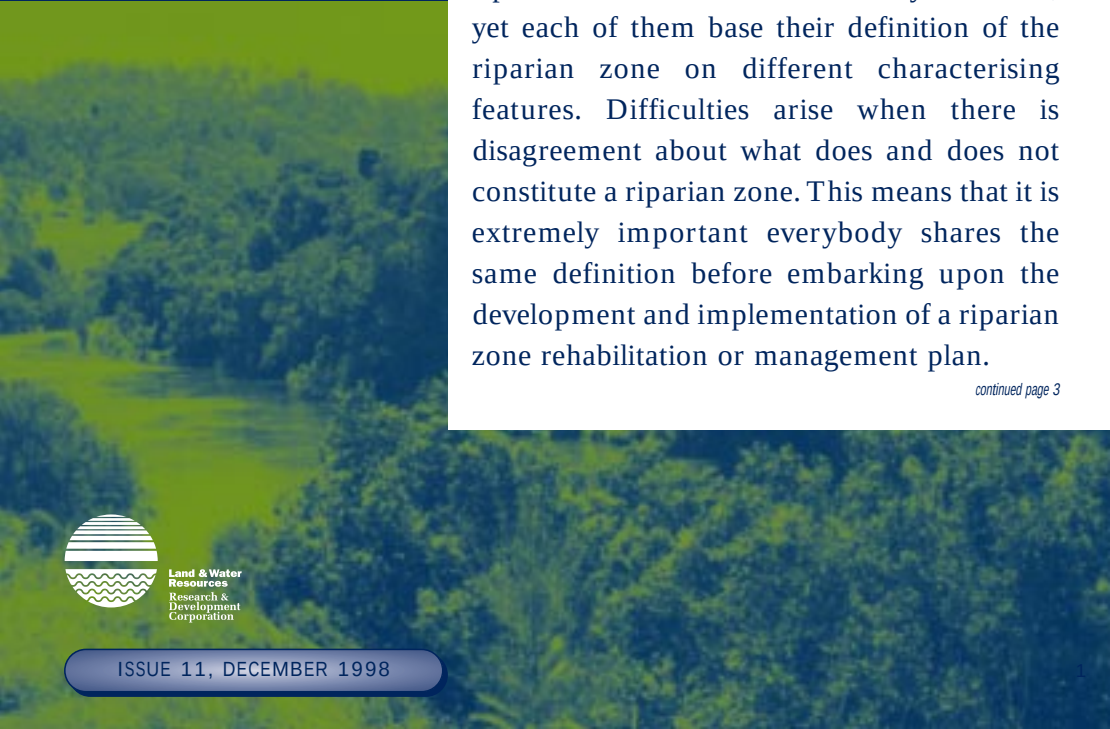
RIPRAP
LWRRDC'S RIPARIAN LANDS MANAGEMENT NEWSLETTER
A COMPONENT OF THE RIVER RESTORATION AND MANAGEMENT PROGRAM

RIPARIAN zones: what are they?

How do you define a riparian zone?

This question is not an easy one to answer, as riparian land can be defined in a number of different ways. The choice of definition is generally dependent on the situation or management aim, and the person or group doing the defining. The following article discusses four different ways of defining a riparian zone — each of them may be useful, yet each of them base their definition of the riparian zone on different characterising features. Difficulties arise when there is disagreement about what does and does not constitute a riparian zone. This means that it is extremely important everybody shares the same definition before embarking upon the development and implementation of a riparian zone rehabilitation or management plan.

continued page 3



Land & Water Resources Research & Development Corporation

ISSUE 11, DECEMBER 1998

CONtents

RIPArian lands:

WHERE LAND AND WATER MEET

From the Editor

How do you define a riparian zone? This edition of RipRap looks at the many different ways a riparian zone can be defined. For example, you could use an ecological, managerial or legal definition and, although very different, all would be useful. Interestingly, the legal dimension to riparian zone management is often forgotten. This is despite the fact that State/Territory legislation and local by-laws can support or prohibit the undertaking of particular activities in a *legally defined* riparian zone. Recent research into this topic is presented in Case Study 1 of this edition, with the findings highlighting the complex web of legislation that exists in each Australian state and territory.

Other features in this edition include: some new research into the sediment trapping capabilities of buffer zones; details of the voluntary riverbank scheme in the Mary River Catchment in Queensland; and, a look at the new poster that will be released next year to promote the work being undertaken in the River Restoration and Management R&D Program.

I would like to thank all those people who wrote in about Edition 10 of RipRap — within the first few weeks the 3000 copies printed had all gone and the subscription list has increased by around 25% — an early Christmas present for the program!! On that note, I would like to wish everyone a Happy Christmas and all the best for 1999.

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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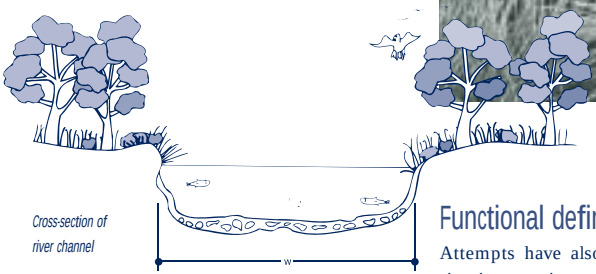
RIPARIAN zones: defined

continued from page 1

Landform definition

Landform definitions are usually based on some idealised cross-sectional shape of a river channel. The riparian zone is defined as that area between the low-flow level of the watercourse and the highest point of transition between the channel and its floodplain. This definition suffers in that it does not include important areas such as adjacent wetlands or billabongs, which may influence streams or lakes. However, this definition does provide a helpful guide for management.



Cross-section of river channel

Vegetation definition

Some attempts have been made to define the riparian zone on the basis that the vegetation in it is obviously (often visually) different to the surrounding terrestrial ecosystem. This has not been of wide practical use, as the riparian zone itself contains a wide range of vegetation types, from mature trees to emergent macrophytes. Importantly, in the Australian context, vegetation change may reflect periodic events with a long return time, for example, fire, flood or severe drought.

Legislative definition

Several Acts within the states and territories of Australia provide legislative definitions of riparian lands. These normally refer to a strip of set width (usually 20 metres to 40 metres) along the banks of designated rivers and streams. However, a fixed designated width along the whole length of a river is not very useful, as it does not take account of variables such as channel size, shape and seasonal flow patterns.

Functional definition

Attempts have also been made to define the riparian zone in terms of its function and effects. Within this approach, the riparian zone is usually defined as 'that part of the landscape, which exerts a direct influence on stream channels or lake margins, and on the water and aquatic ecosystems contained within them'. Added to this type of definition is an indication of the features that can be affected directly by the riparian zone, including: channel morphology and bank stability; the physical and chemical properties of the water; the aquatic ecosystem; water quality; and, conservation-wildlife-recreational-aesthetic values. Once the riparian functions to be protected or managed have been identified in terms of stream size or other location characteristics, regulations and management strategies can be developed.

For the Riparian Lands management component of the River Restoration Program, the functional definition has been chosen as most appropriate for attaining program goals. Using this approach, riparian land is defined as:

'Any land which adjoins, directly influences, or is influenced by a body of water.'

RIPARIAN zones: defined

Using this definition as the basis, riparian land includes:

- the land immediately alongside small creeks and rivers, including the riverbank itself;
- gullies and dips which sometimes run with surface water;
- areas surrounding lakes; and
- wetlands on river floodplains which interact with the river in times of flood.

The functional definition is generally the most widely used of those discussed. This is because it reflects the processes and interactions that take place between the landscape and the river. It is also the definition that most closely relates to the often diverse goals and objectives of riparian management plans.

However, although there is no single law of nature that defines the width of riparian land or buffer strips, legal rules and regulations can provide concrete definitions. As a consequence, it is vital that groups and individuals planning activities in the riparian zone take time to discover the legal provisions relating to the riparian zone in their state or territory. Due to the nature of the riparian zone, many different Acts may impact upon management activities. For example, Acts concerning soils, water usage, land access, pollution control and vegetation may all need to be considered prior to undertaking activities on the riparian zone. This step is often forgotten in the planning process, despite the fact that legislation has the potential to support or prohibit the implementation of management strategies. It is for this reason that LWRRDC commissioned a study to examine the legislation relating to riparian zone management in each state and territory. A summary of the findings of this work is presented in Case Study 1.

> *" … it is vital that groups and individuals planning activities in the riparian zone take time to discover the legal provisions relating to the riparian zone in their state or territory …"*

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NEW publication

Management of River and Creek Bank Plantings in Sub-tropical Coastal Riparian Rainforest

The re-establishment of indigenous vegetation is an effective solution to the problems of bank stability along our rivers and creeks. Through research funded by the National Landcare Program and LWRRDC, a booklet has now been developed to help the user to plan and manage riparian vegetation re-establishment projects. It covers species selection, site preparation, planting strategies and management techniques for successfully re-establishing riparian vegetation in sub-tropical coastal regions

For more information and your free copy

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STREAM corridors CONFERENCE

Adaptive Management and Design

Second International Conference on Natural Channel Systems. 1–5 March 1999. Sheraton Fallsview, Niagara Falls, Canada

For anyone interested in learning, sharing, promoting and integrating knowledge and experience in various aspects of river and stream systems management. Topics include: national, regional and local strategies; management issues; innovations in stream corridor management; design; interactions and community involvement; case studies; research and development and monitoring.

For further information, please contact

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LOCAL government focus
Featuring the Cooloola Shire Council

The Cooloola Conservation Strategy is the driving force behind the Shire's activities in the riparian zone. The development of the strategy featured extensive community consultation and participation, including a survey of 20% of ratepayers and workshops with over 700 people. A key outcome of the process was the identification of healthy rivers and waterways as the most important environmental value of the shire.

Photo courtesy Brian Stockwell

School children and TAFE staff join in riparian planting, March 1997

According to the Council's representative on the Mary River Catchment Coordinating Committee (MRCCC), Councillor David Anderson, these findings were quickly translated into action, with an initial allocation of $50 000 from the Shire's environment levy to kick off the Voluntary Riverbank Restoration Grant Scheme. This scheme was run in conjunction with the MRCCC from 1995. Grants can be obtained for fencing, off-stream watering, revegetation as well as bank and bed stabilisation.

The shire's riparian zone program includes a rate rebate scheme for conservation of important remnants which is open to landholders willing to enter into a voluntary conservation agreement. There is also a rural restoration strategy in the Shire's Planning Scheme, that includes a riparian policy and a number of community projects. Some examples of projects run by the Cooloola Shire Council are:

~ Clean Up Australia Day — each year over 150 volunteers tackle the restoration of a 2 kilometre esplanade park between the two town bridges in Gympie. Heavily infested with *Celtis Sinensus* (Chinese Elm), the Council has trialed a range of eradication and replanting techniques. In 1997, a bulldozer was used to remove the 10 metre high stand of woody weeds and reshape an old land fill site. Australian Trust for Volunteers then promptly covered the exposed river terraces with used carpet underlay and replanted. Eighteen months later a canopy of rainforest between 3–5.5 metres high has grown.

~ The Commissioner's Gully project is the Shire's first Urban Watercourse restoration project. Digital terrain remodelling and historic aerial photographs have been used as part of the community awareness program which has seen neighbours join together to restore the stream.

~ In 1997, Green Corps funding was used to develop an extensive tree planing and walking path scheme. Together with a small amount of LWRRDC funds, Green Corps has assisted in the diversion of low flows from a concrete chanellised section of the gully back to the original alignment of the watercourse. Ironically, the channel was constructed under a similar type of labour scheme in the 1960s (see Case Study 2 for details).

For more information

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Photo courtesy Phil Price

Maintaining top of bank planting.
Photo courtesy Brian Stockwell

CASE STUDY 1

RIPARIAN management and the law: take time to understand

by Emily Cripps

Many of us, including myself, make an initial judgment about whether something is of interest by considering the title. We are, after all, busy people in a busy world. But as with the restoration of an eroded stream bank, it is always important to understand the issues surrounding a proposed action and then plan ahead.

Without the development of such an understanding, it is difficult to determine an appropriate response to the issues confronting us. Riparian management is the same — not only must we consider the practical aspects of what we are doing, we must also be aware of the legal aspects.

But why are the legal aspects important? The law can be used in various ways to help protect our environment, and awareness of the law can also prevent us from unknowingly committing an illegal act. For example, the issuing of permits ensures that actions such as willow removal are not undertaken prior to expert assessment and planning. In this way, the law prohibits or supports particular riparian management actions. Importantly, the law can also be used to protect and conserve riparian areas.

I have recently completed work for LWRRDC analysing the many different types of legislation relating to riparian management. Each State and Territory in Australia has legislation that governs land use and planning and water use. However, this is where the similarity ends, as the legislation in each State and Territory has different provisions and requirements relating to natural resources management. It is under this broad category of legislation relating to natural resources management, that riparian issues fall. However, riparian management is not specifically addressed in most States and Territories, despite the fact that riparian management is clearly a specific type of natural resources management activity.

In order to understand the legislative provisions that may impact upon riparian management it is, therefore, important to consider the range of legislation that exists within your State or Territory. Table 1 shows the major pieces of legislation in each State and Territory that may effect the management of riparian land. The provisions contained within each of the pieces of legislation that have the potential to impact on riparian management are also briefly outlined. In addition, it is important to remember that local by-laws and regulations may restrict what you can do in the riparian zone, or require a permit or approved plan prior to undertaking certain types of works.

In each of the States and Territories there are many more pieces of legislation that may also need to be considered before embarking upon major works in the riparian zone. Another factor to be aware of is that prior to considering the possible applications of a particular piece of legislation, it is important to be aware of the definitions which are applied to terms used *within* that piece of legislation. For example, a riparian right in legal terms, may be defined as the right to use water for household domestic purposes, and for the watering of a domestic garden. In other States, however, a riparian right may embody the absolute right to the control and use of water within a stream or creek. This, as was pointed out in the introductory discussion on how to define a riparian zone, is different to a landform, vegetation or functional definition of what a riparian right might entail.

Legislation is dynamic — it can be changed.

RIPARIAN management and the law

Table 1: Legislation relating to riparian management: examples of the primary pieces of legislation in each State / Territory

	Legislation	Relevant provisions of the legislation
ACT	*Land (Planning and Environment) Act 1991*	Land use and planning, environmental impact assessments, lease conditions
	Environment Protection Act 1997	Duty to avoid damage to the environment
NSW	*Native Vegetation Conservation Act 1997*	Conservation and management of native vegetation, establishment of regional vegetation management plans, control on clearing of native vegetation
	Catchment Management Act 1989	Establishes Catchment Management Committees who advise on management of riparian vegetation within a total catchment management framework
	Environmental Planning and Assessment Act 1979	Land use and planning, including compliance with regional vegetation management plans
NT	*Soil Conservation and Land Utilisation Act 1970*	Conservation, reclamation and prevention of soil erosion
	Pastoral Land Act 1992	Prevention or minimisation of degradation, monitoring of land condition, access to land and water, control of clearing on pastoral land
QLD	*Water Resources Act 1989*	Water management including the protection of watercourses and control of vegetation clearing
	Land Act 1994	Controls tree clearing on State land
	Integrated Planning Act 1997	Land use and planning
SA	*Soil Conservation and Landcare Act 1989*	Duty to prevent land degradation, soil conservation districts with controls on clearing
	Native Vegetation Act 1991	Preservation and conservation of native vegetation, clearing of vegetation prohibited where it is likely to lead to a deterioration in water quality
	Water Resources Act 1997	Sustainable management of State's water resources, may control vegetation clearing through water management plans
TAS	*Land Use Planning and Approvals Act 1993*	Development, use and protection of land, land use and planning activities, implements State Policies
	State Policies and Planning Act 1993	State Policies including State Policy on Water Quality
VIC	*Catchment and Land Protection Act 1994*	Integrated and coordinated management of catchments, establishment of Catchment Land Protection Boards, requirement for Regional Catchment Strategy, duty to avoid land degradation
	Conservation Forests and Lands Act 1987	Controls work which may interfere with the quality of water
	Planning and Environment Act 1987	Land use and planning, catchment management strategies, Victoria Planning Provisions, control clearing within 30 metres of watercourse
WA	*Conservation and Land Management Act 1985*	Management of State forests, reserves and parks
	Soil and Land Conservation Act 1945	Controls land degradation and clearing of vegetation
	Waterways Conservation Act 1976	Controls activities which may interfere with waters or watercourses through a permit system

So how will this impact on your plan for management of your riparian land? Legislation is important as it shows a person, be it a landholder, local government or State government agency, what they can legally do. Planning and implementing a strict management regime is of little use if it is not legally permissible. If the management practices extend beyond those allowed, they will be illegal. Legislation does not only restrict what may occur, but it may outline how managed areas can be protected, either in the long or short term. It may even provide mechanisms by which assistance can be sought by landholders.

Once you have taken the time to investigate how the legislation in your State or Territory defines and 'treats' the riparian zone, it is easy to see how legislation may help you in your quest to develop, implement and manage activities in riparian lands. Legislation is dynamic — it can be changed. This means that you may be able to support the development of legislation that requires permission to undertake certain activities in the riparian zone. For example, you may be able to protect riparian land by placing a covenant on the title of your land that prohibits the removal of riparian vegetation.

Now that you have taken the time to read this article, I hope you will take the time to understand more about legislation as it relates to riparian management. A more detailed outline of other relevant legislation, as well as information about the provisions contained in Table 1, will be included in the soon to be released LWRRDC Riparian Management Technical Guidelines (see next RipRap for details).

For further information on the technical guidelines

Dr Siwan Lovett
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For further information on legislation project findings

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Catch the cartoon on page 10!

Getting a GRIP

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

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

Sediment storage capacity of grass buffer strips

The performance of grass buffer strips alongside streams in trapping and storing sediment and nutrients, is generally considered in relation to sediment transport capacity. Grass strips have a low sediment transport capacity because of the hydraulic roughness of the grass stems, but as deposition takes place and the grass is progressively buried, hydraulic roughness decreases and sediment transport capacity increases until no more sediment is deposited.

As an alternative to the sediment transport approach, a recent study used the storage capacity of buffer strips as a measure of their effectiveness. Backwater storage, just upslope of the grass buffer strip, is important in this respect, especially at lower slopes.

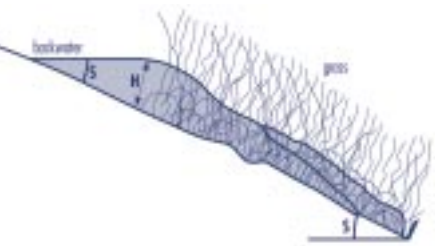

Figure 1: Schematic diagram of backwater with a sediment deposit

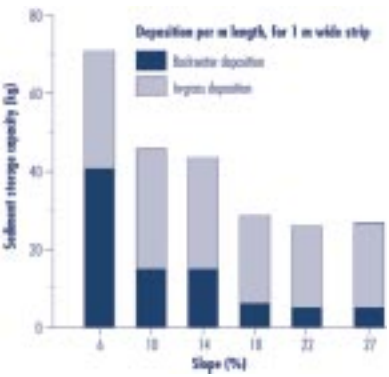

Figure 2: Trapped sediment mass varying with slope.

A BACKWATER what is it?

A backwater is an area of deep, slow-flowing water, that occurs behind a grass buffer strip. Sediment is deposited because the slow-flowing water is unable to carry its load, the same process that causes deposition within the grass. The effectiveness of grass buffers can, therefore, be measured in terms of the total amount of sediment that can be stored in the backwater and the buffer itself.

The effect of slope on backwater and in-grass storage capacity was investigated in this study, with results showing that on a 6% slope, the backwater can trap 41 kilograms/metre length of grass buffer, while on a 27% slope only 5 kilograms can be trapped in this way (see Figure 2).

A recent study has shown that with shallow, evenly distributed overland flow, relatively narrow grass buffer strips can have a considerable storage potential, especially on slopes less than 18%. This is because the grass effectively acts as a permeable weir. The water backing up behind the grass provides a deposition area, as does the grass itself. Backwater storage tends to result in upslope extension of buffer strips, after grass has grown over the sediment deposit. Importantly, sediment trapping can be repeated because grass seeds in deposits germinate and grass grows through earlier deposits.

Under ideal conditions of weak flow convergence, backwater and narrow dense grass buffers can provide efficient sediment control. These findings highlight the importance of understanding the dynamics of sediment trapping in grass buffer strips as they provide a simple, effective and environmentally friendly measure to trap sediment and prevent stream pollution, even on steep slopes.

This study was undertaken by Ms Linda Karssies and Dr Ian Prosser, and was funded by LWRRDC. Their findings will be presented at the Stream Management Conference, 8–11 February 1999, Adelaide.

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River Landscapes

Restoring rivers and riparian lands all over Australia

New poster for Program

This poster reflects the diversity of river and riparian landscapes in Australia. The images created by artist Annie Franklin show the positive and negative impacts of past river management activities. By putting people into the landscape, the poster shows the interdependence that exists between action and restoration.

Part of the positive message in this poster is shown by people actively restoring their riparian environments through the construction of pools and riffles, water testing, tree replanting and other rehabilitation and management activities. The River Landscapes poster will provide inspiration to the community, and its supporting material will raise awareness, stimulate discussion and promote action.

If you look closely you will see that the River Landscapes poster is a map of Australia.

For more information

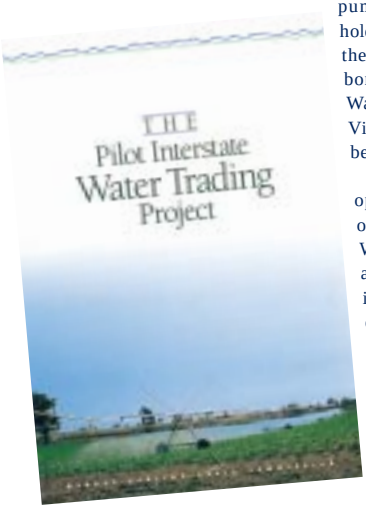
Dr Siwan Lovett (contact details page 2)

The River Landscapes poster will be available early in 1999. See RipRap for details.

MDBC

Pilot Interstate Water Trading Project

In November 1997, the Murray-Darling Basin Ministerial Council (MDBMC) approved the introduction of a pilot project to allow permanent interstate water trade to take place within the Mallee (Vic/NSW) region. The pilot project includes private diverters (those irrigators who pump directly from the river) holding high security licences in the predominantly horticultural border regions of New South Wales, South Australia and Victoria, on the River Murray between Nyah and the Barrages.



The pilot project was developed in response to the Council of Australian Governments Water Reform agenda that agreed to introduce trading, including cross-border sales, of water entitlements by 1998. The rationale behind this reform was that water trading would encourage water to move to its highest value use. This would in turn promote water use efficiency and improved economic returns for the irrigation industry. The aim of the pilot project is to improve the efficiency and effectiveness of consumptive water use in ways that facilitate environmental sustainability but do not increase or accelerate environmental degradation.

To ensure that water trade does not degrade the environment, trading rules have been developed to ensure environmental sustainability. These rules ensure that any water traded under the pilot project will:

- be subject to the MDBMC's policy on environmentally-beneficial flows. This policy states that the Commission will "maintain and, where appropriate, improve flow regimes in the waterways of the Murray-Darling Basin to protect and enhance the riverine environment".
- be subject to State environmental clearance processes (that relate to issues such as salinity, drainage, on-farm management, wetlands).
- need to fall within the State "caps" on total water diversions. As a result, permanent water trade will not result in more water being brought into consumptive use.
- need to be registered in an "environmental account" which will consist of any environmental water that results from trade (that is, where adjustments due to exchange rates for security reasons result in water accruing to the environment).

Overall, the Pilot Project is hoping to establish a system for the permanent interstate transfer of water entitlements that has a set of standards, is accountable and does not result in increased levels of salinity, reductions in environmental flows or degradation of the natural environment.

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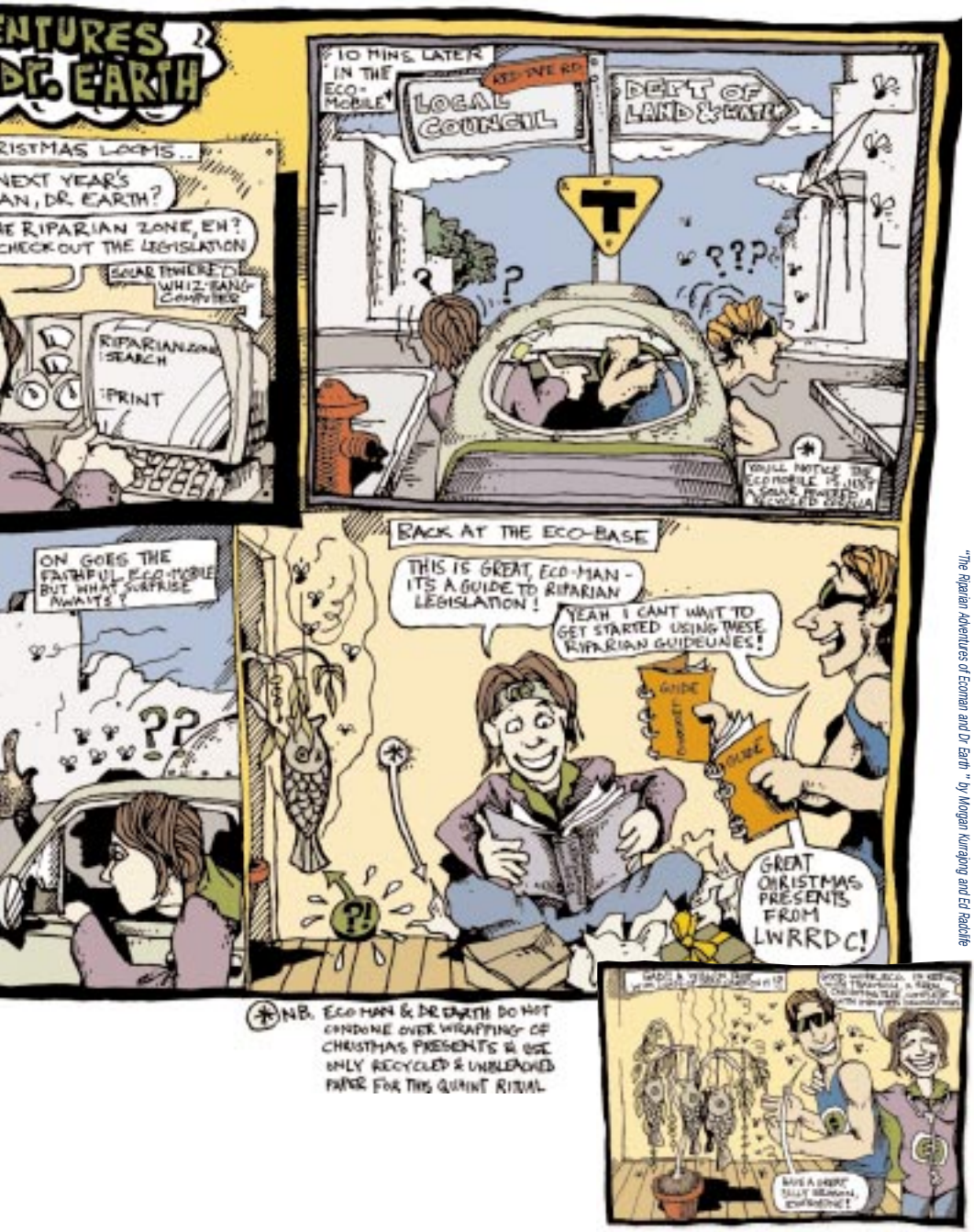

"The Riparian Adventures of Ecoman and Dr Earth." by Morgan Kurrajong and Ed Radcliffe

CASE STUDY 2

COMMISSIONER'S GULLY:

Voluntary action to meet statutory goals

Three years and 38 000 trees; 83 kilometres of fencing; 16 kilometres of woody weed control; 25 in-stream and bank stabilisation projects; and 130 off-stream watering points later, the committee has allocated over $300 000 worth of grants* to riverbank restoration projects valued at over $600 000. The proposed legislation is still a draft. Projects range in size from one which totally excludes stock for the entire length of a tributary in the upper catchment, to a group of urban residents in Gympie banding together to restore their local creek. This case study is about the latter.

by Brian Stockwell
and Paul Marshall

Setting

Rural and regional communities in general, are cautious about new statutory approaches conceived by government to manage the riparian zone. So when draft Queensland Natural Resources legislation was advertised, the Mary River Catchment Coordinating Committee (MRCCC) quickly responded to address a wave of fears and concerns regarding such proposals. Based on the results of their own community consultation and a Council survey of 1400 residents, the Committee identified a high level of support for government assisted voluntary riparian restoration. The Committee decided that rather than spending months, if not years, debating the semantics of legislation, they would establish a Voluntary Riverbank Restoration Grant Scheme.

Figure 1: Original alignment of waterway.

Environment

Commissioner's Gully is the somewhat unceremonious name for an urban watercourse draining approximately 1 square kilometre of the town of Gympie, 180 kilometres north of Brisbane. Like many creeks of its kind, old locals can remember when they skinny-dipped in cool deep waterholes in places where water now barely flows, and how their childhood fishing holes now lay dry thanks to a concrete drainage canal which was constructed in a labour scheme of the 1960s.

Immediately above the drainage canal the creek is in reasonable condition, however, further upstream the riparian zone is infested with woody weeds such as Chinese Celtis (*Celtis sinensis*), Camphor Laurel (*Cinnamonum camphora*) and Cat's Claw (*Macfadenyi unguis-cati*). While the original course of the creek was bypassed by the concrete drainage canal, over the lower 300 metres a comparatively significant stand of remnant riparian rainforest marked the original alignment of the waterway (see figure 1). Unfortunately, the original wetlands adjoining the creek have been heavily grazed and are, as a result, degraded.

Case study details

Thirty five years after the construction of the channel another labour scheme, Green Corps, has worked with the local Landcare Group, Cooloola Shire Council staff, officers of the Department of Natural Resources and various community groups to restore the watercourse. The winter months of 1998 has seen a transformation take place along the bottom reaches of the creek. Work was undertaken to restore 'low-flows' to the natural watercourse over the last half kilometre of its journey to the Mary River.

The original proposal put forward by the Landcare Group, involved substantial modifications to the box drain, however, shire engineers didn't want the integrity of the drainage infrastructure compromised, due to the flood history of the township. Instead, a novel solution was adopted that achieves the principal restoration objectives with minimal modifications to the box drain.

With approximately 27% of the catchment covered by impervious surfaces, and rainfall events of 50 millimetres in an hour not uncommon, the modified design continues to allow the box drain to carry the great bulk of water during storms. During less intense rainfall events, however, most of the run off will flow through a newly installed 375 millimetre pipe, into the natural watercourse, and the newly revived pools, riffles and wetlands.

Strategies and treatments

The low flow diversion has been achieved by constructing a concrete plug in the 2400 x 800 drain to raise the level of water so it flows down a newly constructed inlet drain, that runs alongside the box drain for 50 metres before entering the new pipe. In heavy rain, excess water flows back into the box drain by overtopping the concrete plug and the side inlet drain.

The removal of woody weeds from the remnant vegetation was undertaken at the start of the project in October 1997. Stage 1 of the project has seen the whole corridor fenced off and planted with 3000 riparian rainforest tree, shrub and ground cover species. *Lomandra* spp. have been used to stabilise the edge of the channel. Stage 2 will try to get low-flows back to the river after passing through another waterhole and a series of riffles that are designed to handle the watercourse's descent of 3 metres, which takes place over 100 metres of tightly winding meanders down to the level of the river.

Monitoring and maintenance

The local horse-riding group who utilise the land are actively involved in the implementation and maintenance of the project. It is recognised that follow up woody weed control will be required for several years until canopy and understorey are re-established. The local field naturalists monitor fauna recolonisation of the site, and in October 1998 found that the new pools had already been colonised with the native fish *Ambassis agassiz* and various frogs.

The MRCCC are using university students to evaluate the progress of all revegetation and regeneration sites under the Voluntary Riverbank Restoration Grant Scheme. This takes place on an annual basis.

Low flow diversion pipe and overflow channel

Photos courtesy of Brian Stockwell, MRCCC

Summary

Frequently, bureaucratic impediments, whether statutory or cultural, are the first hurdles to be surmounted for successful riparian restoration. Providing financial incentives to landholders and the community has been a successful strategy used in the Mary Catchment to overcome these constraints. With or without legislative back-up, compromise between restoration objectives and those generated by the often multiple uses of the zone, is the way forward. The restoration of this urban waterway demonstrates how such constraints can be successfully negotiated.

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** Funds for this scheme were provided from Federal Government NLP, Corridors of Green, Bushcare and State Government ICM Funds. The case study was partially funded by LWRRDC as part of a riparian evaluation and demonstration project.*

Re-established watercourse meanders through remnant riparian patch.

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 the ACT, page 17.

Commonwealth

Keeping an eye on the big picture

The National Rivercare Program is only one of a number of programs funded through the Natural Heritage Trust that help conserve, repair and replenish Australia's environment and natural resources. The National Landcare Program, the Farm Forestry Program and Bushcare: the National Vegetation Initiative, all fund projects that improve management of land and vegetation, help reduce erosion and nutrients in run off, and improve the health of our rivers.

The Natural Heritage Trust and the National Rivercare Program have been running since 1997. The Minister for Primary Industries and Energy recently approved funding for projects in 1998–99 for the National Rivercare Program. Around 250 projects valued at over $13.4 million have been funded. This is more than double the funding for on-ground implementation when compared to 1997–98. The experience gained by the community coupled with the increased funding has lead to more diverse, complex and integrated projects.

An important part of the management of the National Rivercare Program is ensuring it achieves what it sets out to do. We need to keep an eye on the big picture. As the Natural Heritage Trust and National Rivercare Programs are now fully operational, it is an appropriate time to consider implementing an evaluation program for the National Rivercare Program. This evaluation will investigate where the Program it is heading, whether it is meeting its objectives and how it fits in with other Natural Heritage Trust programs.

Monitoring and evaluation is vital not only at the project level but also at the National Rivercare Program and National Heritage Trust levels. It enables us to demonstrate that the money spent on projects has been a good investment of funds from all sources, Commonwealth, State, community and private, and has made a positive contribution to the health of our rivers and the conservation of our natural resources.

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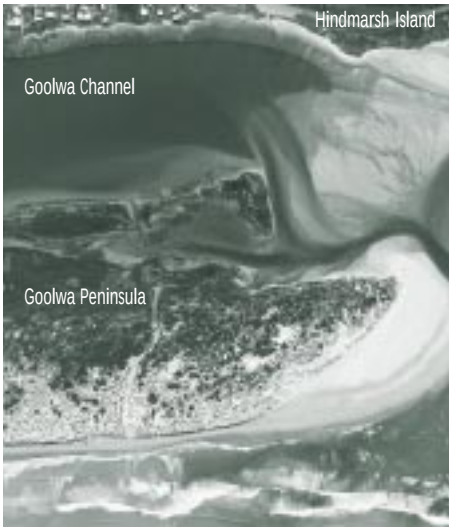
Courtesy of Trevor Jacobs, River Murray Water



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

New South Wales

Fishway projects — learning from nature

New South Wales is in the early stages of implementing the Council of Australian Government Water Reforms. The reforms provide an opportunity for the relationship between community and government to be reshaped, with the development of management plans that aim to achieve clean healthy productive water use throughout New South Wales. As part of the reforms, a review of all the weirs in the state is being undertaken. This review is to assess which weirs are providing a positive useful benefit, and whether a fishway may be incorporated into their design. Those weirs that are not providing benefit are being removed, with subsequent environmental benefits.

The State's fishways group has recently completed two new fishway structures on the Nepean River near Camden. These structures are innovative projects, as they are constructed *around* the weirs rather than on the weirs. This means that they do not affect the operational integrity of the weirs. The fishways have been constructed using the keyed in boulder technique, with the final appearance of the structure looking like a complicated series of natural riffles.

The configuration of the fishway ensures that the fish do not get lost when they reach the weir. No, they do not have signposts! The fish are attracted to the fishway because the entrance is located reasonably close to the weir face, and fish are naturally attracted to the higher velocity areas. Even the smaller fish can join in the fun and traverse the fishway without difficulty. The new fishways provide fish passage for at least 90% of the time. (The other 10% are during periods of very high flow and the fish can normally migrate in these times with the weirs in place.)

Another positive impact is on water quality, which is improved because of the entrainment of air in the riffles. Importantly, the technique works, does not require maintenance and is cheaper than most other methods.

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South Australia

Balancing competing demands at the mouth of the River Murray

As many would have heard, the mouth of the River Murray almost closed over the period June to August 1998. It has only closed once before in recorded history in 1981.

While closure of the river mouth potentially has very significant consequences, there are many other complex and inter-linked issues relating to the ongoing management of this estuary and its associated riparian area.

Before regulation of the river, the area including the Coorong, Lakes Alexandrina and Albert, and the islands near the mouth, was a highly productive estuary. Water quality varied substantially with dominantly fresh water conditions interspersed with, at times, extended periods of saline conditions when river flows were low. The water level varied with flooding and tidal influences, and the estuary was fringed with a wide band of diverse wetland vegetation.

Construction of the Barrages near the river mouth in 1940 completely changed the hydrologic regime of the area. The lakes now contain fresh water at all times and, probably more significantly, is held at an almost constant high level. These changes have resulted in a loss of both diversity and extent of riparian vegetation. In addition, lake shore erosion and land

salinisation has occurred as a result of the high watertables induced by the raised lake level. Many other in-stream impacts have also been recorded. On the other hand, access to an assured supply of freshwater has encouraged the development of extensive irrigation industries surrounding the lakes.

The challenge now is to develop management strategies that will deal with all these issues in a coordinated manner, balancing the competing demands and the, at times, conflicting options. In undertaking such a challenge, it is necessary to recognise the scientific, social and economic constraints that apply. As far as riparian management is concerned, it has become clear that knowledge about the scientific principles of environmental or water management alone, does not guarantee a successful outcome. The implementation of a successful riparian management strategy is as much about reconciling social, as it is about environmental goals. Work has begun on a number of fronts to attempt to resolve individual issues, or groups of similar issues. An extensive and iterative process of negotiation will be required to bring about a broadly acceptable approach to improved management of this whole area. The most important lesson learnt to date, has been the time required to go through this process in a meaningful way that ensures community support for the implementation of long-term management strategies.

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Tasmania

NHT Rivercare Program funding on-ground action

A total of 29 on-ground action projects implemented by Tasmania's landcare groups and aimed at improving the sustainable management of State's rivers and streams, have been approved for funding up to 1997/98. Some of these were funded under the Landcare and Bushcare components, but the majority of the NHT funds of $890 000 were provided under the National Rivercare component. Grants to individual projects ranged from $2000 for rivercare plan development, up to $112 000 for an extensive river rehabilitation project in the State's South-East.

Projects include the control of bed and bank erosion, the improvement of in-stream natural habitats, the control of riparian weeds, the restoration of native vegetation and riparian buffer strips, and the control of farm livestock. The Rivercare Program funding has provided a major boost to the Landcare movement in Tasmania, and groups are enthusiastically 'adopting' their reach of river and actively progressing their projects. The program has also initiated a heightened awareness by Tasmania's municipal councils of their key roles in sustainable river management and in facilitating community solutions to river degradation problems.

The overall objective of Tasmania's Rivercare program is to permanently restore the health of its rivers and streams. A key part is the achievement of 'permanent fixes' and the avoidance of similar repeat investment programs in the future. Without effective on-going maintenance, Tasmania's rivers will quickly deteriorate to their formerly degraded condition. A critical part of the program is, therefore, to protect this significant investment through the establishment of statutory river management bodies. These bodies have the power to raise maintenance funds from landowners and others benefiting from the projects.

This is the first time that such a strategic approach to river management has been implemented in Tasmania. After the first year of the NHT, a total of ten such bodies have been established through partnership arrangements with local councils. These partnerships have resulted in 200 kilometres of rivers and streams being placed on a permanently managed regime. These bodies are working closely with the emerging network of catchment coordinating committees to ensure the integration of the program with other catchment-based programs.

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Victoria

Catchment Management Authorities and stream management

In July 1997, nine Catchment Management Authorities (CMAs) were established in the non-metropolitan Catchment and Land Protection regions of Victoria to ensure the sustainable development of natural resource-based industries; the protection of land and water resources; and, the conservation of natural and cultural heritage. One of the objectives of the CMAs is to maintain and improve the quality of water and conditions of rivers.

In the Wimmera region, the Wimmera Catchment Authority is establishing four demonstration sites, that will be used to encourage landholders to develop responsible management practices for stream frontages.

The sites will illustrate how to overcome the practical obstacles which frequently deter landholders from actively protecting their water frontage including:

~ flood gates and lift up fencing;
~ hard point stock access;
~ controlled stock access;
~ crash grazing;
~ controlled grazing management; and
~ low-cost solar pumped off stream watering.

In the Wimmera Catchment Authority Region much of the stream frontage is in public ownership and used for grazing under license. In the upper catchment, the bulk of the stream frontage is in private ownership and is used for agricultural production.

Tony Overman, Water Program Manager for the Wimmera Catchment Authority, explained that the Wimmera region was fortunate to have one of the best networks of crown frontage in the state, with some 5700 hectares of land reserved. "The past good management of this valuable stream frontage land by landholders has meant that it has retained much of its natural value. Agricultural occupations such as grazing has been the main use of water frontages in the past, but it is now widely recognised that the stream frontage zone has important recreational, environmental, cultural and landscape values."

The protection and establishment of high quality stream frontage environments along catchment waterways is a high priority in the Wimmera Regional Catchment Strategy. The Wimmera Catchment Authority will work through the community through targeted investment to improve stream frontage health.

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Wimmera Catchment Authority

FOCUS ON ... Australian Capital Territory

The rehabilitation of Reedy Creek

Reedy Creek flows into the Molonglo River in the Upper Murrumbidgee Catchment in the Southern Tablelands of NSW and the ACT. The Reedy Creek sub-catchment covers an area of about 5000 hectares in the east of the ACT. Reedy Creek is the major drainage feature. It rises at the northern end of the catchment and flows south through a relatively narrow flood plain to join the Molonglo River near Queanbeyan. All water from the Reedy Creek catchment enters the Molonglo River via Reedy Creek, into the Murrumbidgee River and on into the Murray-Darling system.

The Reedy Creek Landcare Group has started a major project for the next four years to rehabilitate all of Reedy Creek, as sections of the creek and adjacent land are starting to show signs of aging and excessive wear and tear. The catchment community includes a diverse group of land users engaged in farming and grazing, military training, commercial forestry, advanced driver training, horse training and agistment, motor club race tracks, and public recreation areas used for picnics, bushwalking and horse-riding. All these groups place different demands on the catchment's land and water

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continued over

resources, and this presents an interesting challenge for a community trying to develop landcare strategies and programs on an integrated catchment basis. However, Reedy Creek is the backbone of the catchment and, as such, is ideal for developing such community based integrated rehabilitation programs.

The Rehabilitation of Reedy Creek will be the major project for the Landcare group over the next few years. Activities will focus on the riparian zone of the creek system and adjacent land as required. The primary aims of the project are to:

~ stabilise Reedy Creek to minimise erosion of creek and adjacent land;
~ reduce silting and nutrients flowing into the Molonglo/Upper Murrumbidgee Catchment;
~ conserve and restore vegetation along the riparian zone and adjacent land;
~ improve habitat to encourage biodiversity and restore wildlife corridor along the creek;
~ create wildlife links with the Kowen Escarpment and with roadside conservation zones;
~ improve water quality along the creek and flowing into the Molonglo River;
~ improve the productivity of adjacent farming, grazing and forestry activities; and
~ provide visible, high impact outcomes to encourage further community interest and support for Landcare.

> "We believe that such an environment can be restored so that future generations can share the pleasure and happiness that the young Henry Lawson described as his 'Reedy River' ".
>
> *John Rees, Coordinator of Reedy Creek Landcare Group*

The first stage was completed in 1998 as part of the Olympic Landcare Project in the ACT. The second stage will be implemented with the assistance of NHT funding over the next three years.

As part of the Olympic Landcare Project in 1998, a small section of Reedy Creek was used as a pilot area to develop strategies that might be applied to the entire creek system over the next three years. The site covered an area of about 2.5 hectares along about 500 metres of Reedy Creek. On-ground works commenced in July 1998 and will be completed in December 1998.

Reedy Creek before restoration works. Photo courtesy John Rees

Activities included:

~ snapshot reports and advice from ACT and NSW agencies on erosion control, water quality, riparian ecology, species selection, native grass establishment and management;
~ removal of rubbish and weeds from the creek;
~ stream bank engineering with excavation, bank realignment and toe stabilising using more than 120 tonnes of large rock;
~ 2 kilometres of fencing to permanently exclude stock from the creek;
~ creation of a laneway and stable creek crossing for stock and vehicles;
~ extension of the farm's laneway system for easier stock management and additional windbreak and shelter belt;
~ planting 4000 overstory, understory and riparian trees and shrubs, including 30 local species or species that should be local;
~ planting 1200 riparian reeds, rushes and grasses (20 species);
~ sowing two areas of native grasses; 1 acre Wallaby Grass (*Danthonia* spp) and 1.5 acre Weeping Grass (*Microlaena stipoides*) on small creek flats to establish local seed pools to be used in the future for native grass propagation within the catchment;
~ planting 3000 Kangaroo Grass (*Themeda triandra*) virocells in a small demonstration

Tree planting along the banks of Reedy Creek. Photo courtesy John Rees

area, it is also planned to add a small area of Red Grass (*Bothriochloa macra*) in 1999;

~ included windbreaks/shelterbelts for stock and pasture; and also to establish green links from the creek to roadside conservation areas; and

~ installed a water bore and trough system to provide alternative clean water for stock all year round, which also enables future stock exclusion both upstream and downstream on both sides of the creek.

The group has received NHT funding to assist implementation of the second stage of the project over the next three years.

The Olympic Landcare Project in 1998 has been a rewarding experience for the group, as it provided a better understanding of the effort that is required to achieve effective environmental outcomes that also directly benefit the operations of stakeholders.

The Landcare group is working to restore a natural balance into their living and working environment, by regenerating bio-diversity, establishing a sustainable framework, and encouraging a personal commitment by all stakeholders to integrate landcare into their business and lifestyle activities.

A healthy riparian system along Reedy Creek is viewed as essential for sustainable landuse in the future.

The group uses Henry Lawson's poem 'Reedy River' to motivate and inspire them in their efforts to rehabilitate Reedy Creek.

"Around the lower edges
There waves a bed of reeds,
Where water rats are hidden
And where the wild-duck breeds;
And grassy slopes rise gently
To ridges long and low,
Where groves of wattle flourish
And native bluebells grow."

"Now still down Reedy River
The grassy sheoaks sigh;
The water holes still mirror
The pictures in the sky;
The golden sand is drifting
Across the rocky bars;
And over all for ever
Go sun and moon and stars."

LWRRDC has published a new occasional paper

18/98: A Phytoplankton Methods Manual for Australian Rivers
ISBN 0 642 26731 6
It retails for $20 from AFFA (former DPIE) Shopfront.

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