into more degraded sections of the catchment. This framework not only helps restore a continuous riparian corridor, but ensures that good reaches are conserved, maintained and extended throughout the catchment or farm system. This shifts the emphasis from the most degraded sections of the catchment, where rehabilitation is costly and likely to fail unless placed within the context of the prevailing catchment processes (see Figure 2).

***Figure 2**. An idealised catchment showing how the prioritorisation strategy works by building out from the reaches in the catchment displaying good condition to the more degraded parts of the catchment. The upper tributary effectively builds in a downstream direction, whereas the lower tributary has a high recovery potential reach in its lower section. This particular reach is used as a focus point to build out from. These good reaches often provide important seed sources in the catchment.*



The management strategy and level of intervention required in each reach is based on the condition of the river style (i.e. its position on a continuum of recovery potential such as that in Figure 3), and the location of the reach within the catchment (taking into consideration sediment and water transfer from upstream, the condition of upstream reaches and their impact downstream, and offsite impacts such as nickpoints). For example, many lowland areas of coastal draining systems are highly degraded. Unless upstream reaches are successfully conserved or rehabilitated, ongoing influence will be exerted on the degraded reaches leading to minimal rehabilitation success along the lower reaches of the system.

Works in a particular reach must replicate the natural river structure and flow for that particular

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HELPING your river system to recover

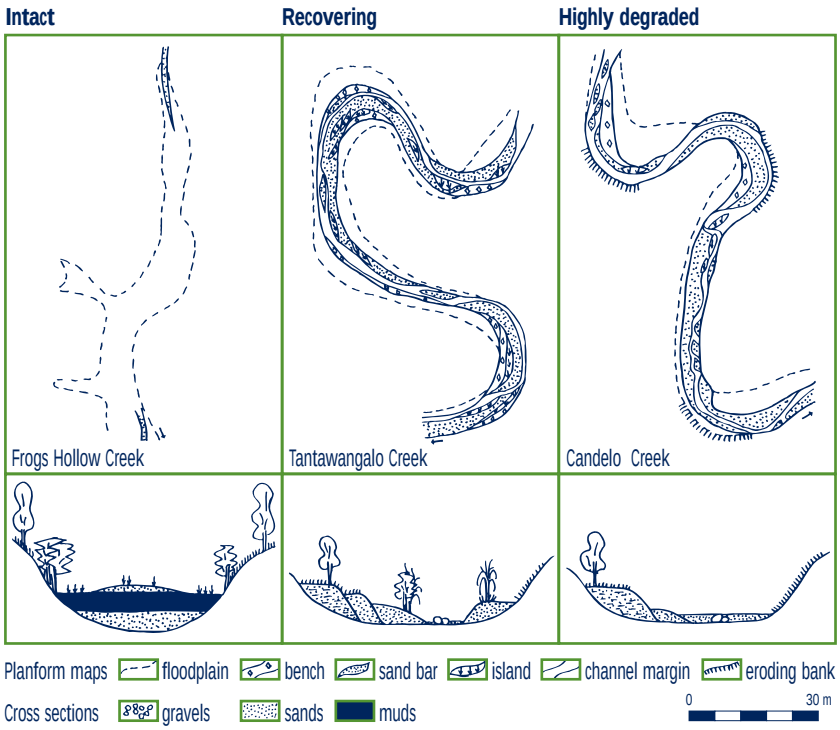

***Figure 3 (at left)**. An example of the application of the recovery potential concept for the transfer river style in Bega catchment on the south coast, NSW. Continuums such as these are built from real examples that exist in the catchment. They are used to describe the stages of recovery for each river style. River planform, river structure and vegetation strategies are detailed in such figures. Each of the nine river styles identified in Bega catchment have been assessed in this manner.*

river style. In addition, the works must complement strategies being undertaken in other parts of the catchment. Strategies should aim to maximise the potential for rivers to self-adjust, reducing the need for ongoing reactive management.

Intact reaches require conservation and protection from off-site impacts. These are the highest priority in the catchment. *Recovering* reaches can be divided into high and moderate recovery potential conditions depending on the level of degradation and subsequently the level of intervention required by river managers. In many instances, low cost strategies such as vegetation maintenance and stock management will suffice. In other instances, river rehabilitation strategies will involve direct vegetation planting, or bed and bank control structures. Quick (within a decade), visible results can be obtained in such reaches. They have a high likelihood of rehabilitation success. Along *degraded* reaches, expensive, invasive, long term (decadal) rehabilitation strategies would be required. Best management practice would be to simply leave the reach to adjust naturally until it shows signs of recovery.

This catchment based framework can be used to prioritise river reaches and, in turn, aid the effective allocation of funding within the catchment or farm system. River managers and landowners can strategically select those sections of the catchment or farm system that have the greatest likelihood of rehabilitation success. Cost effective, low risk strategies which will yield results can then be selected, employed and eventually extended throughout the catchment.

River managers and landowners can strategically select those sections of the catchment or farm system that have the greatest likelihood of rehabilitation success.

***Intact transfer research**. Note the intact valley floor with floodout and discontinuous watercourse in the foreground. Tussock grasses characterise the surface. Many mid-catchment reaches were characterised by this condition prior to European settlement.*

***Degraded transfer reach**. This degraded transfer is characterised by an over-widened channel, concave bank erosion (to the right of photo), a poorly defined low flow channel (i.e. it braids through sand sheets) and an extensive point bar (to left of photo). Riparian vegetation is poor, or in this case absent.*

***Recovering transfer reach**. The first signs of recovery are the formation of a well-defined low flow channel and the formation of point benches and point bars along the inside of the bend (to left of photo). These features act to narrow the channel and store sediment within the reach. This particular reach is only in the initial stages of recovery. Riparian vegetation coverage is still poor and concave bank erosion still occurs.*

Local government focus

featuring the Murray Darling Association

Sam Bartlett, a former honours student at the Australian National University, has recently completed part of a study commissioned by the Murray Darling Association on local government involvement in natural resources management. His research was based on interviews, visits, material and examples from many councils in the Murray–Darling Basin. The following is a summary of his report as presented to the Association's AGM in Strathalbyn. The report discusses the factors that contribute to local government involvement in natural resource management (NRM), with a particular focus on the Murray–Darling Basin.

Local government involvement in natural resource management

Reflecting a global trend, Australian environmental policy has increasingly placed greater emphasis on communities and local governments to respond to environmental degradation. There are many examples of councils undertaking innovative and effective projects. However, generally speaking, local government involvement in NRM can be characterised as highly variable, yet underdeveloped.

Evaluating and determining the local government role in NRM is complicated by the great diversity of local governance in Australia. Local government functions and responsibilities differ widely between and within each State, and generalising about council's attitudes towards environmental issues, is almost impossible. Council operations are governed by various state legislation, that can both empower and exclude local government from involvement in particular aspects of NRM. This helps explain some variability in NRM involvement, but there are a number of other critical factors.

Funding arrangements for NRM are a key issue for councils. The greatest source of funding for environmental projects currently available to councils is the Natural Heritage Trust (NHT). However, the lack of any ongoing commitment or guarantee of funding beyond the life of the NHT deters many councils from embracing greater involvement in fear of creating a financially unsustainable precedent. Also, the complexity and bureaucracy associated with applying for NHT funds has discouraged councils and community groups.

The best examples of local government involved in NRM are self-supporting programs which rely on, and build on, local community support for NRM, rendering them largely resistant to the problems of external funding. While the resourcing of NRM remains crucial, the significance of a supportive and enabling local community cannot be overstated.

Generally speaking, the involvement of councils in NRM has mirrored, and will continue to mirror, the concerns Australian communities hold toward environmental degradation

It is also important not to overstate the role that local action plays in achieving sustainability. The successes of local activities are limited by the fact that they are localised. A complementary and enabling response from state and federal governments is required if local action is to be translated into an effective response to environmental degradation nationally. If the burden of responsibility is devolved to local government and to local communities, without the support and funding that is required, then central governments are doing a great disservice to the community, to councils, and to the sustainability imperative.

There is undoubtedly a very important role for local government in NRM. It is vital, however, to be mindful of both strengths and weaknesses of local responses.

For further information and your copy of Sam's report

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Fax: (02) 6021 2025

The second part of this report is still being finalised by another student from the Australian National University, Kirsty MacIntyre.

MURRAY DARLING ASSOCIATION INC.
FOR CONSERVATION AND SUSTAINABLE DEVELOPMENT

REHABILITATION MANUAL for Australian streams: available via the Internet SOON

by Dr Ian Rutherford

'Spreading the word'
Ed Radclife and Morgan Kurrajong

Over the past two hundred years we have physically and biologically degraded many Australian streams. The daunting task that is facing catchment managers at the end of the millenium is, not only how to minimise further damage to rivers and streams, but how to repair the damage that has already occurred. Can we return natural values to our waterways? This manual is designed to help those professional managers who are accepting the challenge of rehabilitating the physical and biological condition of Australian streams. The manual is divided into four sections:

1. rehabilitation concepts,
2. a planning procedure for rehabilitating streams,
3. typical stream problems, and
4. a range of tools that could be useful for rehabilitation.

The concepts provide a firm basis for planning a rehabilitation strategy, whilst the typical problems and tools provide resources that could be useful to the manager.

It is important to emphasise that this is not a catchment or stream management manual. There are many reasons to intervene in streams and catchments that are not related to rehabilitation of the natural stream values. Thus, the manual will only touch on issues such as erosion control, water supply, flooding, and the sociology of management, in so far as they affect rehabilitation.

This manual was only possible with the contribution of many managers and researchers across Australia. We also acknowledge the generous support and vision of the Cooperative Research Centre for Catchment Hydrology and LWRRDC that has brought this manual to fruition.

VOLUME 1: Concepts and planning

will be on the Internet by the end of April 1999.
Check the LWRRDC site for address details.
http://www.lwrrdc.gov.au

We need your feedback!

There has been a long tradition of trying to preserve natural values in Australian streams. But it is only in the last two decades that people have begun to reverse the degradation of the past, and it is only now that rehabilitation is becoming one of the core goals of stream and catchment managers. As a result, there are few projects aimed specifically at rehabilitation of natural values in Australian streams. There are even fewer projects that have been adequately evaluated. Thus, this manual is based on an evolving set of ideas rather than on well-established approaches that are known to be effective in Australian conditions. You will also find many gaps in the manual that need to be filled.

Our hope is that this manual will grow and mature along with the infant stream rehabilitation effort. It is only as we evaluate and record the successes and failures of our stream rehabilitation efforts that we will gain the confidence needed to roll-back the many decades of degradation that our streams have suffered. To this end the manual includes 'feed-back' and 'case-study' sheets so that you can add your thoughts and experiences to the next edition of the manual. You will be able to fill in these sheets via the Internet, or print them off and fax them back to the address details that will be provided.

REHABILITATION MANUAL FOR AUSTRALIA STREAMS

RIVER LANDSCAPES

poster and brochures now available

The River Landscapes poster has been launched, with an overwhelming positive response from landholders, agencies and communities alike. Everyone wants a poster on their wall!! If you would like one of these beautiful and inspirational posters, as well as a brochure explaining how LWRRDC, with the cooperation of communities and agencies across Australia, is involved in river and riparian restoration, contact the organisation in your State.

River Landscapes

Commonwealth
Agriculture Forestry Fisheries
Australia Shopfront
Edmund Barton Building
Core 2 Entrance
(off Blackall Street)
Barton ACT 2601
Tel: 1800 020 157 (toll free)

Australian Capital Territory
Environment
Information Centre
Environment ACT
Macarthur House
12 Wattle Street
Lyneham ACT 2602
Tel: (02) 6207 9777
Fax: (02) 6207 2227

New South Wales
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Department of Land
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... AND IT'S FREE

CONTRIBUTIONS welcome

Mary White, author of the *Greening of Gondwana*, *After the Greening* and *Listen… Our Land is Crying*, is writing a fourth book in the series titled *Water in a Changing Land*. It describes ancient paleodrainages; prior streams and ancestral rivers; what our modern rivers were like at the time of settlement (from early Surveyor Generals' reports, explorers' diaries, early illustrations and photographs and, oral history); how European management of catchments has completely changed the form and function of many rivers; and, the present status of chosen examples with information on rehabilitation. It also deals with groundwater, its origins, and issues surrounding its sustainable use.

Anyone who has recent scientific publications on subjects which they think would be valuable additions to the information provided by the book are asked to contact Mary.

For further information

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INFORMATION sheets

'Practical methods for riparian restoration in the wet tropics'

Riparian restoration in wet tropics catchments poses specific problems due to high rainfall and floods occurring at least annually. Through a LWRRDC funded project entitled 'Collation and dissemination of practical methods for riparian restoration in the wet tropics', consultation with landholders, technical experts from various government agencies, and the wider community was used to work out what the needs of the region were with regard to 'riparian restoration'.

The following information sheets were a result of this project:

- Streambank revegetation and restoration—benefits for the landholder and the community.
- Guidelines for revegetating streambanks.
- Common weeds on streambanks and control methods.
- Restoration of streambanks—economic benefits and tax incentives.
- River processes and how they affect streambanks.
- Existing legislation for the protection of streambanks and rivers in Queensland.
- On-farm issues affecting streambanks and water quality in the wet tropics catchments.
- Practical site examples of streambank restoration in the wet tropics.

For more information and your free copies, contact

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EDITION 11

We have some copies of Edition 11: *Riparian zones — what are they?* remaining, if you would like copies to use as the basis for workshops, for distribution or because you missed out, please contact LWRRDC on the details listed on the last page.

LWRRDC's new river and riparian website is under construction. See next RipRap for details

WEBsites

Natural Heritage Trust http://www.nht.gov.au
All about the National Rivercare Program and other Natural Heritage Trust programs

Streamline on the Web http://www.infoscan.com.au
Australia's natural resources data base is on the web, together with the Australian Rural Research in Progress and the Australian Bibliography of Agriculture data base

Riparian bibliography http://www.npsc.nbs.gov.resource/literatr/riparian/riparian.htm
Information about riparian communities and related topics

US Department of Agriculture http://www.nhq.nrcs.usda.gov/ccs/Buffers.html
Information from Uncle Sam

It's a WRAP

Keeping up to date with what is happening across Australia in the area of natural resources management is vital. This section provides States and Territories with the opportunity to 'wrap up' key activities, research and upcoming events. This edition's focus is on South Australia, page 22.

Western Australia

Foreshore condition assessment in urban and semi-rural areas

Landcare groups in Western Australia have been concerned with the protection and rehabilitation of river systems for some time, however, with such large areas to cover, and many streams being in private ownership, there is a lack of information available to many groups to assist them in making management decisions.

In 1995, Luke Pen and Margaret Scott developed a technique for 'Stream foreshore assessment in farming areas'. This provided a standardised assessment technique that can be performed by groups and individual landholders themselves. It has been widely accepted and used to successfully assess many streams throughout south-west Western Australia.

As use of the technique has expanded from farm to catchment scale surveys, users began to express a need for a modification of the methodology that would enable them to assess streams in urban and semi-rural environments, where there are a different suite of issues to be considered.

Nicole Seimon and Kelly Shepherd of Ecosystem Management Services, in consultation with the Water and Rivers Commission, are developing a technique for 'Foreshore condition assessment in urban and semi-rural areas'. The assessment technique is comprehensive yet, like that of Pen and Scott, does not require specialised knowledge or expensive technical assistance. This means that assessment can be performed by groups and individuals themselves.

The methodology considers overall stream condition to be comprised of four major parameters that are independently assessed and the results then combined to determine the overall stream condition. They are:

1. *Bank stability* includes assessment of bank slope, erosion, slumping, sedimentation and stabilising structures.
2. *Foreshore vegetation* structure and composition, includes the use of tables with native and weed species commonly found in the region. This allows for straightforward yet comprehensive vegetation surveys looking at abundance, health and regeneration of individual species.
3. *Stream cover* recognises the importance of overhanging native vegetation and in-stream cover, and notes the abundance of native and exotic vegetation and the presence of deciduous trees.
4. *Habitat diversity* includes stream form, water quality and identifies habitat requirements for a variety of terrestrial and aquatic fauna.

Along with recording information on stream condition at the time of the survey, the methodology also ensures that the information collected will aid groups in making management decisions. This information includes disturbance factors, surrounding land use, evidence of existing management and special cultural or spiritual significance.

The condition assessment techniques that are being developed have several features that are particularly important in helping groups to make their own river management decisions. The techniques:

~ do not require specialised knowledge or expensive technical assistance and surveys can therefore be undertaken by individual landholders or by community groups;
~ immediately provide managers with data to aid them in their decision making process, especially in prioritisation of works;
~ provide standardised data suitable for compilation and comparative assessment, even when using data collected by a variety of groups and individuals; and
~ provide standardised data suitable for ongoing monitoring and evaluation.

WATER AND RIVERS COMMISSION

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New South Wales

Deep Creek: adaption of rock ramp to accommodate fish passage

Deep Creek is a small coastal catchment with an area of 55 square kilometres at the tidal limit. It is located in the north east of Nambucca Valley on the mid-north coast of New South Wales. In July 1997, under the supervision of the Department of Land and Water Conservation, Valla Landcare Group installed a rock ramp in Deep Creek to address active bed erosion. The migration of a nick point had resulted in the lowering of pool water levels, bank erosion, reduced fish habitat and was also thought to be contributing to the migration of the tidal limit upstream.

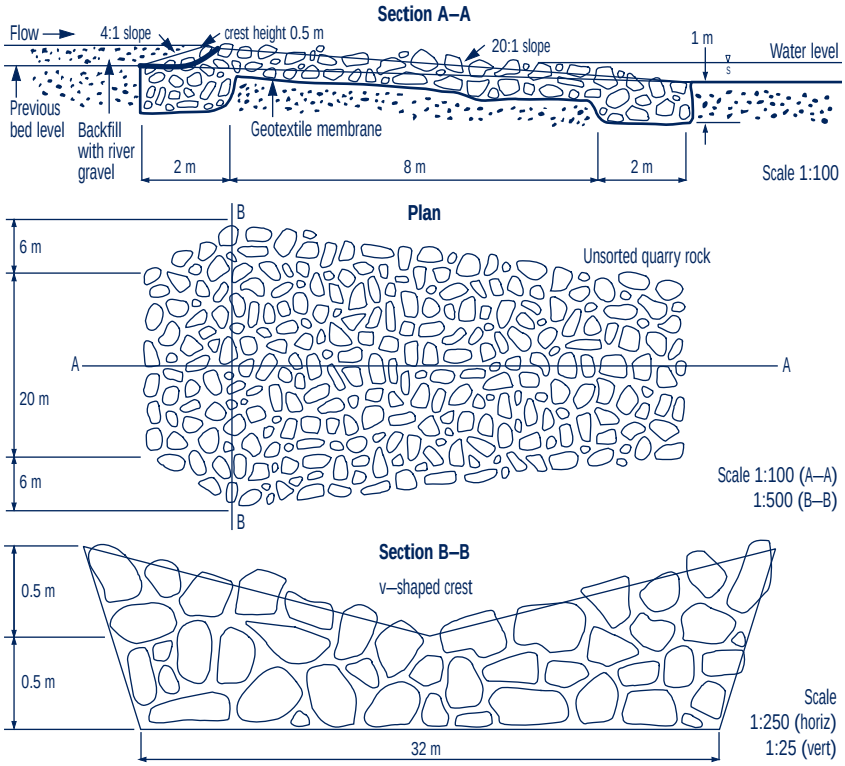
The ramp was constructed at the first inflection point downstream of the active headcut and bank erosion. The ramp, with a v-shaped crest of 0.5 metre (minimum height), was constructed with an upstream face of 1 vertical:4 horizontal, and a slope of 1:20 downstream of the crest. Geofabric (A64 bidum) underlies the entire structure, including the cutoff trenches that are 1m deep and are located at the up and downstream extents of the ramp.

Due to New South Wales legislation (*Fisheries Management Act 1994*) the ramp required modifications to improve fish passage. A fish ladder was established in February 1999 by installing rock ridges 0.2 metres high at 2 metre intervals across an approximate 4 metre width down the centre of the 32 metre wide ramp. Geofabric lines the upstream face of each ridge. The ridges aim to provide a series of steps down the ramp to enable staged fish passage.

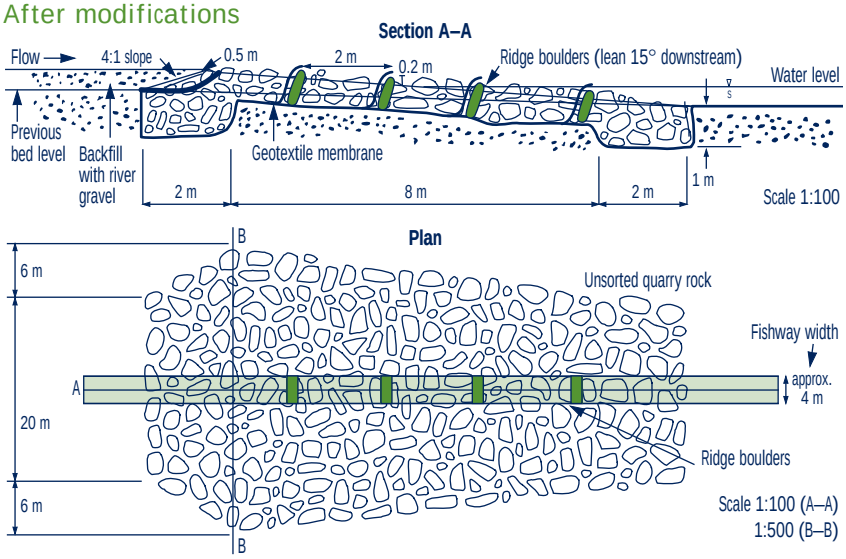
The completed work represents the successful achievement of multiple outcomes, in this case, river bed and bank stability, improvement of the riparian ecosystem functioning, as well as enhancement of natural fish passage. This outcome has been the result of cooperation between Valla Landcare Group, the NSW Department of Land and Water Conservation and the NSW Department of Fisheries.

Rock ramp construction details modified to improve fish passage

Before modifications



After modifications



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***Left**. Taken in July 1997 by Sally Boon.*
***Right**. Following improvements to the fishway, taken in February 1999 by Fiona Nagel.*

Queensland

Water allocation and management plans: a new planning tool

Queensland has introduced an innovative process to develop catchment-based Water Allocation and Management Plans (WAMPs) as a major step toward ecological sustainability. The strategic approach will replace the current incremental approach to water allocation and river flow management. WAMPs will provide a greater level of security to existing and potential water users, including environmental needs.

The WAMP process adopts a multi-disciplinary approach to determining the needs of the riverine environment and associated ecosystems, and the possible impact and benefits of various environmental flow management strategies. An advisory panel is formed for each WAMP, comprising professionals with expertise in hydrology, river ecology, aquatic biology, and geo-morphology.

Stakeholders from a broad mix of interests are represented through a community reference panel established for each WAMP. The panels form a conduit for two-way communication between the Department of Natural Resources and stakeholders. In addition to the broad community views reflected by the panel, the catchment community has the opportunity to directly comment on the draft WAMP when it is advertised for review.

One of the key innovations of the WAMP process has been the capacity to link hydrologic and ecologic information. This is done using new modelling and analysis tools which form an effective decision support system for water planners and managers. It is expected that the WAMP modeling will lead to a greater understanding of riverine ecology impacts and allow water managers to better appreciate the riparian values that support riverine ecosystems.

To date a draft WAMP for the Fitzroy Basin has been completed and subjected to an extensive community review. Over the next two years WAMPs are also being developed for the Condamine-Balonne, Macintyre, Barron, Logan, Burnett, Pioneer and Burdekin basins.

For more information on WAMPs visit

http://dnr.qld.gov.au/water/wamp or contact your local Department of Natural Resources office

wamp
FINDING BALANCE

Victoria

A new tool for catchment management: an index of stream condition (ISC)

The Department of Natural Resources and Environment (DNRE) has developed an Index of Stream Condition (ISC), which is an integrated measure of river health that will provide information to assess trends in the long term condition of rivers. The ISC assesses five components of streams, namely, hydrology, water quality, physical form, streamside vergetation and aquatic biota. Wherever possible, the ISC is utilising the macro-invertebrate and expanded habitat information collected as part of the AusRivas program in Victoria. Protocols have been developed to transform the AusRivas scores into ISC scores.

Preparation for the full statewide benchmark of the ISC is well underway. In order to ensure that all those using the ISC are properly trained, Victoria's Catchment Management Authority staff and their consultants will be attending workshops in late April and early May. Once these training sessions are completed, field work will commence at some 2000 sites across the State.

The development of a data entry program to record ISC results from across the State is also underway. It is hoped that data will be entered directly into the State Water Resources Data Warehouse via the internet. The warehouse will allow a high level of interactive access to this information and to other material from Victoria's water quality monitoring networks and groundwater monitoring program.

The original set of three ISC manuals that underpin the assessment technique are currently being revised, and it is anticipated that these manuals will be available early in May 1999.

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Australian Capital Territory

To fence or not to fence: the Paddy's River dilemma

Paddy's River rises in the mountainous Namadgi National Park south of Canberra, flows through leasehold grazing properties whose stock generally have unlimited access to the river, and exits some 40 km later into the Cotter River. As a permanent watercourse, the river is an immensely valuable asset to farmers in an extreme and unpredictable climate, and carries with it the imperative to balance their resource utilisation with resource protection. The water quality is variable to poor; in-stream sediment transport is on-going; willow and blackberry invasions are creating channel change and bank undercutting; and the diversity of wildlife in and around the river is highly variable.

One proven remedial strategy is to control stock access to the river through fencing, and revegetate the riparian zone with native species. To this end, Paddy's River Landcare Group are working with an independent consultant to prioritise where, when and how the river should be fenced for stock exclusion, revegetated, and subsequently managed. Natural Heritage Trust funding is available to carry out the recommended fencing.

Reaches of the river prioritised for fencing are those:

~ actively eroding;
~ without native riparian vegetation;
~ invaded by willows; and
~ where tributaries and gullies are actively eroding.

Importantly, those reaches with undisturbed riparian vegetation, excellent water quality, abundant aquatic and riparian species, and intact pool and riffle sequences are already being managed to protect the river resource. For other areas of Paddy's Creek, fence design and distance from the river, off-point watering strategies, revegetation strategies, weed control, limited stock access points to the river, and on-going management strategies will vary depending on topography, stocking rates, existing paddocks, dams and other infrastructures, and personal preferences. The consultant will detail fencing, stock access and watering, revegetation and management strategies for each river reach and property, provide advice on riparian species suitable for the toe, batter and buffer zones and recommend time frames. With the report in its final stages, action is expected to begin in autumn and will continue throughout the next 12 months, promising a greatly improved riverscape and an accompanying increase in productivity.

Actively eroding reach of Paddy's River with stock tracks, no native vegetation and uncontrolled stock access year round. The banks are further damaged by regular wombat holes. Algal blooms flourish here. Photo, Alison Elvin

Paddy's River with undisturbed riparian vegetation, naturally occurring pool and riffle sequences and high water quality. This reach of river still has stock access, but in controlled numbers and intermittently. Photo, Alison Elvin

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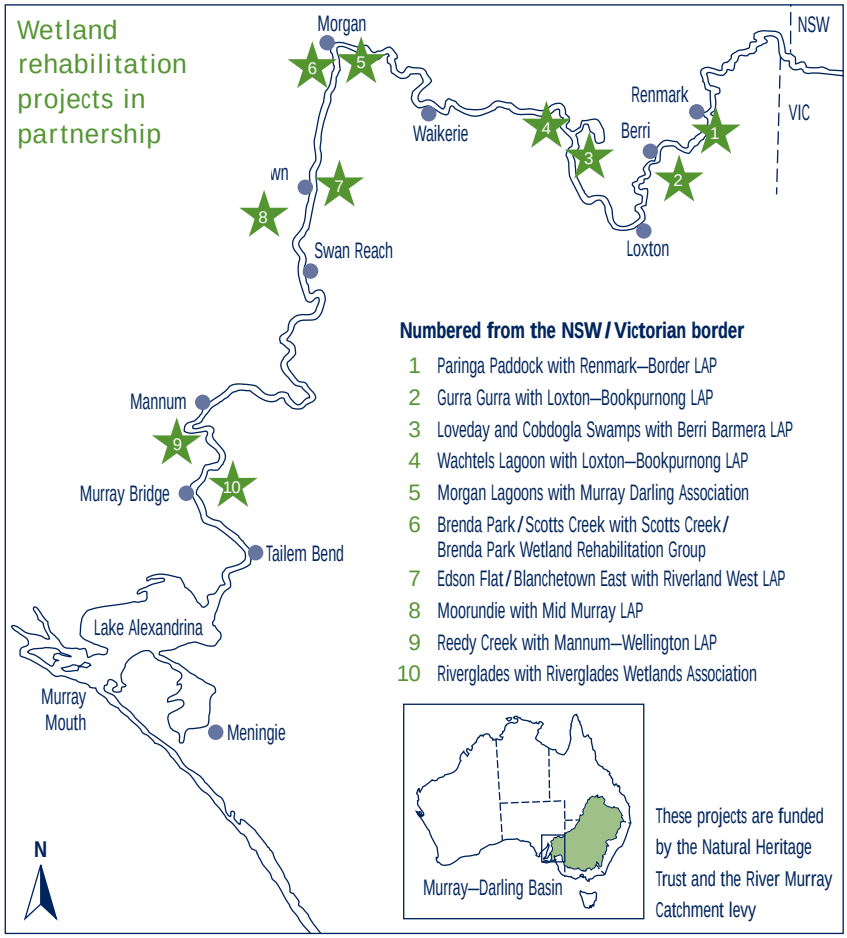
What's happening in SA wetlands?



The current projects

- Paringa Paddock (flanking the western approach to Paringa Bridge near Renmark)
- Gurra Gurra Wetlands Complex (covering the floodplain from Lyrup to Bookpurnong Cliffs, opposite Berri)
- Wachtels Lagoon (adjacent to Kingston Bridge near Moorook)
- Blanchetown East Wetlands Complex (flanking the eastern approach to Blanchetown Bridge)
- Reedy Creek (on the Mannum–Murray Bridge Road, downstream of Mannum)
- Morgan Lagoons (Morgan Conservation Park, opposite Morgan)
- Scotts Creek and Brenda Park Wetlands Complex (western floodplain downstream of Morgan to Scotts Creek)
- Moorundie Wetlands Complex (extensive anabranch and creek system stretching 20 kilometres south from Blanchetown)
- Riverglades (remnant wetland basin among 'reclaimed' dairy pastures).
- Loveday and Cobdogla Swamps (former swamps, now irrigation drainage basin)

Wetland Care Australia is speeding up the pace of wetland rehabilitation in South Australia, putting into practice its new mission of *working together to enhance Australia's wetlands*.

The working foundation of this not-for-profit community group is partnerships with wetlandholders, community groups, sponsors and volunteers. While the longer term goal is for a national focus, current activities concentrate on regional projects. The major wetland rehabilitation project currently under way involves partnerships with Local Action Planning Committees along the Murray Valley in South Australia to address management issues for 11 wetland complexes.

It is no accident that the sites selected by community groups for active management are close to major highways and bridges, in places where many passersby will become aware of the action and results.

A common thread for all of the projects is that they are complex, involving more than a single wetland. This reflects the need to manage the wetlands as total hydrological complexes, taking account of all of the flow paths and connections across a whole section of floodplain.

Gurra Gurra Wetlands Complex

The Gurra Gurra project is an excellent example of community involvement in a local wetland project. The wetland site covers over 3000 hectares of floodplain and involves 38 landholders. The landholders are concerned about the visible deterioration of their floodplain and have created the Gurra Wetland Care Group to coordinate a major restoration project. The project includes an integrated program of structural works, costing several hundred thousand dollars over three years to restore floodplain flow paths and some of the natural flow regime.

The Gurra Gurra floodplain suffers from two major impacts. The lower lying downstream area is drowned by higher river levels sustained at Weir No. 4, while the higher sections of the floodplain and upstream high level flow paths are droughted. This drought is due to reduced flow volumes from the interstate catchment. Other impacts include salinisation, grazing and introduced pests, notably carp, foxes and burr.

The project proposal includes installation of several road crossings in key flow paths, including a major crossing of 250 cubic metres

Tasmania

Riverstyle workshops with Dr Gary Brierley

Because of the considerable resources being invested in Rivercare works in Tasmania, there was a perceived urgent need to establish a rational catchment framework in the State for these activities. Gary Brierley and Kirstie Fryirs from the Macquarie University were invited to come to Tasmania and run two workshops on the subject, 'River Styles: A Biophysical Approach to Prioritisation of River Rehabilitation Strategies'. The workshops were held in December 1997 and were attended by a wide variety of people and practitioners.

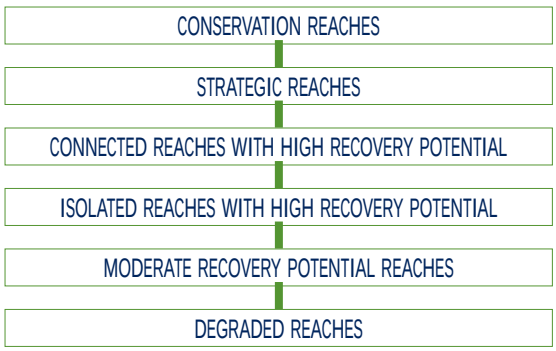
Since 1996, Gary and Kirstie have been developing a catchment based characterisation strategy that assesses the character and behaviour of different sections/reaches of rivers and places within a catchment context. This provides the basis for prioritisation of river management strategies. They also believe that unless you get the structure of rivers right in geomorphological terms, they do not function in an ecologically sustainable fashion in terms of habitat availability and viability (see case study two for more details).

Each workshop consisted of an indoor tutorial, followed by a day in a local catchment, 'earthing' and 'truthing' the River Styles principles and testing them to ascertain their applicability to Tasmanian streams. The River Styles methodology was deemed to be relevant and potentially useful for the effective development of the Rivercare Program in Tasmania.

One of the key outputs of the four stage River Style process is the 'Prioritisation Hierarchy' (see figure). There are three major principles underlying this hierarchy.

~ Conservation precedes rehabilitation.
~ Work in river sections where the chance of success is high.
~ Contemplate more difficult tasks.

Prioritisation hierarchy



We were hoping that the work on River Styles would complement the approaches and concepts that had been conveyed by Bob Newbury from Canada over the last few years. We were right!

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South Australia continued

at Tortoise Crossing, designed to pass flows of 40 000 ML/day. The entry sills to several high level creeks will be lowered to increase the frequency of flows along a major former river channel, to freshen the area which has been deprived of freshwater flows.

A highly successful demonstration project has already commenced at Little Duck Lagoon, showing the rapid response when a drowned wetland is dried and re-flooded. A section of the wetland has been fenced to exclude adult fish (particularly adult carp), and there is a graphic difference in water clarity and integrity of water plant communities. Visitors are impressed with the value of this simple management action.

The scientific response is being closely monitored so that these management techniques can be refined for future management actions. The community response is positive and spreading. More and more people can see for themselves what a difference can be made to the health of the wetlands, and indirectly to the health of the river.

The partnership work in these wetlands is leading to on-ground results in line with the Wetland Care Australia vision of *healthy wetlands for healthy rivers: special forever!*

For further information

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