RIPRAP

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

SEEING IS BELIEVING
The value of demonstration sites

Seeing is believing: The value of demonstration sites

We live in a society awash with information and knowledge. What are the best ways of ensuring that we learn from the mass of information that surrounds us?

The most basic source from which we gain understanding is to have first-hand experience. Western culture, however, has come to favour the indirect knowledge gained from secondary experience, in which information is selected, modified, packaged and presented to us by others. Edward Reed, a writer on this subject, argues that we are becoming increasingly removed from the environment in which we live and that this situation has become so dominant in our technological workplaces, schools and even our homes that first-hand experience is endangered. What is required, Reed contends, is a better balance between first-hand and second-hand experience, because without opportunities to learn directly we become less likely to think and feel for ourselves.

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Land & Water Resources Research & Development Corporation

EDITION 15, 1999

CONtents

RIPArian lands:

WHERE LAND AND WATER MEET

From the Editor

Welcome to the Christmas edition of RipRap. This edition is packed with information about the value of demonstration sites, both here and overseas, as ways of allowing people to experience first-hand riparian and river restoration activities. In addition, following requests from RipRap readers, we have some articles on rapid riparian assessment methods, as well as the use of long-stem native tubestock as a replacement for willows and poplars. Speaking of willows! — we have enclosed a free brochure for those RipRap readers who live in regions affected by willows, as well as a brochure on the Land and Water Resources R&D Corporation that gives an overview of the organisation, and lets you know what it is we aim to do. We hope you find both brochures useful and interesting — perhaps they will provide you with some enlightening reading over the Christmas break. Finally, I would like to say a big THANK YOU to all RipRap readers — our subscription list is continuing to grow (as is the size of the newsletter!) and your feedback and interest in the program is valued. Have a great Christmas and New Year, and I will look forward to working with you at the start of the new Millennium!

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.

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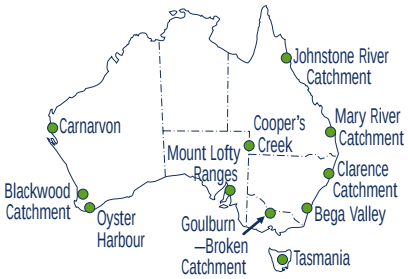
SEEING IS BELIEVING

continued from page 1

By Siwan Lovett

For a research and development program like the LWRRDC Riparian Lands R&D Program Reed's words are important, as the main challenge facing the program is to ensure that the science undertaken is translated into useful and relevant information for those working on-the-ground. One of the greatest criticisms of research and development programs is that they perform badly in the area of 'information transfer' or 'knowledge exchange'. This is because it is much easier for a scientist to package material in ways that their peers would understand, and much harder to present that material to people working outside that environment. This breakdown in communication works both ways, with communities seeking solutions to particular problems often finding it difficult to articulate exactly what it is that they require of the scientist.

With these problems in mind, the Riparian Lands R&D Program developed a research and development portfolio that included 'demonstration and evaluation of riparian land management' sites (see map). Local communities, in partnership with LWRRDC, have assessed the problem to be addressed, applied different treatments and monitored changes at the site using individuals and groups living and working in the area. The rationale behind this approach is that without getting people involved, in their own communities and in their local environments, it is difficult to reassure them that the science undertaken has any relevance for their local problems. As Andrew Campbell, in his analysis of the Landcare program points out, the old adage of:



Tell me and I'll forget;
Show me and I may remember;
Involve me and I'll understand;

is borne out by the results that accrue when people are brought together to work out solutions to problems facing them and their natural resources. By making the community responsible for the development and management of the demonstration site, they move beyond being shown what can be done, to being involved in making it happen.

For the Riparian Lands R&D Program, the inclusion of demonstration sites has added considerably to the strength of the material it produces as well as in raising awareness about the need for better management of riparian lands. The recent review of the Riparian Lands R&D Program (see page 29) found that the demonstration sites were important components of the program that allowed 'local catchment groups to engage in a learning process of identifying problems, developing solutions, implementing changes and monitoring impacts'. Importantly, the review recommended that any future research program continue with the demonstration site approach, but expand it further to have a greater proportion of the program using the approach.

The success of the demonstration sites can be attributed to some key factors: firstly, they have provided a common reference point for local communities, scientists and government agencies to focus their attention on a particular problem and develop collective solutions to deal with that problem; secondly, they have become sites for the exchange of information, both formal and informal; and thirdly, they allowed people to experience first-hand the changes that can be effected by working with different groups and applying different riparian land management treatments.

This issue of RipRap features the results from three of the Riparian Lands R&D Program demonstration sites. What is common across all of them is the effect of the demonstration site in catalysing action in the local community concerned. In all cases, an attitudinal shift occurred in those involved with the project, with the initial scepticism moving through to a greater understanding about the problem being dealt with, the need for it to be addressed and, finally, an acceptance that something can be done.

Not all the treatments used on the sites have worked, but the failures have been as important as the successes in demonstrating what works, what doesn't and how best to deal with the particular problem being addressed. The real strength of the demonstration sites is that they provide first-hand experience and allow people to see with their own eyes and develop an understanding based on that experience. Seeing is Believing!

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SEEING IS BELIEVING:
The Johnstone River catchment experience

By Pete Gleeson

The Johnstone River Catchment is one of the wettest catchments on the Australian coast, with recorded annual rainfall sometimes exceeding 6000 mm. Flooding resulting from periodic cyclones not only causes significant damage to degraded areas of the riparian zones, but also makes rehabilitation of these problem areas difficult.

Typical sub-catchment in Upper North Johnstone River Catchment. Note, the overgrazing by cattle. Photo by Pete Gleeson.

The catchment contains a wide range of primary industry groups including sugarcane, beef, dairy, bananas, pawpaw and other horticultural crops. The Johnstone River Catchment Management Association (JRCMA) has combined the efforts of these and other stakeholder groups, in order to improve riparian zones in the catchment, whilst trying to achieve both economic and environmental benefits.

Through a LWRRDC-funded series of projects, the JRCMA aimed to improve the conditions of riparian zones in the catchment by

~ increasing the awareness within the community of the need to properly manage riparian zones;
~ ensuring that information from research and 'on-the-ground' riparian projects is promoted within the community; and
~ determining what improvements could be made to increase the effectiveness of existing riparian restoration techniques for the Wet Tropics.

The following LWRRDC funded projects have been successfully completed in the Johnstone River Catchment.

Periodic forums

There are many research, demonstration and restoration projects underway within the Johnstone River catchment related to aspects of riparian management. It is often difficult for groups and individuals within the catchment to keep up to date with all this activity, let alone assess the value of the results of their own enterprise or management activities.

The objective of this project was to establish a periodic forum within the Johnstone River catchment to promote communication and interaction between the community, researchers and others undertaking works and activities related to riparian land management.

There have been two periodic forums with a third currently being planned. The first forum involved the Management of Riparian Lands in the Wet Tropics Region, and the second was a Water Quality Conference and Workshop. Both forums were attended by over 120 people representing a wide range of interest groups within the region.

The forums provided an opportunity for the broader community to be informed about the research taking place in the region, as well as to find out about current trial and implementation projects being undertaken by practitioners. The forums indicated

~ that there exists a need for all agencies involved in riparian land management to implement public information programs to help support community understanding and participation; and

Water Quality Conference Workshop Group. Photo by Pete Gleeson.

~ that the Integrated Catchment Management philosophy needs to include the combined management of our marine and terrestrial environments and, to this end, there needs to be more coordination between land and marine based organisations.

Cost/benefits of riparian restoration

In many catchments, groups are spending considerable amounts of money on work to restore riparian lands. There is little quantitative information to guide these projects, and often limited attention paid to describing clearly the purpose and objectives of the work before commencement, or to measuring the costs and benefits of the restoration work and its impact on farm profitability. This project was designed to

~ identify the types of costs and benefits associated with riparian restoration in the Johnstone River Catchment;
~ provide some direction as to the likely values these variables would assume in practice; and
~ estimate how riparian restoration work would affect farm profitability.

A model was developed to allow landholders to determine the overall costs and benefits of undertaking riparian restoration on their properties. The models developed suggested that, under some circumstances, farmers could derive net financial benefits from riparian restoration work. Whether or not they did, largely depended on the amount of riparian land requiring attention and the initial costs involved.

All photos by Pete Gleeson

Top: *Revegetation (right) protects creekbanks and steel posts (foreground) prevent flood-carried logs blocking culvert.*

Left: *Fencing off creekbanks allows protective vegetation to flourish.*

Below: *The leaves of banana palms protected by trees from wind remain intact — as a result the trees produce more fruit.*

Effectiveness of catchment coordinating activities

Without a clear picture of the beliefs and attitudes of groups within the catchment, it is difficult for the JRCMA to target information and demonstration activities, or to determine whether ICM goals are being achieved. The purpose of this project was to provide baseline data to help the JRCMA determine its priorities for catchment management activities, as well as more effectively deliver information and other outcomes to key audiences.

A survey questionnaire was undertaken that showed whilst much had been achieved, the two way flow of information between the JRCMA and the community needed to improve if the JRCMA was to operate efficiently. In response to these findings, the JRCMA has explored different ways of communicating information to both local and Statewide audiences. For example, the JRCMA now supply articles for the statewide

The purpose was to provide baseline data to help the JRCMA determine its priorities for catchment management activities, as well as more effectively deliver information and other outcomes to key audiences.

SEEING IS BELIEVING

ICM newsletter, as well as writing a regular column in the local paper, the Innisfail Advocate. These articles provide the community with information about ongoing ICM activities and general natural resource management issues. Upcoming events such as field days and conferences are advertised in the three papers in the catchment and on the local radio station. The catchment coordinator attends industry group meetings on a regular basis and the JRCMA sponsors an ICM award as part of the annual cane productivity awards.

Information sheets on riparian restoration

Several different groups are involved in riparian restoration work within the Wet Tropics, each having different approaches and methods. Some of these methods are successful, but there is concern that much of the key information about practical methods that work, and those that are less effective, is not readily communicated to others.

The objectives of this project were to collect, collate and analyse information about practical methods used for riparian restoration within the Johnstone River catchment and adjacent Wet Tropics. The resulting information sheets that were produced have received very positive feedback from a range of individuals. Comments have indicated that people with a technical or farm background have found the publications to be well presented and easy to read, as well as containing a lot of useful information. The JRCMA has undertaken to update and revise these sheets as new research findings shed more light on issues such as the most appropriate tree planting techniques to use in the Wet Tropics.

Direct seeding site in Malanda. Mulching machine is used to mulch grass and then sow in the seed.

Direct seeding trials

There had been limited direct seeding trials in the Wet Tropics region, and this has perpetuated the conventional and expensive method of rehabilitation using tube stock. However, many landholders simply do not have the time or finances to plant and maintain trees using traditional methods. The purpose of these trials was to develop and document practical and cost effective techniques for broad scale revegetation in the Wet Tropics using direct seeding.

The work undertaken showed that a mix of 'best bet', locally occurring fast growing pioneer species are the most appropriate to use for direct seeding, and that the best method to establish rainforest species in the Johnstone River Catchment would be to

~ Sow the seed into a mulch layer, remembering that the time of sowing is extremely important as follow-up rain is essential for germination and early establishment.
~ Leave the area for approximately 6 to 12 months, then locate any seedlings,
~ Control weeds and fertilise as necessary.

The trials have also showed that direct seeding has extreme limitations on alluvial river banks and is best suited to more degraded sites where weed competition is less aggressive. In addition, a mechanical mulch-striking method (a baggase mulch layer) employed at one of the sites was discovered to have significant potential to assist in weed control and germination. (Contact Pete for more information.)

Sub-catchment case study

The Johnstone Revegetation Strategy was produced to focus and coordinate the efforts of revegetation groups, and to increase the benefits from their activities. Riparian areas were considered a high priority for revegetation in all parts of the catchment. The strategy also identified low order streams (sub-catchments) as priority areas. The aim of this project was to develop and apply methods to prepare a detailed rehabilitation plan for a particular sub-catchment, which could be used to guide and prioritise rehabilitation of this and other sub-catchments in the future.

The project's overall objective was based on the following question: 'Given limited financial resources, how would the Landcare groups define the sub-catchment areas in most need of attention, and what strategies, techniques and likely budget would be needed for its rehabilitation.'

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SEEING IS BELIEVING

Two Landcare groups undertook the task of identifying priority areas for rehabilitation works in the Upper North Johnstone catchment. This task involved both the development of a methodology to identify and prioritise project sites, and the application of this to develop a future works program.

The method chosen involved the collation of existing information and collection of additional site information through site visits and taking photographs. Despite the time committed to the on-ground inspections, the project team felt that there were large 'gaps' in the information gathered due to the inability to access all areas of the study area. To fill these 'gaps', a helicopter was hired to cover the source of each stream to its confluence with the North Johnstone River. This aerial assessment proved both valuable and cost-effective, and allowed the revegetation opportunities in each part of the upper catchment to be assessed and valued. It was agreed that the digital recording model could be used as an educational tool for future rehabilitation projects. The final step was the employment of an ecologist to collate the data into a useable format for the group. A budget was also prepared to carry out the rehabilitation of the highest priority sub-catchment.

The central role of community and Local Government participants in the process provided a strong sense of local ownership and commitment to the on-going adoption of the recommendations through future on-ground projects. The landholders of the Landcare groups were also able to inject valuable knowledge of the local landscape during the course of the project. The project also showed that aerial survey, aerial photos and the aerial video are the most useful sources of information in developing a rehabilitation plan for a sub-catchment.

In summary…

The Riparian Management Demonstration and Evaluation project funded by LWRRDC has formed a significant part of the JRCMA's activities over the last three years. The project has helped to contribute to increased awareness amongst the community of the importance of properly managing our riparian zones, and there has certainly been an increase in the willingness to take on board information and research findings with regards to riparian projects.

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Although there has been a wider acceptance that the role of the riparian zone affects on-farm activities, the financial aspects of restoring and maintaining these riparian areas is still an issue which needs to be addressed. There is a general feeling that landholders should not carry sole responsibility for financing riparian projects on their properties, and that there should be incentives to carry out riparian restoration projects. This attitude of 'why should we have to pay', is not helped by the current status of the primary industries in this region, and a chain of events which is causing financial hardship for many landholders. There is also concern among landholders, particularly in the horticulture industries, that riparian vegetation may host diseases that may threaten their crops.

Work for the future

Essentially, the largest hurdle currently faced by the JRCMA is the problem of either financing riparian restoration projects, or providing some form of financial incentive. Conventional riparian restoration methods used in the Wet Tropics remain expensive, and require maintenance for considerable amounts of time. The sheer cost and time associated with these existing techniques, is the primary reason why many farmers are not willing to privately invest in riparian restoration projects. This needs to be addressed if there is to be success in broad-scale riparian restoration works

The JRCMA is currently setting up trials aimed at reducing the costs associated with riparian restoration. These include

~ further improving the direct seeding technique to allow wider adoption;
~ exploring the potential to actively promote natural regeneration as a means of revegetation of riparian areas; and
~ reducing revegetation costs by reducing maintenance periods of conventional tubestock plantings.

For further information

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Getting a GRIP

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

THE USE OF native long-stem tubestock as an alternative to willows or poplars for controlling streambank erosion

By Bill Hicks
and Allan Raine

Introduction

Historically, the success of river training and other erosion control works in southern Australia has relied almost exclusively on the use of willows (*Salix* spp.) as the main method of vegetation establishment (Raine and Gardiner, 1995). Willows, and occasionally poplars were chosen due to their ease of establishment, rapid growth rates, fibrous root system, and the lack of maintenance required following planting. The success of willows for bank stabilisation stems from the fact that mature 2 to 3 metre long poles could be planted directly on site using a water lancing jet, at a depth of up to 1.5 metres. The planting depth allowed the plants to access sub-surface moisture, avoid competition from weed roots, rapidly stabilise soil, and most importantly, have the ability to survive the impacts of floods.

The ecological and geomorphological problems associated with the widespread use of willows has become apparent during the last decade (Ladson et al. 1997). In particular, regeneration by seed has led to a proliferation of willows along many streams in south-eastern Australia with the potential to cause major changes to stream geomorphology. Such concerns have led to the recent declaration of the majority of willow species as noxious weeds within New South Wales.

Until recently, there was thought to be no comparable native plant alternative to the use of willows for streambank erosion control. In many cases, to be successful, the use of standard native tubestock required follow-up weeding and watering. Even then, plants required several years to establish before they performed an erosion control function. In harsh, highly-altered environments such as those along the Hunter River on the central coast of New South Wales, survival rates of standard native tubestock were very low (Vernon, 1987).

In a collaborative project between Norkhil Technologies Pty Ltd (NT), NSW Department of Land and Water Conservation (DLWC), Hunter Catchment Management Trust (HCMT), with supporting funding from the Natural Heritage Trust, trials have been undertaken in the Hunter Region using "long-stem" native tubestock as a viable alternative to willows. It is the aim of this paper to provide the successful results of these trials, and describe the growing and planting techniques for long-stem tubestock.

What are long-stem tubestock?

Long-stem tubestock are native plants grown for 12 to 18 months and fed using a specific nutrient control program until a plant with an elongated stem of up to 1.5 metres length is produced (see photo). These are then planted at depth in a similar fashion to willow cuttings.

Growing long-stem tubestock

Most standard plant growing media consists of a combination of organic and inorganic (usually sand) constituents. Long-stem tubestock are grown in a media consisting entirely of organic material. The organic mix should preferably be composed of horticultural grade pine bark and pine bark fines and composted for at least 7 months to minimise nitrogen draw-down. This mix allows greater moisture retention (sand is usually included in most mixes for drainage and to provide bulk) and maximum available area for plant root development.

Plants are grown in standard, open-based tubes placed on an elevated wire-mesh bench. The bench allows any roots which protrude from the bottom of the tube to be naturally pruned as they come into contact with the air. The result is a root system consisting of numerous vertical roots and a procedure that prevents root curl from occurring.

Plants are subject to a nutrient regime consisting of slow release fertiliser (low phosphorous content) supplemented with slow release micro-nutrients, both designed to release over an 8 to 9 month period. The fertiliser is of low phosphorous content. Plants are provided with

an initial infusion of slow release mini-fertiliser to boost growth over the first 4 months, ahead of the 8–9 month fertiliser.

Micro-nutrients in the form of Micro-max Trace-element compound is also added to the organic growing mix at the time of preparing it.

It usually takes 12 to 18 months to produce a long-stem plant, depending on the species and growing conditions. Plants should be grown in "hard" conditions to ensure an upright plant with numerous nodes and a small inter-nodal space. Stem elongation should not be encouraged by limiting light availability, as this will result in plants with thin, weak stems, and a large inter-nodal space. A high density of nodes is important, as it is from the nodes that roots will sprout once the long-stem tubestock is planted.

An 18-month old long-stem River Red Gum. The lower white tag marks the location of the tube. The upper white tag marks the upper limit of the burial of the stem. Photo by Allan Raine.

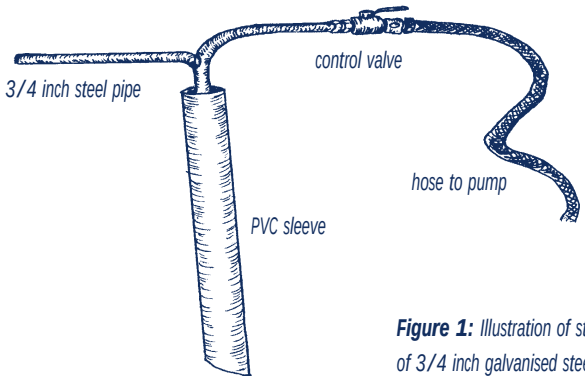

Figure 1: *Illustration of standard water lancing jet, constructed of 3/4 inch galvanised steel (developed by DLWC).*

Planting long-stem tubestock

Long-stem tubestock are planted in a similar fashion to willows using a water lancing jet attached to a small, high pressure, pump. Two types of jets have been developed. These are

~ standard jet for planting in fine soils, sands, and loams (Figure 1); and
~ percussion jet for planting in gravel and cobbles (a modified jet with steel sleeve and hardened tip).

Planting of long-stem tubestock is a four-step process:

~ Step 1 — The jet is placed inside a PVC or steel sleeve and the pressure of the water used to drill a hole in the soil to a depth of 0.6 to 1 metre. Holes drilled in the top of the sleeve allow water to escape. It should be noted that the sleeve is not necessary in cohesive soils such as silts and clay-loams.
~ Step 2 — The jet is removed and the long-stem plant (remove tube) is placed in the sleeve. If necessary a stick or rod is used to push the plant to the base of the planting hole. In most cases, 70–90% of the plant length is placed in the hole. In cohesive soils the plant is gently placed directly into the hole.
~ Step 3 — The sleeve is removed from the hole, leaving only the long-stem tube. Care must be taken to ensure that the plant stays in the hole while the sleeve is removed.
~ Step 4 — The hole is filled in around the plant. It is important to ensure that the entire hole is filled with soil. Air pockets will retard growth and discourage root development from the nodes.

Planting in gravel or cobbles using the percussion jet is carried out in a similar fashion to the steps above. A dolly bar is used to hammer the jet to the required planting depth.

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Getting a GRIP 1

Trials of long-stem tubestock

Methods

Trials comparing growth and survival rates between long-stem tubestock and standard tubestock were commenced in 1997 and established at Luskintyre on the Hunter River (alluvial bank), Seaham Weir on the Williams River (alluvial bank), and Marlee on Dingo Creek (cobble bed). The site at Luskintyre was later abandoned as a trial due to poor planting method (the planting holes were insufficiently backfilled, resulting in high losses).

Species trialled included *Eucalyptus camaldulensis* (river red gum), *Callistemon viminalis* (weeping bottlebrush), *Tristaniopsis laurina* (water gum), *Waterhousea floribunda* (weeping myrtle), *Ficus coronata* (creek sandpaper fig), and *Casuarina cunninghamiana* (river oak).

Other plantings have also been undertaken across the Hunter Region as part of riparian revegetation programs. Although no specific data has been recorded at these sites, a diverse range of species have been used and valuable information obtained on the ability of species to be planted as long-stem tubestock. About 50,000 long-stem tubestock have been planted in the Hunter catchment to date.

Results

Growth rates

A comparison of growth rates between standard tubestock and long-stem tubestock was undertaken at each site by comparing the height at planting to the present height. This provided data for approximately 11 months and 6 months of growing time for the Williams River and Dingo Creek sites respectively. Data was analysed for significance using a student's t-test. The results are presented in Figures 2 and 3.

At the Williams River site there was a significantly higher growth rate in the long-stem tubestock compared to the standard tubestock for both *T. laurina* and *W. floribunda*. No significant difference was recorded for *C. viminalis*. It should be noted, however, that the row of *C. viminalis* was planted closest to the water's edge, giving both treatments potential access to subsurface moisture.

The trial site at Dingo Creek has only been established for 6 months, and therefore data should only be regarded as preliminary. There still was however a significantly higher growth rate for *T. laurina*, and a trend of increasing growth rates for both *C. viminalis* and *F. coronata*.

Survival rates

Landholders recorded rainfall data at both trial sites over the study period. At the Williams River site, rainfall was below average for the months December 1997 to March 1998, and higher than average for the remainder of the study period. Rainfall was higher than average over the study period for the Dingo Creek site.

At the Williams River site a better survival rate was recorded for all species except *T. laurina*, which had similar survival rates between treat-

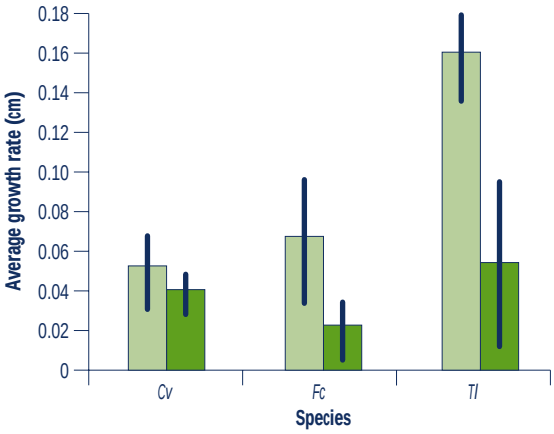


Figure 2: *Average growth rates at the Williams River site for* C. viminalis, T. laurina, *and* W. floribunda *comparing long-stem and standard tubestock. 95% confidence limits are shown.* C. cunninghamiana *was excluded due to damage from cattle.*

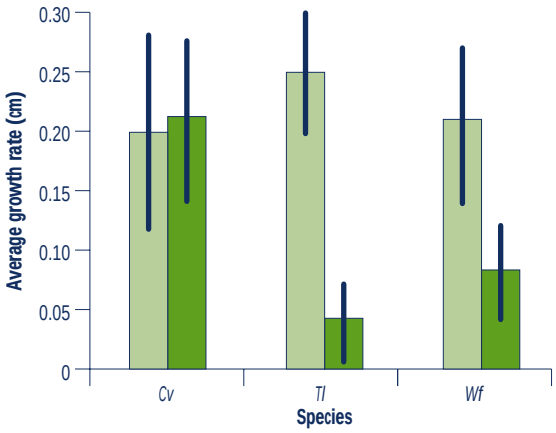
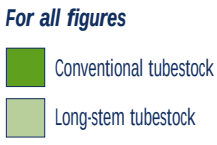


Figure 3: *Average growth rates for* C. viminalis, F. coronata, *and* T. laurina *comparing long-stem and standard tubestock at the Dingo Creek site. 95% confidence limits are shown.* C. cunninghamiana *was excluded due to no growth during the trial.*



ments (Figure 4). Differences were most marked between treatments for *W. floribunda* and *C. cunninghamiana*. These species were planted on the top of the bank slope and top of the bank respectively at a height of approximately 1.5 metres above low flow water level. The increased survival rates may be attributable to the ability of the long-stem tubestock to access subsurface moisture, however, further research would be required to verify this. It should also be noted that the plantings at the Williams River site were carried out into a thick cover of kikuyu grass, with no weeding undertaken prior to, or during the trial.

No marked differences were recorded in survivorship at the Dingo Creek site. This may be attributable to the higher than average rainfall and the fact that weed competition was also initially less vigorous at the site. Survival rates following scouring could not be measured as no floods occurred over the study period. The greater depth of planting, however, would make plants less liable to removal from gravel bars by scouring.

Root development

Plants of long-stem *Eucalyptus camaldulensis* were dug up from the initial trial site at Luskintyre to assess whether root development occurred along the buried stem. Root development was noted along the length of the buried stem, with roots developing from the growth nodes.

At the other trial sites, both *T. laurina* and *C. cunninghamiana* were observed to produce adventitious root growth from the nodes.

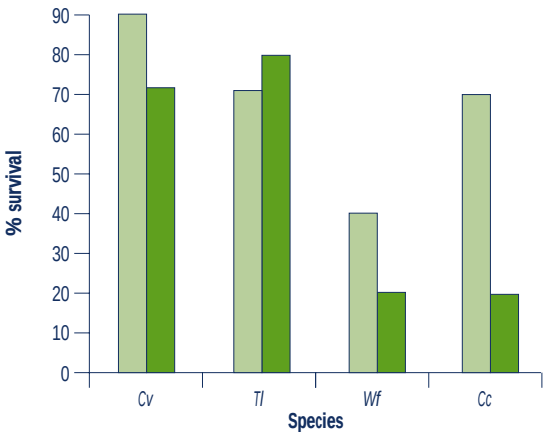


Figure 4: *Survivorship between long-stem and standard tubestock for C. viminalis, T. laurina, W. floribunda, and C. cunninghamiana at the Williams River site.*

Conclusions

The recent declaration of willows as noxious weeds within NSW has effectively prevented their further use for river management and stream bank erosion control.

Results from trials undertaken with native long-stem tubestock indicate that they offer a potential alternative to the use of willows.

Advantages in the use of long-stem tubestock over standard native tubestock include

~ increased growth rates;
~ potentially better survival rates; and
~ root establishment at depth.

The ability to plant long-stem tubestock at depth allows plants to access sub-surface moisture, and also potentially lessens competition for nutrients and moisture from the roots of weeds. The need for follow-up watering and weeding can, at most sites, be eliminated. More rapid growth rates and root development at depth provide more rapid soil stabilisation potential than standard tubestock. In harsh stream environments such as gravel bed streams, losses due to wilting and floods (as a result of scour) would be expected to be less due to the deep-rooted establishment of the plant. This latter point, in particular, allows long-stems to be planted in environments where only willows would be expected to have high survival potential and achieve rapid erosion control.

Results of the trials and other plantings in the Hunter Region indicate that many species have potential for use as long-stem tubestock and can tolerate burial of their stems for depths of at least up to 1 metre. Other species which have successfully established as long-stems include *Eucalyptus robusta, E. grandis, E. maculata, E. amplifolia, E. tereticornis, E. deanei, Melaleuca linearifolia, M. styphelioides, Acmena smithii, L. polygalifolium, Acacia melanoxylon*, and *Casuarina glauca*.

Long-stem tubestock are presently $1.80 per plant (standard tubestock range from 70c to $1.50) and take about twice as long to plant as a normal tubestock on average.

Further research is required over a range of climates and stream-types within Australia to determine the applicability of long-stem tubestock to other locations, especially inland streams and the tropics.

A video showing how to grow and plant long-stem tubestock has been produced and is available from Norkhil Technologies.

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CASE STUDY

IS THE VALUE in the bed or the banks?

Upper Mary demonstration sites good as gold

By Brian Stockwell

Like all Catchment Management Groups struggling to fund their action plans, the Mary River Catchment Coordinating Committee thought its dreams came true when evaluating the success of their LWRRDC funded riparian demonstrations sites. On a hot spring day, with theodolite poised and wader filled chainman bobbing happily down the stream, the cries rang out — Gold, Look at the Gold! Shimmering from the newly deposited sand bar at the base of the stabilised banks of the over-wide Mary River were millions of tiny specks of alluvial gold — well at least it looked like gold. "It's pyrite you fool" the chainman exclaimed as he fished himself out of the fast flowing spring fresh. The committee may not be enjoying the fruits of new found wealth but landholders still think their riparian demonstration sites are as good as gold for the long term sustainability of their farms.

The LWRRDC Riparian Management Demonstration and Evaluation Project funded — riparian revegetation trials, a channel realignment project using riffle construction, and the construction of a rock ramp fishway. The projects were designed and supervised by Simon O'Donnell, Steve Kelly and Damon Telfer from the Queensland Department of Natural Resources, with further assistance from the National Landcare and Rivercare Programs and Queensland Integrated Catchment Management Grants. The sites have all stood the test of time, with most playing a crucial role in binding the banks and absorbing the energy of huge flows during the largest flood this century in the Mary, experienced in February 1999.

The sites have all stood the test of time, with most playing a crucial role in binding the banks and absorbing the energy of huge flows during the largest flood this century in the Mary, experienced in February 1999.

Study area

The headwaters of the Mary River originate in the Conondale Ranges near Maleny, two hours north of Brisbane in sub-tropical South-east Queensland. Three hundred and seven kilometres downstream, the waters of the Mary empty into the Great Sandy Straits west of Fraser Island, at River Heads. Some reaches along the 2947 km of waterways in the Mary contain remnant freshwater riparian communities of national conservation significance, supporting habitat for a range of rare and endangered fish, frogs, turtle and vegetation species. Estuarine riparian communities in the lower Mary are of international significance for wader birds and the areas were added to the RAMSAR list in 1999.

In general, however, riparian zones throughout the 9700 km^2 catchment have been significantly degraded by 150 years of intensive utilisation of the floodplain for forestry and agricultural purposes, combined with a lesser period of mining of instream resources. The State of the Rivers report for the catchment rated riparian vegetation as 'very poor' for 40% of the stream length and 'poor' for a further 23%. This survey revealed that the poor condition of the zone related to a very poor riparian width and a high percentage of exotic species present in the zone. Erosion was recorded along 85% of the stream length with at least 13% of the banks being considered unstable.

The main degradation issues being addressed in the Mary relate to

~ severe loss of riparian vegetation and continued uncontrolled stock access leading to bank instability, slumping and slips;
~ significant bed lowering and undercutting of banks (and bridge pylons), partially resulting from inappropriate sand and gravel extraction in the past;
~ inadequate riparian buffers resulting in limited stream shade cover, constrained production of snag habitat, and reduced primary production to sustain the endangered Mary River Cod

(*Macculluchella peeli mariensis*) and Mary River Turtle species; and

~ continued invasion of woody weeds (e.g. *Celtis Sinensis*) which out-compete early native colonising species, and viny weeds (e.g. *Macfadyena unguiscati*) which strangle mature vegetation.

The negative pressures and degradation within the catchment are, however, being matched by a significant growth in community based action to address the problems. A LWRRDC funded survey of riparian landholders revealed a 60% increase in riparian management practices (Figure 1) in the last 5 years. The study identified that a range of altruistic and financial forces are motivating restoration of the riparian zone (Figure 2).

Growth rates win gold

The need for careful management of remnant riparian vegetation and the difficulties associated with previous attempts to re-establish riparian vegetation in the Mary Catchment led to three experimental planting sites being developed to demonstrate cost-effective methods of riparian rehabilitation. At the site in the Upper Mary, trees were planted in 1 m diameter spray rings, fertilised and maintained for a period of 2 years. Stock was excluded during the establishment phase with crash grazing once per month after 2 years.

After two years, biological diversity was high, with 74 different species becoming established on the site at 3000 stems per hectare, with losses of just 17%. This site was the most vigorous trial site in the catchment and at five years an average canopy cover of 100% had been achieved over the 1.4 ha, 25 m wide planting. 36% percent of the site enjoyed the benefits of an additional mid stratum. Measurement of the dominant species revealed that the average canopy height had achieved 8.5 m with the highest recorded species being *Casuariana cunninghamiana* (River she oak –13 m) and *Grevillea robusta* (Silky oak 11 m). Planted and regenerating *Acacia melanoxylyn* and *aulacocarpa* had reached similar heights. Figure 3 shows the growth rates of the more common species measured in 1999. Overall, canopy cover over the stream had increased to 50–75% with abundant leaf packs evident after spring storms

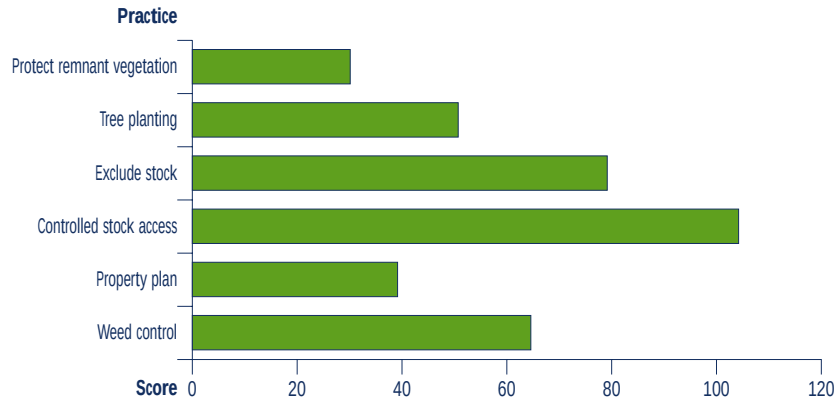

Figure 1: *Common riparian management practices. Survey reveals uptake of such practices has increased 60% between 1995–98.*

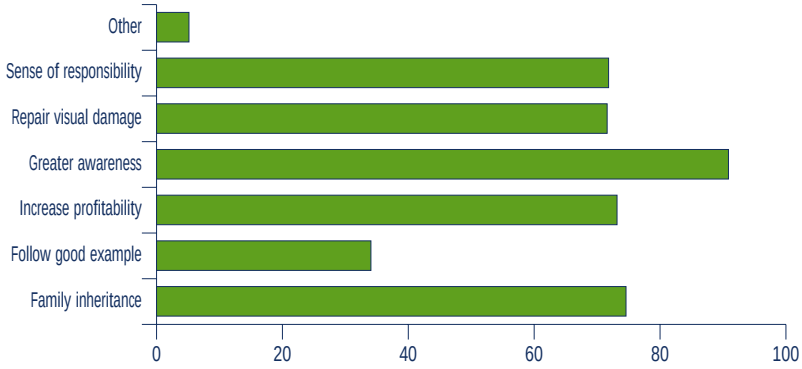

Figure 2: *Most significant motivating forces for riparian and floodplain management.*

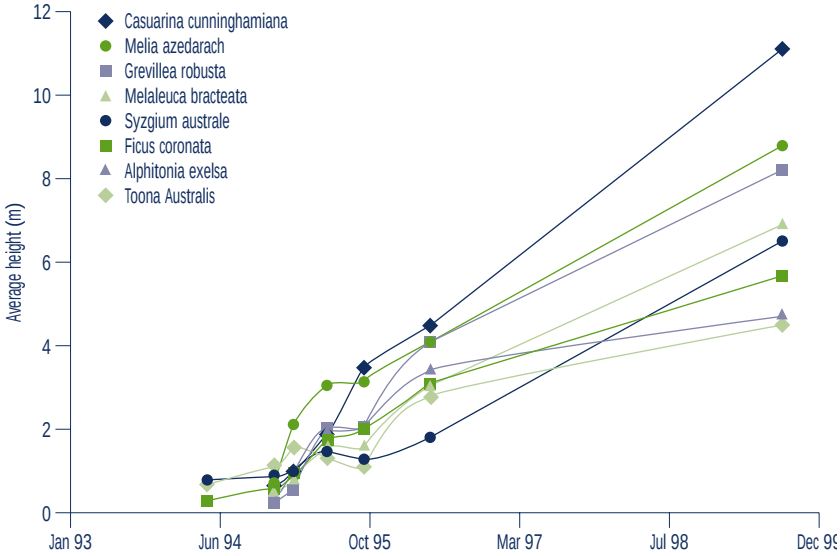

Figure 3: *Growth rates of dominant species*

References

Johnson, D. 1997. State of the Rivers — Mary River and Major Tributaries. Department of Natural Resources, Resource Science Centre, Brisbane.

Sillar, I. & Kingston, J. 1998. Cost Benefit Study of Riparian Restoration in the Mary River Catchment, MRCCC, Gympie.

in backwaters and against boulders, creating preconditions for a potentially improved local in-stream ecology.

Golden opportunity for cod

At another site a new bridge had been constructed with the old concrete culvert left spanning the waterway. In low flow times, native fish could not negotiate the culvert below the bridge as the low flow pipe had become clogged with debris and the remains of the crossing were too high out of the water (Photo 1). In higher flow periods when fish were more likely to attempt to migrate, the concrete box section of the bridge concentrated the flow, again making the crossing difficult for fish to negotiate. Fish passage in this area was thought to be particularly important for assisting in the recovery of the endangered Mary River Cod.

In order to rehabilitate the site, a major part of the culvert was removed and a rock ramp fishway was constructed over a 20 m length of the river immediately downstream. In addition, riparian and littoral revegetation was undertaken to stabilise disturbed areas of the streambank and the bed.

The local community was involved early in the planning process for this project. The construction period was over two days with approximately 15 m^3 of large rock (up to 1 m diameter) and 50 m^3 of river gravel delivered to the site and shaped using a mini-excavator to form a 'natural' riffle structure. The largest rocks were strategically placed to create natural eddies and backwaters behind which migrating fish could rest before moving up through higher velocity sections of the riffle. The design also featured variable bed morphology so that slower flowing backwaters were created. Large woody debris was retained as part of the design.

The fishway has now been monitored for two years and observation during medium flow events suggests it provides an effective physical environment for the facilitation of fish passage. A range of common fish species have been sighted moving through the system including mullet, eels and bony bream, as well as a turtle. In July 1999, a thalweg survey and a range of cross sections were taken. Results were encouraging, with no significant reduction of the riffle crest, a down stream slope of 1:22 and a front abutment slope of 1:6 (Photo 2). The water level and environment in the waterholes upstream and downstream remain virtually the same, with water flow also unchanged. Velocity measurements showed a good variation of flow environments throughout, and across the restoration site. Pre-existing snags are still in place and the amount of debris and, hence, habitat has increased.

1: *Fishway before — 1997. All photos by Brian Stockwell.*

2: *Fishway after — 1999.*

Following Newbury's golden rules

When LWRRDC funded Dr Bob Newbury from Canada to run a river restoration training workshop in the Mary, participants were taught some golden rules of river dynamics. A demonstration site in the upper Mary was devised to utilise "Newbury" formulae to space riffles and predict location of natural riffle formation in a

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bid to pin the low flow channel for the river to a central alignment within the channel cross section. The site, which was suffering from accelerated bend migration and bed lowering from extraction, was rehabilitated using relatively small rock size in riffle construction (Photo 3).

The new channel alignment aimed to reduce direct fluvial pressure on vertical banks to facilitate revegetation, as well as removing the obstacle to fish migration created by the head cut. The riffle pool also back-flooded an old extraction site to prevent undercutting. Stock were excluded from the site.

Back-flooding created a wetland which prevented undercutting and facilitated natural regeneration and bird colonisation. Despite some early problems, constructed riffles have stabilised the low flow channel, taking pressure off the outside bend and protecting agricultural land. A head cut appears to have moved through the system in the 1999 flood, but, riffles have reformed and flattened and are being stabilised by colonising macrophytes in some places. Deposition and armouring of point bars and longitudinal islands (I'm sure it's gold in there!) is assisting recovery of pre-disturbance channel form. The site was chosen to release fingerlings as part of the Mary River Cod restocking program.

The LWRRDC Riparian project also funded a cost benefit study which revealed that for a total investment of $23,000 at this site, the project had an internal rate of return to the farming enterprise of 4% with a benefit:cost ratio of @7%.

3: *Before 1996, channel just starting to be constructed.*

Riparian vision for Upper Mary. One of the regional bus tours. This was the researchers forum in May 1999.

Eureka

Like news of the discovery of gold the riparian restoration story has spread far and wide as a result of the LWRRDC demonstration sites in the Upper Mary. Not only have local landholders heard the message resulting in numerous restoration projects in the Upper Mary, but bus loads of people from all parts of the catchment and the region are visiting the sites. Visiting interstate and international river managers are also frequently seen prospecting for the real gold in the Upper Mary Demonstration Sites which they, like the local community, have discovered to be — in the Bed and the Banks!!! The Gold's in the Bed and the Banks!

THE GOLD'S IN THE BED AND THE BANKS!

Getting a GRIP 2

RAPID ASSESSMENT of riparian health and relationships with land management practices

By Amy Jansen and Alistar Robertson

Development of a rapid survey technique for riparian condition

Assessing the health or condition of ecosystems over large areas requires a technique with the appropriate balance of detail and breadth. In the case of the riparian zone along the edge of large rivers, remote sensing techniques provide broad coverage, but lack detail regarding ecological processes. Traditional ecological studies provide detail at specific sites, but do not provide the coverage necessary to gain an understanding of relationships at the scale at which management generally occurs — paddocks and properties.

To overcome such problems, work was undertaken to develop and test a rapid appraisal survey technique. The technique was based on the assessment of a variety of indicators of ecological function in the riparian zone. Riparian zones serve a number of functions in the riverine environment

1. riparian vegetation has a significant influence on bank stability, through intercepting water and dissipating energy, and stabilising and enhancing soil;
2. living and dead components of the riparian zone provide important physical habitat diversity for terrestrial and aquatic fauna;
3. riparian vegetation supplies materials (leaf fall, wood) for aquatic food chains; and
4. riparian zones are efficient filters of sediment and nutrients entering river channels.

Indicators of riparian condition were chosen that provided some measure of the degree to which the ecological functions of the riparian zone were being maintained. These indicators were divided into six components as follows

- habitat continuity and extent (width and longitudinal continuity of riparian vegetation)
- vegetation cover and structural complexity (number of vegetation layers, cover of each layer)
- debris as habitat (leaf litter, standing dead trees and terrestrial coarse woody debris)
- banks and soil (bank stability, aquatic coarse woody debris and soil structure)
- biotic integrity (relative dominance of native *vs* exotic species in each vegetation layer)
- indicative species (*Eucalyptus camaldulensis* regeneration, damage to the regeneration, *Phragmites*)

A single, trained person can obtain information on each of the indicators in approximately 1 hour by walking a 1 km reach of river bank and scoring the indicators.

Riparian health on the Murrumbidgee River

The rapid appraisal index of riparian condition was used to survey 138, 1 km reaches of the Murrumbidgee River between Gundagai and Hay. Reaches were surveyed on private grazing properties, State Forests and River Reserves managed by the Department of Land and Water Conservation. At the same time that reaches were surveyed for riparian condition, counts of cow pats on river banks were recorded as a measure of grazing intensity.

The possible range of scores for the riparian index is zero (highly degraded) to 50 (excellent condition). There is a wide range of riparian condition scores for the banks of the Murrumbidgee River (Figure 1). The highest condition scores were for riverbanks that have had stock removed for long periods or are traditionally very lightly grazed (such as some State Forests and a few private properties). The poorest scores were recorded for sections of the riverbank on private properties at the upstream end of the area surveyed.

There is a strong negative relationship between grazing intensity and riparian condition, and it is clear that riverbanks on private properties are generally in poorer condition than those in State Forests and River Reserves (Figure 2).

Full analyses of the riparian zone condition data have shown that when factors such as: distance down the river; stocking rate in the riparian paddock; presence of additional watering points in the paddock; type of rotational practice used; how much of the river bank is accessible to stock; and paddock size are considered, they account for 70% of the variation in riparian condition. The major findings of this analysis were that condition is lower

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Getting a GRIP 2

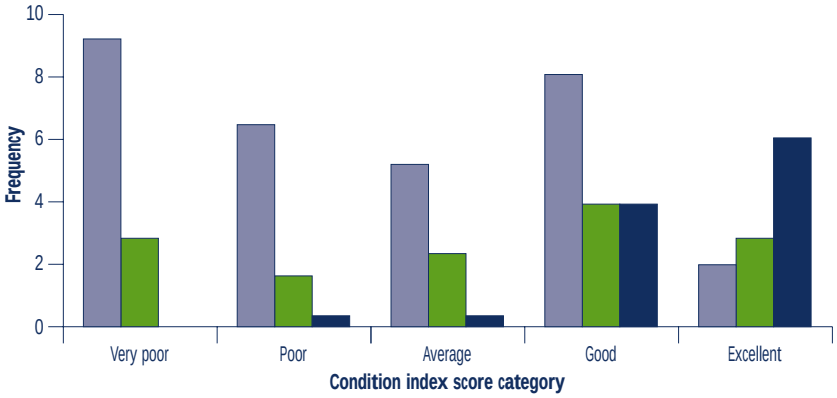

Figure 1: *Frequency distribution of condition index scores at 138 sites of three tenure types on the Murrumbidgee River between Gundagai and Hay*

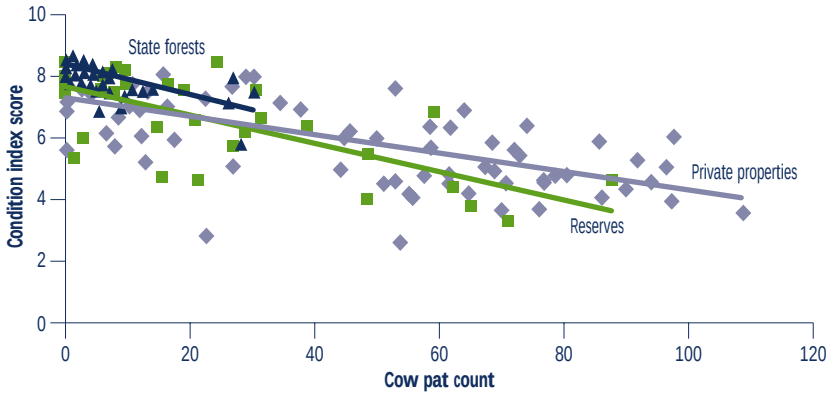

Figure 2: *The relationship between cow pat counts and the condition of the riparian zone at 138 sites along the Murrumbidgee River between Gundagai and Hay on private properties (◆), in State forests (▲) and in reserves (■).*

~ in paddocks with higher stocking rates
~ in paddocks which have shorter, or no periods of rest from grazing
~ when there are no alternative sources of water in the paddock.

These findings suggest the following options for improved management of grazing in the riparian zone

~ grazing regimes — short periods of grazing, even at relatively high stocking rates, interspersed with long periods of rest, are likely to have the least impact on the riparian zone.
~ planting/natural regeneration — planting and/or temporary fencing to allow natural regeneration of trees and shrubs may be necessary to restore native vegetation cover.
~ alternative watering points — the provision of appropriately placed (in shade) watering points in paddocks may reduce the impact of stock on river banks and wetlands in those paddocks.

Future developments

The condition index will be used to survey sites on a number of rivers in the Murray–Darling Basin in the next two years. In collaboration with the Department of Land and Water Conservation, we will also be producing a publication detailing the survey method for use by landowners and managers.

Local government focus

Ipswich City Council

Waterways across Ipswich are slowly having their riparian zones transformed from weed infested areas to valuable corridors of native vegetation. Through a variety of programs, both Ipswich City Council and private landholders are actively involved in river restoration and management.

By Sonia Culley

Why local government?

Ipswich City Council (ICC) recognises that many of the City's natural assets are located on both public land and freehold land. Regardless of land tenure, there is a general community expectation that governments at all levels will work to protect and enhance the natural environment. Local government also has an important role to play in the management of public lands within their jurisdiction. This role extends to educating communities about the importance of riverine systems and the potential impact of their activities on these systems.

ICC has been actively involved with the ongoing management of a growing conservation estate of parks, reserves, local roads and waterways, along with the provision of a range of support initiatives to assist private landholders managing remnant vegetation.

Council riparian restoration program

Numerous mapping and assessment projects have played a crucial role in assisting Council with determining priorities for action in the area of riparian land management. The ICC manages a large area of riparian land across the region. Through the development of successful and active partnerships with various State and Federal programs, the ICC has been able to value add to its existing resource base and undertake extensive riparian rehabilitation work. These partnerships include Green Corp, Work for the Dole, Community Jobs Plan, Office of Corrections and Queensland's Healthy Waterways program.

The focus of these activities has been split between highest ecological priority and greatest community impact. It was recognised that high profile sites play an important role in securing the support of the Ipswich community for these activities.

The Ipswich Rivers Improvement Trust has also been working closely with the ICC in the implementation of its on-ground riparian works. This statutory authority has been undertaking woody weed removal, follow up weed control and replacement planting with local species on waterways throughout Ipswich. This work is undertaken on both freehold and public land. Council's Ipswich Enviroplan, Conservation Partnerships and catchment management programs further complement these on ground activities.

Natural vegetation in healthy condition provides an essential and valuable buffer between urban development and a nearby waterway.

Ipswich Enviroplan

The Ipswich Enviroplan is a program of environmental initiatives to facilitate the management and appropriate usage of natural resources in Ipswich City. The Enviroplan levy funds

- ~ securement (purchasing land for its conservation values — 3500 ha bought to date as well as through 25 year management agreements with private landowners which can incorporate re-zoning for conservation)
- ~ development and management
- ~ education and awareness raising activities

LOCAL government focus: Ipswich City Council

Conservation partnerships

A range of mechanisms from the ICC is available to provide support to private riparian landholders.

- ~ Voluntary Conservation Agreements — management agreements include rate rebates, grants, material support for weed control, and optional re-zoning in planning scheme
- ~ Land for Wildlife — aims to encourage and assist private landowners to provide habitats for wildlife on their property. ICC currently manages this program for SE Qld and the 15 local governments involved.
- ~ Environmental Weed Control rebate — provides 50% rebate for the control of eligible environmental weeds up to $400 per property.
- ~ Free Plant program — river blocks are entitled to 25 free plants per year and 100 per year for primary producers;
- ~ Flora and fauna database — species lists to assist with revegetation plans are available to land owners;
- ~ Bushland care program — enables the community to become involved in the management of Ipswich's bushland areas;
- ~ Land Management Seminars — these are run each year on a variety of topics targeted at both rural and rural residential landowners. Topics have included streambank management, erosion control and weed control;
- ~ Technical advice, brochures and fact sheets — erosion, riparian weeds, environmental weeds poster

Catchment management

ICC instigated the local Bremer Catchment Association in 1995, and it is now actively involved in encouraging sustainable management. The Association has a Natural Heritage Trust funded Streambank Restoration Grant Program available to landowners within the catchment. In addition to this, the catchment association has a Waterwatch program in place implementing water quality monitoring in the region and has developed a catchment management strategy. The Council has also received funding to establish a catchment management program in Six Mile, Goodna and Woogaroo creek catchments. This will focus on increasing community involvement and understanding of catchment management.

A range of groups are involved in river restoration and monitoring activities across the catchment.

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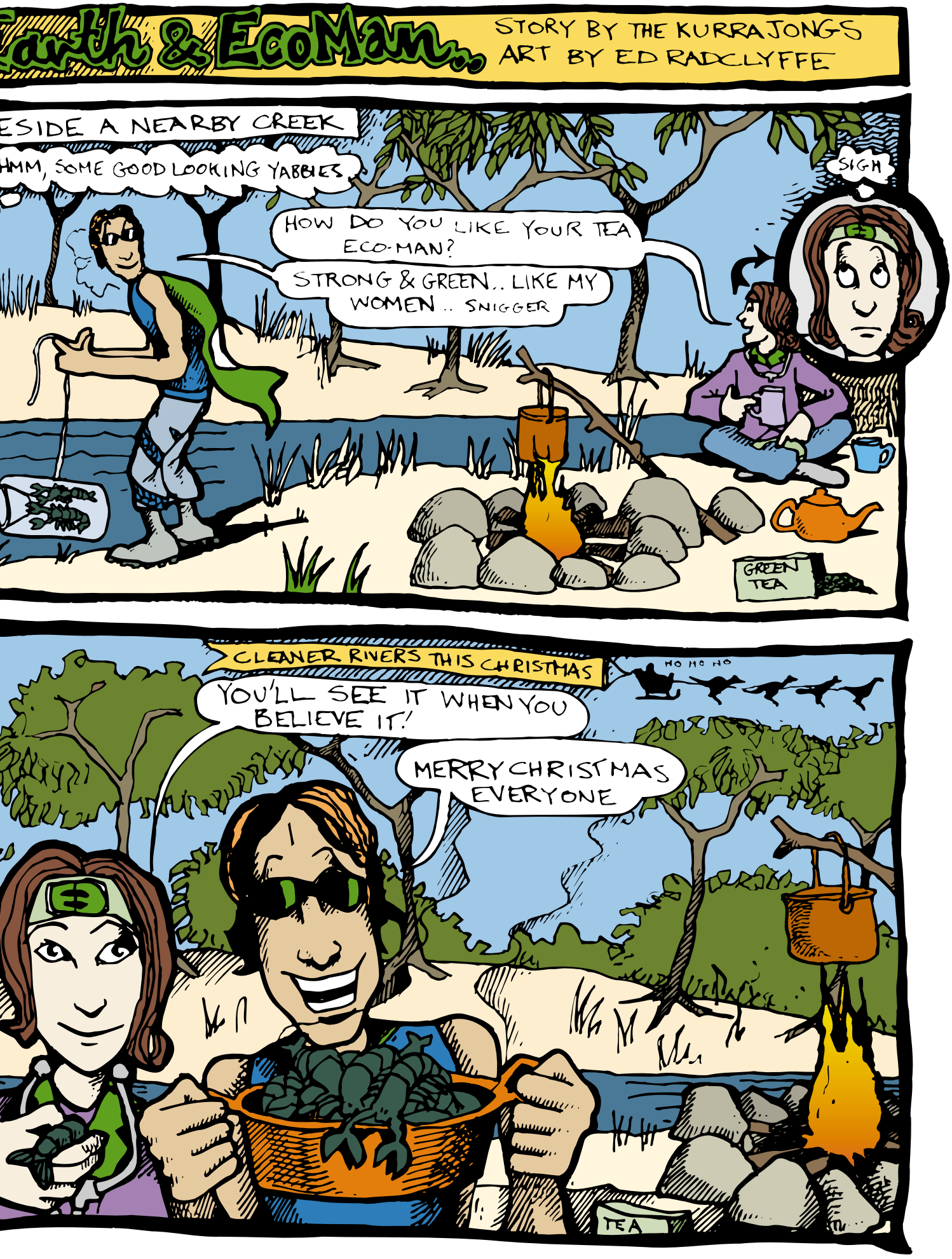
The Riparian Adventures of Dr.E
DOWN AT THE HALLS OF JUSTICE *
WHAT ARE YOU DOING, ECO MAN?
I'M STOCKING UP FOR THE MILLENNIUM..
CARP SP.. TURBITY 72..
RVR MURR.. AUS
EARTH MONITOR
GREEN TEA
TEA
* HEY, ISN'T THAT WHAT EVERY SUPER HEROS' ABODE IS CALLED?
CLEANER RIVERS THIS CHRISTMAS


Earth & EcoMan...
STORY BY THE KURRAJONGS
ART BY ED RADCLYFFE
ESIDE A NEARBY CREEK
HMM, SOME GOOD LOOKING YABBIES
HOW DO YOU LIKE YOUR TEA ECO-MAN?
STRONG & GREEN.. LIKE MY WOMEN .. SNIGGER
SIGH
GREEN TEA
CLEANER RIVERS THIS CHRISTMAS
YOU'LL SEE IT WHEN YOU BELIEVE IT!
MERRY CHRISTMAS EVERYONE
HO HO HO
TEA

THE VALUE OF demonstration projects and their public image: Overseas experience

By Martin Janes

The River Restoration Project

In 1990, a group of enthusiastic professionals concerned about the state of the United Kingdom's rivers decided that it was time to do more than just talk about river restoration and its benefits. In 1993, the River Restoration Project (RRP) was launched by the Prime Minister. RRP's principle aim was to act as a catalyst to promote the concept of river restoration by undertaking major projects, demonstrating the benefits and how to achieve them.

In partnership with many UK organisations, and linked to a major scheme in Denmark, two river restoration projects were proposed with initial funding support from the European Union's LIFE programme. Both rivers had been straightened, widened and deepened for various reasons, such as protection from flooding, land drainage, land reclamation and milling. Both schemes were to integrate all appropriate disciplines and concerns, and produce an acceptable, environmentally 'sustainable' river reach, which between them demonstrated an array of current best practice restoration and river management techniques.

The River Cole

River Cole

The rural River Cole, a tributary of the River Thames, runs through The National Trust owned Coleshill estate, north-east of Swindon on the Oxfordshire/Wiltshire border. It has been extensively modified by man for a variety of reasons over the past 900 years, particularly milling. Originally the reach below the mill was simply straightened, but more recently was considerably enlarged to increase flood capacity and safeguard agricultural production. Above the mill the channel was realigned 200–300 years ago to form the present mill leat. This type of historical management for milling, land drainage and agriculture is typical of many other rivers in the UK. The objectives of the restoration work were

- Restoration of the river and floodplain in terms of physical features, flood storage, habitat diversity and visual appearance.
- Application of innovative restoration techniques and best management practice, within a sustainable rural agricultural system
- Furthering of knowledge and understanding of river restoration by monitoring to a very high degree, and by practical demonstration of the results.

To involve the local community (around 250 people) at an early stage, a pre-design meeting was held in the school hall. Starting with a sketch map of the river as it was, the 'team' explained the general concepts and drew their ideas, asking for comments, which were also added to the 'map'. This exercise identified most of the areas of concern for the local residents. In addition, the three affected tenant farmers were all supportive of the concept and aims of river restoration, but were very sceptical of the likely success given the involvement of 'outsiders' who did not have a history of knowledge of the river Cole.

THE VALUE OF demonstration projects and their public image

River Skerne

The River Skerne in the centre of Darlington, north-east England, flows through an urban parkland surrounded by housing and industry. Over the past 200 years it has been straightened and deepened for flood control and drainage. Much of the floodplain has been raised high above the river by industrial waste tipping. Housing development, gas and sewer pipes and electricity cables, further limit restoration opportunities. This situation is typical of many rivers flowing through towns and cities in the UK, where ecology and the visual and recreational appeal of rivers has suffered. The objectives set were

- Restoration of 2 km of the river in terms of physical features, flood management, habitat diversity, water quality, landscape and access for the community.
- Application of innovative restoration techniques and best management practice within an urban environment.
- The furthering of knowledge and understanding of river restoration by comprehensive monitoring and by practical demonstration of the results to the local community and wider audience.

Within 1 km of the 2 km reach lives a population of approximately 5000 people. The local council had plans for locating a second bridge (to create a circular walk) and to carry out landscaping and planting on the valley sides above the parkland. To enable the project to get a representative view of the local public's perceptions a two-phase independent survey was commissioned.

Phase 1 (1994/5 — pre-works) entailed a detailed quantitative survey of over 250 randomly selected local residents. The survey aimed to describe the existing use and perceptions of the river and surrounding parkland and to assess the public perception of the proposed river restoration scheme, and contribute to the public consultation exercise on scheme design.

Attractions	Perceived problems
~ Green open space for recreation	~ General cleanliness of the area
~ Natural environment of the river	~ Poor water quality
~ Quiet place to visit	~ Rubbish and litter
~ Enjoyment of wildlife	~ Problem of vandalism
	~ Lack of trees
	~ Lack of footpath maintenance
	~ Canalised nature of river, concrete banks, etc

Phase 2 (1997) then repeated the survey after substantial completion and compared the views expressed. As part of this follow up survey some residents from Coleshill were also involved to look at the response in a rural area.

The River Skerne following restoration works

Public perception of the projects

Fifty residents from Coleshill were surveyed on their reaction to the works. Bearing in mind the already pleasant rural setting of the River Cole and its 'good' environmental quality, the majority of responses were positive with 74% approving of the works. Many thought that one year was 'too soon to tell' with regard to value for money and achievement of the projects objectives.

Overall 91% of the local community at Haughton-le-Skerne approved of the River Skerne Restoration Project, just one year after the majority of the work had been completed. The specific responses from the Darlington residents show the degree of appreciation of the river as a well-visited focal attraction within their immediate landscape. Over 90% approved of the

works, and thought that the new river fitted in well with its surroundings and, importantly for future schemes, thought that similar objectives would be equally achievable elsewhere in the country.

Questions asked	Coleshill %	Darlington %
Agreed to interview	71	75
Visited river in last 12 months	64	81
Approval of the changes	74	91
The new river 'fits in' with its surroundings	93	99
Good value for money	43 + 43 too soon	69 + 13 too soon
Increased wildlife habitat	30	82
More attractive landscape	39	78
Were local people consulted about the project?	79	71
Project objectives achieved	39 + 54 too soon	73 + 22 too soon
Objective achievable in UK generally?	78	90

The table shows the percentage of positive responses (don't knows have been discounted).

It is expected that these figures will increase as the rivers and vegetation mature, and funding is being sought for a follow-up survey.

In support of this feedback from the local community, the Skerne project has won various national awards, notably from the Civic Trust, Landscape Institute, Royal Institute of Chartered Surveyors and was a finalist for the 1999 Brisbane Riverprize Award. Such awards are an important step forwards as they deal with the issues of raising awareness with planners and designers and bringing the public and their local environment closer together, rather than just pure bio-diversity/environmental gains.

Swans nesting at restored meander in mill leat. Photo by Martin Janes.

River Restoration Centre

On April 1st 1998, the River Restoration Centre (RRC) became the successor body to the River Restoration Project. The evolution to a UK Centre for advice and the exchange of information and expertise reflects the priority to learn from what has gone before, so that future works are undertaken more efficiently and pioneering achievements are communicated to benefit others. RRC provides a single point of contact for practitioners, researchers and others to learn from and contribute to river restoration in the UK and Europe.

RRC's overall aim is to support the development of river restoration as an integral part of sustainable water management in degraded UK catchments. This is supported by

~ Maintaining comprehensive information about the progress of river restoration and ensuring its structured dissemination to practitioners across the UK,

~ Helping others through a network of professional advisors with up-to-date experience,

~ Supporting the development of projects to further knowledge and understanding of restoration techniques appropriate to differing river types and situations.

Outputs from the Cole and Skerne Demonstration Projects are available —summary leaflets, a manual of restoration techniques and a film.

For further information

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NATURE CONSERVATION COUNCIL OF NSW Inc.

NCC Ecological Bush Fire Conference 2000
Red truck: Green future

Friday 24–Saturday 25 March, 2000 Sydney

In 1997 the *Rural Fires Act* came into being. It involved fundamental changes in the way Bush Fire Management Planning occurred, bringing community involvement, public exhibition and rights of appeal for land holders.

The NCC advocates that sensitive vegetation communities such as wetlands, rainforests and alpine areas, be regarded as 'no burn' areas in terms of the preparation and implementation of *Bush Fire Risk Management Plans* under the *Rural Fires Act (1997)*. Practices of concern include prescribed burning, removal of native vegetation for firebreaks and access roads, and use of toxic chemicals.

In all cases, rural and urban development appears to have the consequence of encouraging bush fire management strategies that are frequently in conflict with the community's desire to ensure that wetlands are conserved and used in an ecologically sustainable manner. Although fire events may be due to wildfire, arson, accidental ignition or planned ignition, it is the purposeful fire caused by hazard reduction burning that gives rise to the most cause for concern.

NCC's view is that prescribed burning is not ecologically sustainable in wetlands

The new Act aims to improve environmental management practices, through incorporating Ecologically Sustainable Development (ESD) principles and providing public exhibition of Bush Fire Risk Management Plans. This enables the wider community to also own, monitor and participate in bush fire risk management planning.

Minor changes are expected for the Rural Fires Act 1997 in the coming year. This two-day conference will in part provide a platform for discussion regarding the possible legislative changes. This is a very timely conference for all the community to attend. Topics will cover

- how to implement ESD into bush fire management
- best practice ecological fire management
- bush fire management and the *Native Vegetation Conservation Act 1998*
- bush fire management and the *Threatened Species Act 1995*
- community responsibilities, awareness and rights in bush fire management
- clarifying the bush fire related legislation

Who is the NCC?

The Nature Conservation Council of NSW (NCC) is the peak environment group for NSW with over 100 conservation groups around the state and has a statutory right to nominate representatives for Bush Fire Management Committees (BFMCs).

The primary NCC objective for bush fire management is to protect the integrity of the natural environment from inappropriate fire regimes without compromising the need to protect human life an property.

Who should attend

RFS planning staff; RFS volunteers; NSW Fire Brigade staff; NCC member societies; National Park and Wildlife Service staff; environmentalists; community groups; academics; environmental planners; local government officers; members of catchment management committees; environmental consultants; media.

To register your interest in either attending the conference or in presenting a paper, please contact

Tanya Leishman, Nature Conservation Council
Level 5, 362 Kent St, SYDNEY NSW 2000
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CASE STUDY 3

RIPARIAN RESTORATION in the Blackwood catchment

By Alice Karafilis

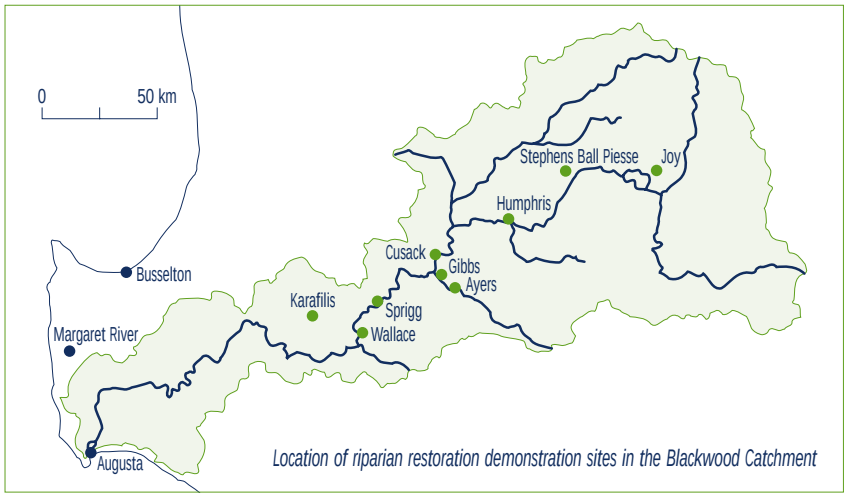
The Blackwood Basin Group in the south-west of Western Australia, is working with 11 farmers in the Blackwood Catchment to demonstrate and evaluate riparian restoration techniques. This LWRRDC-sponsored project is seeking to demonstrate practical methods of rehabilitating riparian land (including saline land), to evaluate the costs and benefits of undertaking this work, and to survey farmer's attitudes to riparian zone management.

Tallest trees under stress

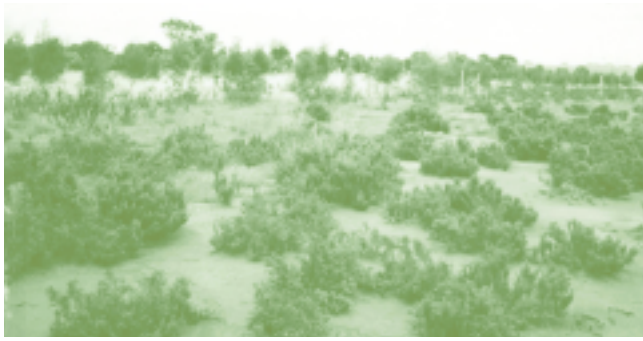
Rehabilitation of three saline riparian areas were monitored over three years to assess the effectiveness of various restoration techniques.

At a highly saline creekline near Dumbleyung, landowners Raymond and Melissa Joy fenced and planted the edge of a large salt scald with salt tolerant Eucalypts and Casuarinas. Growth and survival of the seedlings was monitored along with changes to cover of other vegetation on the site.

As the seedlings grew and their canopy cover increased, there was a decrease in the cover of annual grasses around the trees. In adjacent unplanted areas, the cover of annual exotic grasses increased without sheep grazing the site. There has also been a significant increase in the cover of samphires on the salt scald, helping to stabilise the soil and reduce erosion.



Location of riparian restoration demonstration sites in the Blackwood Catchment


Natural recruitment of samphires on the salt scald with planted Eucalypts and Casuarinas.

At less than 1.5 m below the soil surface, the highly saline groundwater is the major factor limiting the success of restoration activities. The trees that are less than one metre tall are not showing signs of salt stress, while taller trees of the same species are severely salt stressed. This demonstrates that the success of riparian restoration in highly saline sites is dependent on reducing recharge to groundwater over the whole of a catchment.

Economic benefits outweigh costs

A further six riparian restoration sites were established in the middle Blackwood Catchment from Bridgetown to Kojonup. In addition to monitoring and evaluating the success of the riparian restoration works, a benefit:cost analysis was also undertaken. This analysis discovered that at each of the restoration sites, the landholders were primarily inspired by the potential for environmental benefits from undertaking riparian restoration work.

One of these sites is located on the Arthur River near Moodiarup. Michael and Wendy Cusack fenced off a section of the riverbank and trialed various restoration techniques to compare their relative effectiveness. Several restoration techniques were trialed along the riverbank. While much of the riverbank was left to regenerate naturally, seedlings of some local species were planted in a few places. Some other areas

Above: *Riparian area being prepared for planting with oil mallees in 1995.*
Below: *Riparian area in 1999 after stock had been excluded from the site for more than 3 years. Photos by Alice Karafilis.*

were burnt in patches and then locally collected seed was scattered on the ash bed.

Monitoring of the site over three years showed that spreading seed on burnt areas was the most successful regeneration technique. Since 1995, when the area was burnt, some overstorey and shrub species have regenerated, and there has been an increase in the cover of native sedges and herbs. In the area planted with local native seedlings, a local rare species was reintroduced to the site along with other local native shrub species.

As with most of the other riparian restoration sites monitored through this project, natural regeneration (unassisted) appears to be the least successful regeneration technique. This may be due to a number of factors, including low seed storage in the canopy and soil, weed competition and soil conditions.

The Cusacks also trialed various oil mallee species on a flat area above the river bank. Two of the species showed commercial potential as oil mallee Eucalypt species in this area. While the other species have value in revegetating the site, they did not have the growth and survival to make them viable as commercial species.

The benefit of revegetation with oil mallee species is that there is potential commercial return compensating for the costs of the restoration activities (fencing and seed/seedlings) and the loss of production as grazing is excluded from the area. A benefit:cost analysis of the restoration activities for this site indicated that the economic benefits of the riparian restoration could potentially outweigh the costs of the restoration activities. As the oil mallee industry in Western Australia is still developing, the economic analysis was based on a comparison of various scenarios relating to income generated by the oil mallees.

At another site near Boyup Brook, an initial benefit:cost analysis conducted three years ago

The benefit of revegetation with oil mallee species is that there is potential commercial return compensating for the costs of the restoration activities.

The practices that were most commonly viewed as having a positive effect on the river environment were tree planting and fencing to manage stock access

indicated potential for improving productivity over the whole farm as a result of the restoration work. When Trevor Sprigg erected a fence to exclude stock for the riparian area, he needed to install a new stock watering system. A solar powered pump distributed water from the Blackwood River to watering points across the whole property, allowing for increased stocking rates across the farm.

When this economic analysis was reviewed in 1999, a fall in the value of sheep over the previous three years meant that the stocking rate had not been increased and the economic value of watering system had declined. Despite this experience, other farmers are encouraged by the potential for improving productivity of a farm while restoring valuable riparian areas.

Inspiring farmers to restrict stock access

Farmers from the middle Blackwood Catchment were surveyed in 1996 to assess attitudes and behaviour to riparian management, and to gain a general view of the past and present condition of the river environment. The main findings of the survey indicated that

- there is a high awareness of and interest in river management issues,
- the river environment and its native vegetation are considered to be very important,
- people perceive a high degree of attitude change in relation to land and water management,
- there is strong support for protecting riparian zones, and
- most people indicated they are capable of undertaking activities that will benefit the river environment.

The practices that were most commonly viewed as having a positive effect on the river environment were tree planting and fencing to manage stock access. The main activities considered to be detrimental to riparian areas were over-clearing, fertiliser application and uncontrolled stock access. People expected to be increasing activities such as fencing, planting native trees and erosion control in riparian areas, as well as decreasing stock watering and cropping near these areas in future years.

Spreading the word

Project activities and events have been publicised throughout the life of the project through media releases, newsletters, field days, seminars and tours of the project sites. The tours of the sites have been particularly effective in enabling people to view the restoration techniques and discuss the effectiveness of projects in meeting objectives. A sign was erected on each site to draw attention to the riparian restoration projects. Posters have been used at conferences, agricultural shows and field days across the Blackwood Basin, with the 'Blackwood Barometer' used to promote riparian restoration works and raise awareness about the need to better manage these productive, yet highly vulnerable parts of the river landscape.

Many people have been involved in the riparian restoration project, with community Landcare Coordinators taking an active role in promoting the results of the work and assisting with monitoring of project outcomes. University students and researchers have monitored some of the restoration sites, gathering detailed information on the results that would not have otherwise been possible. The large number and diversity of people involved has provided an opportunity for one-on-one extension of results to key stakeholder groups in the community.

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www.rivers.gov.au

The large number and diversity of people involved has provided an opportunity for one-on-one extension of results to key stakeholder groups in the community.

RESULTS from the review of Riparian Lands R&D Program

An independent, external evaluation of the Riparian Lands Research and Development Program was conducted in early October by the Virtual Consulting Group. Such reviews, when programs are nearing completion, are a standard LWRRDC requirement. The main purpose is to assess whether the program is likely to achieve its goal and objectives, to determine what actions might be required in the final stages to optimise outcomes, and to provide a guide as to the justification and priority of further investment in the topic area.

The review findings are generally very positive. It has found that the research programs and the products produced have been of excellent quality. The communications activities, carefully targeted due to the limited resources available, have also been effective. The review has made a number of recommendations about opportunities to improve program functioning, about further opportunities through extension to promote adoption of research findings, and about some specific knowledge gaps that need to be addressed. These have been incorporated into a revised draft of a Program Plan for Phase 2. It now remains to be seen whether the LWRRDC Board will decide to invest in a second phase of the program — fingers crossed!!

NEW PUBLICATION

UNFORTUNATELY DUE TO SOME TECHNICAL PROBLEMS DELIVERY HAS BEEN DELAYED.

Australia's top scientists have come together to produce a two volume Riparian Land Management Technical Guidelines set, with the findings from five years of research undertaken through LWRRDC's Riparian Lands Program brought together in these easily understood publications.

The Riparian Lands Technical Guidelines Volume One and Two will now be available from the **end of December 1999**. Volume One of these guidelines: **Principles of Sound Management** provides information about the physical and ecological processes characteristic of riparian lands with chapters on, for example, temperature and light, the delivery of sediment and nutrients to streams, and the role of vegetation in riparian management. Volume One also contains a section outlining the legislation that relates to riparian land management in each State and Territory.

Volume Two: **On-ground Management Tools and Techniques**, provides seven guidelines covering topics that range from the control of nuisance aquatic plants to managing riparian land for terrestrial wildlife and controlling stream erosion. This volume is produced on tough, water-resistant paper that is designed for use in the field, and is underpinned by the information provided in Volume One.

State or Territory	Who to contact in your State / Territory for Program products
Commonwealth	Agriculture Forestry Fisheries Australia Shopfront Edmund Barton Building Core 2 Entrance (off Blackall Street), Barton ACT 2601 Tel: 1800 020 157 (toll free) Email: shopfront@affa.gov.au
Australian Capital Territory, Northern Territory, Queensland, Victoria	as above
New South Wales	Mr Peter Wem, Department of Land & Water Conservation PO Box 3720, Parramatta NSW 2124 Tel: (02) 9895 7029 Fax: (02) 9895 7845 Email: pwem@dlwc.nsw.gov.au
South Australia	The Environment Shop 77 Grenfell Street, Adelaide SA 5001 Tel: (08) 8204 1910 Fax: (08) 8204 1919 Email: mgill@dhaa.sa.gov.au
Western Australia	Information Centre, Waters and Rivers Commission Hyatt Centre, 3 Plain Street, East Perth WA 6004 Tel: (08) 9278 0338 Fax: (08) 9278 0301 Email: library@wrc.wa.gov.au
Tasmania	Department of Primary Industries, Water & Environment Shopfronts located in Launceston, Hobart and Devonport Contact: Ms Tina Pinkard Tel: (03) 6336 5402 Fax: (03) 6336 5365 Email: tina.pinkard@dpiwe.tas.gov.au

To get your copy, contact the outlets listed. $25.00 for the two volume set.

Getting a GRIP 3

ECOLOGICAL IMPACTS of willows in Tasmanian rivers

By Martin Read

Introduced willow trees (*Salix* spp.) have been thought to degrade in-stream faunas in south-eastern Australian rivers, but there was little hard data to substantiate these speculations. My postgraduate research, funded by LWRRDC, addressed three of the main areas of speculation about the impacts of willows.

1. Willow- and native-lined reaches of medium-sized rivers were compared in a survey to determine if there were any consistent impacts on macroinvertebrates. Differences were most marked in summer, when native-lined reaches supported higher densities and numbers of taxa than in willowed reaches; in autumn, diversity was slightly reduced in willow-lined reaches. The changes in the faunal composition were consistent with the habitat differences resulting from the combined effects of shading, decreased water quality, and alterations to channel morphology in willowed reaches.
2. Additional surveys were used to examine differences in macroinvertebrate and fish populations between willowed vegetation and reaches where willows had been removed (Figure 1). Major differences were found in resources provided by riparian vegetation: willowed reaches had more organic matter and generally less algal growth than removal reaches. Although overall densities and diversity of macroinvertebrates were similar, there were substantial differences in species *composition*, which reflected the differences in resources in the two types of reach. In extreme situations (Figure 2) willows degraded water quality via high organic inputs which eliminated most intolerant species. Fish populations at these sites were also lower. At less impacted willow sites and at removal sites, fish species were strongly associated with woody debris and undercut banks.
3. The role of willow large woody debris (LWD) was investigated, with LWD loadings in 142 reaches on Tasmanian rivers assessed. This work revealed that removal of woody riparian vegetation, in concert with active removal of in-stream LWD, accounted for most situations with low stocks of LWD. Suprisingly, there was very little LWD derived from willows. The ecological role of willow LWD was further investigated by comparing in-stream native and willow wood. Although willow wood seemed to decompose more quickly and was softer than native wood, it supported lower populations and diversities of invertebrates owing to its simpler surface texture. LWD provided important habitat for the fish populations surveyed, and reduced or negligible standing stocks of LWD corresponded to a reduction in the number and size of particular fish species.

These findings confirm some of the speculations regarding the impact of willows on rivers in south eastern Australia. Willows were found to be a poor surrogate for native vegetation although they provided important riparian resources in the absence of any vegetation at all. The restoration of riparian zones and selective and strategic removal of willowed vegetation over the long term and replacement with endemic vegetation should minimise the ecological impacts of riparian vegetation removal on macroinvertebrates and fish.

For further information

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Figure 1: *(left) Willow removal on the Clyde River, Tasmania.*
Figure 2: *A severely degraded willow reach on the Rubicon River, Northern Tasmania.*
Photos by Martin Read.

Getting a GRIP 3
WILLOW MANAGEMENT for Australian rivers

by Kurt Cremer

Although willows (*Salix*) are much appreciated for their various benefits, concern has grown over the past several years about their natural spread in our rivers. The booket 'willow management for Austrlaian Rivers', written by Kurt Cremer, outlines methods of willow control and discusses the spread and escalation of willow populations. For readers of RipRap living in regions where willows are a problem, the enclosed booklet should assist you in understanding the nature of the plant and in developing management strategies to deal with it. If you did not receive a copy of the willow booklet and would like one, they are freely available by contacting Bob Trounce.

You can also ask Bob about other booklets on willow identification and control.

Bob Trounce
NSW Agriculture
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Email:
bob.trounce@agric.nsw.gov.au

The following biological features help to explain the spread of willows as well as providing a base from which management strategies for control can be developed

- The original cause has been importation and planting, usually as cuttings of just one or two clones at a time.
- Most of our tree willows have branches with fragile bases and tend to spread by broken live branches taking root in wet areas. The shrub willows are less fragile.
- Male and female flowers are usually on separate trees, and seed production is prevented if male and female trees are far enough apart to avoid pollination.
- Female trees will usually produce viable seed with pollen from a male of the same species, or of any other species of its group (either tree willows or shrub willows), provided that the trees occur within bee pollinating distance of each other (up to at least 1000 m) and flower at the same time.
- In Australia, the resulting seedlings are very often hybrids and are able to grow vigorously. They can also breed with each other and with both their parents.
- Regeneration by seed of all but one of our willows (*S. cinerea*, a 'Pussy Willow') is virtually restricted to more or less bare sediment that is wet for weeks or months from the time of seed shed (about October/November). This is so because the seed lives for only 1–3 weeks when dry, and germinates in about one day when wet, and because the tiny seedling needs much light and has very slow root growth.
- Seed is easily carried by wind for more than 1 km, and some travels for up to 50 or even 100 km. Transport of seed and live branches by water also serves to spread willows, but is less effective.
- Probably the main barriers to the survival of seedlings are lack of suitable seed-beds, rising or rapidly falling water levels, and floods that uproot or bury the seedlings.
- Conditions suitable for the establishment of large numbers of seedlings probably occur in most southern streams at perhaps 5- to 20- year intervals.
- *S. cinerea* spreads by seed to riparian as well as other moist to wet habitats, and this is of special concern.
- National strategies for management should include restrictions on importation, sale and planting, and the total eradication of the most aggressive species, such as Black Willow and *S. cinerea*. A significant start has been made with the

Thickets of 3–4 years old willows blocking the Murrumbidgee near Canberra. This is the aggressive Black Willow, regenerating from seed produced by local parents that had grown from seed brought by wind from plantations established during 1964–77 near Tumut, some 70 km away.
Photo by Kurt Cremer.

For further information

Read your booklet!
Order a booklet or contact Kurt Cremer
PO Box E 4008
Kingston ACT 2604
Tel/fax: (02) 6453 3235
Email: kcremer@snowy.net.au

It's a WRAP

Please note
Western Australia's contribution to It's a Wrap is the Managing Our Rivers advertisement on page 17.

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 36.

Tasmania

Tasmanian Bushcare Toolkit

Bushcare Tasmania has just completed a set of native vegetation management kits known as the 'Tasmanian Bushcare Toolkit'. The Toolkit provides landowners, community groups and extension staff with a comprehensive guide to the management and conservation needs of native bush. The Toolkit covers a variety of topics including different vegetation types, threatened species, revegetation and weed management.

For more information

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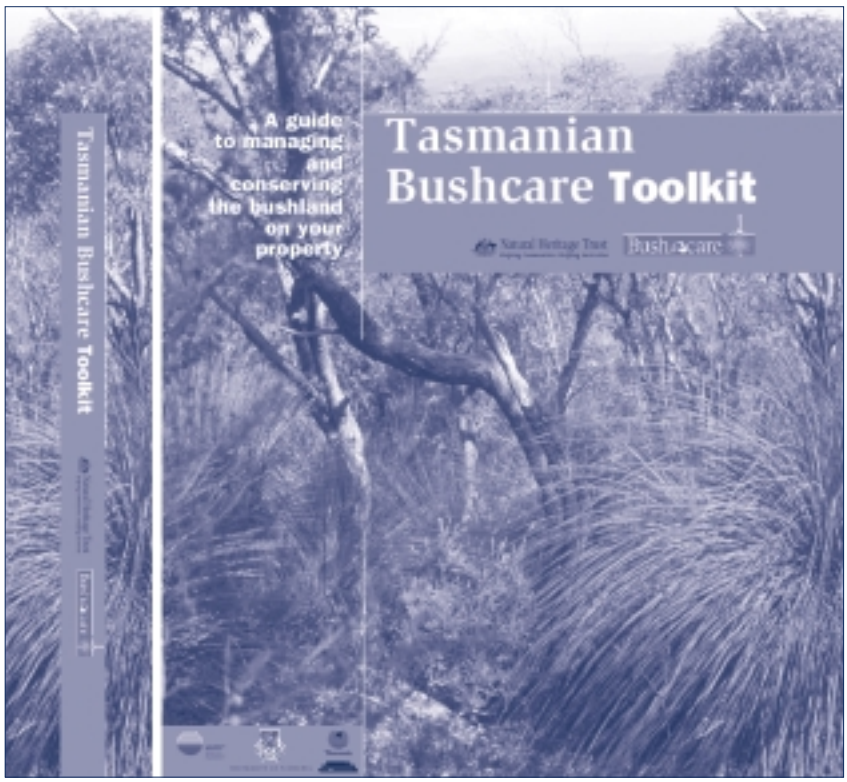
In recent years, there has been much interest from landowners and community groups in the management and conservation of native bush. Rural communities watching the gradual decline or loss of their native remnants have become increasingly concerned. Unfortunately, there has never been an easy way to reverse this pattern of decline. Tighter economic margins and overwhelming problems such as rural tree decline have meant that communities cannot effectively tackle these problems on their own.

Substantial areas of native vegetation have been cleared in the period since Europeans arrived in Tasmania. This clearance is still proceeding at a high rate and continues to impact upon plant species, communities and wildlife habitat. Tasmania's native vegetation is also under threat from inappropriate grazing and fire regimes. In the past, remnant vegetation has been used regularly for supplementary grazing. A combination of overgrazing and frequent burning has led to degradation of these remnants, with native species being lost and often replaced by weeds. Similarly, undergrazing and infrequent burning can lead to degradation in some bush types.

Thankfully, these problems are being eased through a number of initiatives. One of these, Bushcare, has been funded through the Natural Heritage Trust. Bushcare is providing significant financial and other support to community groups and landowners, to both protect and better manage their native vegetation. More and more landowners are fencing out remnants, removing weeds, revegetating areas and generally improving the way in which they incorporate native vegetation within their whole farm management.

Throughout the life of these programs, there has always been a shortage of people and information needed to help groups with their different projects. The Natural Heritage Trust's Bushcare Program has started to change this by putting



more people on the ground to help groups and by supporting the development of different management tools. One of these tools is the *Tasmanian Bushcare Toolkit*. The Toolkit consists of a series of modules that will help groups to manage the different plant communities and species found in Tasmania's agricultural regions.

There are nine modules in the Bushcare Toolkit including:

Kit 1. Bush on your farm
Kit 2. Managing your bush
Kit 3. Weeds in your bush
Kit 4. Revegetating your farm
Kit 5. Threatened plant species in your bush
Kit 6. Riparian bush
Kit 7. Grassy bush
Kit 8 Eucalypt bush
Kit 9. Other bush types

Kit 1 includes a key that will help you decide what type of bush you have on your property. General guidelines on the principles of managing native bush can be found in *Kit 2*. Methods that are useful for restoring remnant bush can be found in *Kits 3–4*. Guidelines for managing the specific bush types are found in *Kits 6–9*.

A typical use for the Toolkit would be in a situation where a landowner has a remnant grassy woodland that he/she wishes to preserve. *Kit 7* will provide information on that community type, its conservation significance and how best to manage it. If weeds are a problem, then *Kit 3* has information on how to control them without adversely affecting the native vegetation. There may be some areas, such as old gravel pits, that require revegetation, and *Kit 4* can be referred to for information on the different methods that can be used. If threatened species are suspected or known to occur at the site, *Kit 5* has pictures and management and conservation information for individual species.

Another important innovation associated with the *Bushcare Toolkit* is the development of the Tasmanian Bushcare Web Page. The Web Page contains versions of each module that will be continually updated. Eventually, users will also be able to access vegetation maps through a GIS Web Server. By clicking on a vegetation type on the map they will be linked directly to the relevant Toolkit module. People can visit the Bushcare Web site and view the modules.

The Tasmanian Bushcare Toolkit can be ordered for $35 (postage included) from the Mail House by phoning (03) 6272 5526, or faxing (03) 6273 3655, or email: mailhouse@oakenterprises.com.au, or by contacting your local Bushcare officer for details on how to order the Toolkit or for further information on looking after native vegetation.

New South Wales

Joint project between Queensland and New South Wales

Yes it does happen — States do co-operate and come up with a product which is polished and useful to all in the community who spend time down by the riverside.

Riverguide

An extension kit called Riverguide, is currently being developed by a team from the Department of Land and Water Conservation North Coast region and Queensland Department of Natural Resources South East region. The kit is made up of modules that provides easily understood information about different aspects of river and catchment processes for community groups and landholders. The modules follow the NSW North Coast Rivercare planning workshop format and come in booklet form with an associated set of high quality slides for use by workshop presenters. Computer presentations are also available in Powerpoint and Adobe Reader format. The modules are purposely designed to be flexible and allow for local examples of issues to be used.

At present, the modules are mainly focussed on meeting the needs of river management officers from the NSW North Coast/SE Qld bioregion. To date, two modules on 'Catchment Processes' and 'River Processes' have been completed. A further three modules are in production and will address concepts such as approaches to stream management planning, prioritising stream management actions, and typical problems, symptoms and causes. The kit focuses on providing information that empowers landholders and groups to make sound decisions, and avoids prescriptive treatment advice by providing case studies of holistic solutions to stream problems. The kit should be completed by June 2000.

For further information

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Applications close soon for Natural Heritage Trust funding

Individuals and groups wanting to apply for funding for projects under the Commonwealth Government's Natural Heritage Trust must do so by 25 February 2000.

During the current financial year, community and other groups undertaking rehabilitation works along Australia's inland rivers and in their catchments, will receive total funding from the Trust of nearly $54 million.

Under a series of recent announcements, a total of 682 projects will be funded during 1999–2000 from the Trust's National Rivercare and Murray-Darling 2001 programs. The two programs are aimed at ensuring progress towards the sustainable management, rehabilitation and conservation of rivers, and at improving their health. Projects funded under the Murray–Darling 2001 program must be part of a wider integrated catchment management plan.

The focus of both programs is on inland rivers. They do not fund projects in coastal or tidal areas. The programs seek to encourage the development of strategic and integrated responses to address identified river issues. The expected outcome of projects is improvement in the water quality and ecological values of river systems. Projects should

~ maintain or improve water quality by preventing pollution (such as trapping sediments or nutrients), improving the management of discharges or controlling stock access to rivers;
~ manage accelerated erosion or build-up of riverbanks or beds (where it is ecologically and hydrologically sound to do so); and
~ contribute to healthy streams and ecosystems.

The Natural Heritage Trust is providing total funding of $279 million over six years for the two programs.

Examples of new projects funded this year under the National Rivercare Program and Murray-Darling 2001 include those listed on the following page.

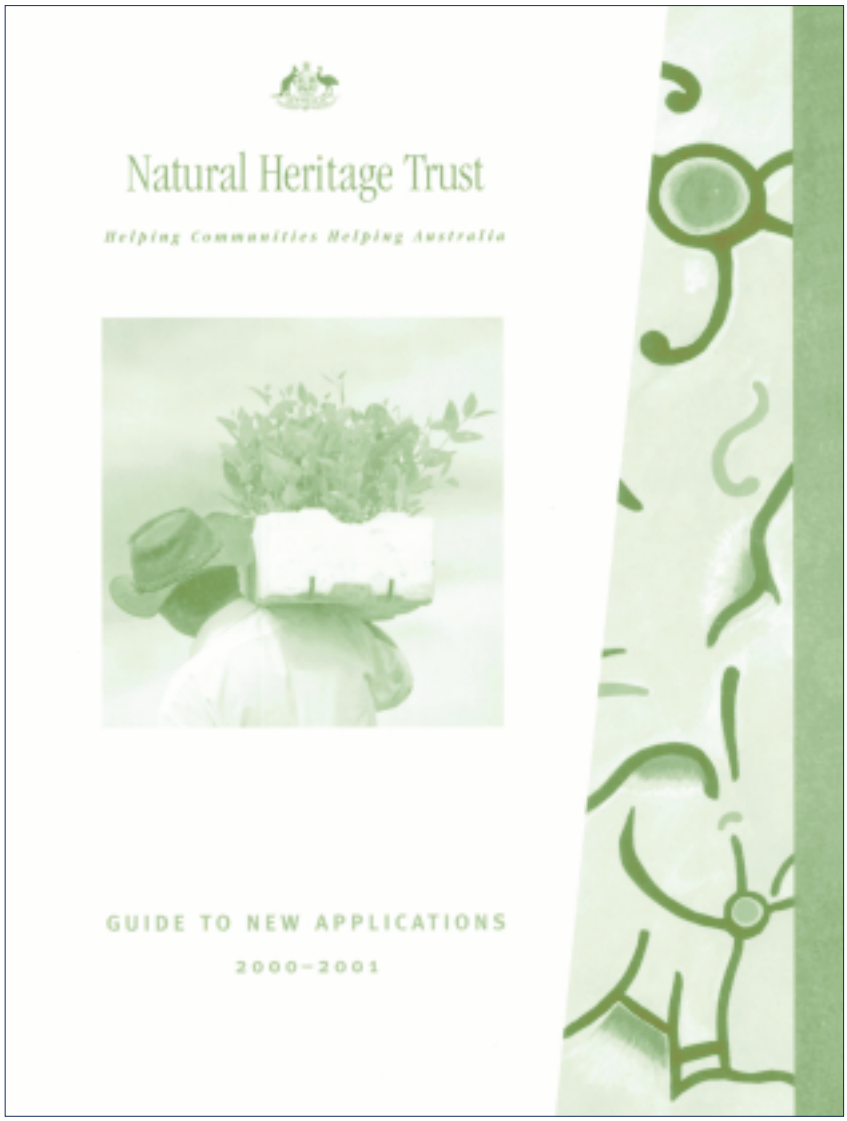
Information about the

National Rivercare Program can be found at the new Rivercare Website www.rivercare.gov.au

Information about the

MD 2001 program and copies of the Natural Heritage Trust one-stop shop 'Guide to New Applications' are available at www.nht.gov.au

The 'Guide' is also available by phoning 1800 065 823.



Natural Heritage Trust
Helping Communities Helping Australia

Riverine Corridor and Nutrient Control Planning and Implementation, NSW ($52,785)	This project will help the community develop and implement river plans within the Namoi catchment. It will coordinate activities associated with management along river systems, provide a link with catchment and property planning, identify priority streams where river plans are needed and promote river management and principles.
Minnamurra River Catchment Strategy — Whole of River Corridor Action Plan, NSW ($36,900)	This project will promote community participation in taking a collaborative, coordinated approach to developing a 'whole of river' action plan to ensure better delivery of existing State natural resource initiatives. It includes adopting recommendations of the Catchment Management Strategy and identifying financial incentives and opportunities for development that will lead to environmental improvement.
Riparian Restoration in the ACT, Murrumbidgee River Catchment, ACT ($71,800)	This project aims to reduce nutrient and sediment loading caused by erosion of critical areas by providing carefully targeted incentive funding to landholders and land managers to undertake erosion control measures and vegetation restoration.
Fast Tracking River Health Priorities in the Upper Goulburn, Vic ($300,000)	This project will undertake erosion control works in waterways to improve water quality, channel stability and enhance instream and riparian zone environmental values.
Revegetating the Waterways of the Gippsland Lakes Catchment (West Gippsland Component), Vic ($166,000)	This project aims to restore and protect native riparian vegetation in the waterways of the Gippsland Lakes catchment, to reduce the amount of sediment and nutrients moving downstream which is threatening the ecological health of one of Australia's most important estuarine systems and wildlife habitats.
Development and Implementation of Sustainable Management Strategies for the Restoration of the MacIntyre River, Qld ($56,250)	This project seeks to address issues relating to the increasing destabilisation and degradation of the riverine environment of the MacIntyre River and its tributaries. The immediate aim of the project is to develop a river management plan that will ensure long-term improved environmental health of the riverine system.
Implementing the Dee River Action Plan, Qld ($104,200)	This project will determine whether historic mining is affecting local agriculture, examine instream pollution sources and implement trial methods of rehabilitation.
Quantification of Environmental Flows for Ephemeral Streams in the Eastern Mt Lofty Ranges, SA ($69,440)	Information from this project will be used to implement sustainable water allocations between ecological and agricultural uses, as well as identify on-ground works priorities for local action groups to address existing damage problems.
Enhancing and Protecting the Broughton River Riparian Zone, SA ($118,000)	This project aims to improve ecosystem health and water quality by tackling problems such as bed and bank erosion, lack of riparian vegetation, weeds and unrestricted access by stock along 245 km of the river's tributaries and main channel (estimated combined length of 2000 km) by fencing, revegetation, relocation of watering points and installation of small erosion control structures.
Upper Frankland Gordon River Catchment Rehabilitation Project, WA ($382,440)	This project addresses the loss of biodiversity in the catchment through increasing awareness and coordinating large-scale protection and re-establishment of local native vegetation. It seeks to reduce degradation of the Frankland–Gordon River through fencing and rehabilitating major tributaries. It seeks to increase the uptake of sustainable farming by promoting new and successful production initiatives. The implementation of the works will reduce groundwater recharge and the spread of salt land.
Lake Indoon Catchment Recovery Project, WA ($31,500)	Lake Indoon is listed on the directory of important wetlands in Australia and is under immediate threat from declining water quality due to catchment activities. This project will produce a management action plan for the lake and its catchment as well as seeing high priority on-ground works implemented.
Stream Side Preservation and Restoration Program Pet River Catchment, Tas ($144,700)	This project will address inappropriate farming activities inherited from the past which have caused a significant impact on the quality of water of the Pet Catchment. This will result in cleaner waterways, stabilisation of stream-side embankments, a more sustainable water supply for both rural and populated city areas. Concepts employed will also improve farming practices and property environmental values.
Sustainable Farming, Revegetation and Water Quality Improvement in the Cygnet Catchment, Tas ($19,200)	This community based project aims to improve and restore the water quality in Supplices Creek Cygnet, which will ultimately contribute to a cleaner catchment water discharge into the Huon River Estuary. This will involve developing and implementing a sustainable whole farm management plan, fencing for stock control, and establishing shelter belts, riparian vegetation and corridors to assist in the re-establishment of habitat for native wildlife, aquatic fish and macro invertebrates.
George River Catchment Rivercare Plan Implementation, Tas ($91,500)	This project will finish implementing the Upper George Rivercare Plan and implement the Lower George Rivercare Plan. A rating system to fund on-going maintenance in perpetuity has already been approved by the Break-O-Day Council and will start at the completion of the on-ground works program in 2001.

Ginninderra Waterwatch: Not just watching water

Landscapes and catchments are slowly changing and being degraded as a result of land use practices. Often these changes are subtle and may not be picked up by current monitoring programs until irreversible damage is done. A number of indicators have been identified which can be measured to identify warning signs and assess the health of the catchment. In spite of the vast amount of information that is available on indicators, little attention has been paid to preparing the community to access or test their suitability.

Community participation in natural resource management has increased dramatically in the last decade, and has been accompanied by a trend from governments to devolve greater responsibility to the community. As a result, community groups are making important decisions in the implementation of local on-ground projects, as well as expending great effort and resources in order to carry out these works. Unfortunately, much of this work has to be carried out with little available scientific information and inadequate monitoring programs to test the effectiveness of the projects.

The Waterwatch Program has led the way by making use of water quality measures to empower the community to identify local catchment issues and provide the impetus for remedial action. The 'Catchment Health Indicators — Pilot Study' project has built on the Waterwatch Program and has developed a method that will allow individuals or community groups to use indicators to identify trends in catchment health and to initiate action at the local level.

Following consultation with the Ginninderra Catchment Group in July 1998, it was agreed that the Ginninderra Catchment would be the 'launching site' for the 'Catchment Health Indicators — Pilot Study'. Commencing in March 1999, Ginninderra Waterwatch has been coordinating local community groups involved in this innovative project. This catchment group is comprised of seven landcare groups, with land use in the catchment including urban, rural, rural residential, nature reserve and areas zoned for further development. The project has been an excellent vehicle for integrating landcare on-ground action with the Waterwatch program.

Willow removal in Ginninderra Creek — a major issue for the group.

The three year Pilot Study, funded under NHT, investigates the application of existing catchment health indicators by community groups. It is a collaborative project between Environment ACT, CSIRO Land and Water, Cooperative Research Centre for Freshwater Ecology and the Upper Murrumbidgee Catchment Coordinating Committee. The focus of the project is on environmental/biophysical indicators, however, social and economic indicators will also be explored. Currently, 11 groups from rural, urban and nature conservation areas are engaged in the project. Aims and objectives of the project include

- identifying appropriate indicator sets for the community to assess and monitor the health of their sub-catchment;
- making scientific knowledge and procedures concerning catchment health and sustainable land use available and meaningful to the community;
- obtaining community group feedback on the application and usefulness of indicators, particularly as they relate to directing on-ground action;
- enabling the community to measure the health of their catchment and the effectiveness of their projects, in order to better manage natural resources in a sustainable and self-reliant manner;
- compiling a booklet outlining the project methodology;

For more information

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Willows and after removal in Ginninderra Creek

Members of the monitoring team water testing in Ginninderra Creek.

- ~ compiling a series of 'how-to' information sheets (methods of monitoring and options to solve problems);
- ~ developing curriculum materials to assess catchment health for use in school programs; and
- ~ developing an Internet site to make the information accessible to groups Australia wide.

Ginninderra Waterwatch is the leader in this project, being the first group to coordinate a team of volunteers who are undertaking water sampling, stream habitat assessment and water bug surveys at 16 sites within the Ginninderra Catchment. Following the initial six month trial period, collation and analysis of the data were carried out and results presented to the members of the Ginninderra Catchment Group. Group members will now be in a position to use these results, and future results, when devising ongoing sub-catchment management plans. The Catchment Health Indicators project has already provided the framework for monitoring and evaluation processes in the new Ginninderra Creek Catchment Strategy. It will also be important in providing the group with a continuous assessment of catchment health and the progress of their projects.

In the next six month period the project will be extended to monitoring soils, weeds and biodiversity. The enthusiastic volunteer team is made up of Landcarers, students, graduates and members of the general public.

Queensland

Useful guidelines for estimating riparian zone widths

With the growing acceptance by landholders, river managers, town planners, and community groups of the important values and functions of riparian lands in our landscape, there is an increasing interest in protecting and rehabilitating riparian vegetation. The Queensland Government is now requiring that properties purchasing new or increased water allocations for irrigation, submit a land and water management plan which will include a riparian component (see *RipRap* 13). However, a common question asked by people is "how wide a strip do we protect or plant, and what sort of plants are best?"

To build on this emerging momentum, and to help people address this practical question, the Queensland Department of Natural Resources has contracted CSIRO Land and Water and the

Cooperative Research Centre for Catchment Hydrology (CRCCH) to develop guidelines on how to estimate the widths and types of riparian vegetation needed to filter out sediments and nutrients, as well as to provide bank stability. These two agencies were chosen due to their expertise in these aspects of riparian management emanating from their direct involvement in the LWRRDC Riparian Lands R&D Program.

In *Guidelines for Riparian Filter Strips for Queensland Irrigators*, Linda Karssies and Ian Prosser of CSIRO have quantified the minimum widths of well grassed riparian strips needed in various site conditions to effectively remove sediments and attached nutrients from surface runoff. The site conditions include bio-geographic region of the State; rainfall erosivity; soil erodability; land slope; and potential soil loss (a function of surface cover on the adjacent land). The recommended widths are derived from the average annual soil loss of adjoining lands (calculated using the Universal Soil Loss Equation) and the capacity of the grass strip to capture and store the sediments. The recommended widths are also based on draining a 200m length of hillslope and having the flow from the hillslope concentrate or convergence by a factor of 2 at the riparian zone.

For example, the *Guidelines* recommend a filter strip of 15 m width for draining lands of poor cover (degraded pasture or traditional tillage practices), low slope (under 2%), and medium soil erodibility (K= 0.03) in a very high rainfall erosivity (7000 MJ.mm/ha.h.yr) part of the Wet Tropics region. The bases for the calculations are given in the document so that more detailed estimates can be made for specific situations.

In *Guidelines for Stabilising Streambanks with Riparian Vegetation*, Bruce Abernethy and Ian Rutherfurd of the CRCCH have provided a methodology to determine the minimum width of vegetation (trees, shrubs, groundcovers and macrophytes) needed for various site conditions to effectively stabilise the stream banks. The site conditions include the dominant bank erosion process, the condition of existing vegetation in the riparian zone, height of bank, and erosion rate. The recommended widths required to reduce the risk of bank slips and erosion are derived from previous quantitative experiments of root reinforcement. The methodology is provided as a decision tree with a series of tables

How wide a strip do we protect or plant, and what sort of plants are best?

to assist in assessing stream condition changes at catchment, reach and site levels.

For example, the *Guidelines* recommend a riparian width of 24 m to stabilise an actively eroding 4 m high bank on the outside bend of a stream which has poor vegetation cover at present. The recommended width is a combination of a basic 5 m strip plus an allowance for the bank height (4 m) plus an allowance of 15 m for the erosion that will occur before the replanted area is fully established. This will result in a stabilised bank with a 9 m riparian strip to provide continuing stability.

Copies of the 'Filter Strip Guidelines' are available free of charge from

The document is available on the web at http://www.clw.csiro.au/publications/technical99/ or

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GPO Box 1666
Canberra ACT 2601
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Copies of the 'Bank Stability Guidelines' are available at a cost of $25 (including postage) from

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Children voice their approval for environment conference

Students who participated in the inaugural Young Peoples' River Health Conference held in Mildura this week have praised the conference as an outstanding success.

After three days of making friends with other students from across Australia, learning from each other about the environment, and listening to some of Australia's leading environment spokespersons, the conference concluded with a ceremony at the Old Mildura Homestead. At the closing, the children joined together in singing the conference theme song 'Involve me and I'll understand', written by Mildura West Primary School students and Helen Healy.

More than 150 students and teachers from across Australia attended the conference organised by the Mallee Catchment Management Authority in conjunction with Mildura West Primary School. The conference also enjoyed the support of the Federal Department of Agriculture Fisheries and Forestry, the Murray–Darling Basin Commission, the Victorian Department of Natural Resources and Environment and the Sunraysia Rural Water Authority, as well as many local sponsors.

Jackson Robbins, a student at Mildura West Primary School, says, 'I took away from the conference a number of messages including, not to wash the car on the driveway because chemicals can find their way into drains and then into the river'. 'I also learnt that kids make a difference'.

According to Georgia Baker of Penrhos College in Perth, the highlights of the conference included children from all over Australia working together, participating in the River Health Olympics and the workshops run by kids. The conference was opened by Ian Kiernan, chairman and founder of Clean Up Australia, who related his experience of sailing the worlds oceans, seeing the need to do something about waste management and the transition from Clean Up Sydney harbour to Clean Up the World.

A highlight of the conference was the conference dinner prepared by Mildura chef, Stefano de Pieri, who spoke to the conference delegates about his passion for rivers and the life they give to communities like Mildura. Dr Peggy Rismiller, an environmental physiologist and educator, thrilled conference participants with an insight into her research on Australia's unique echidna. Comedian and landcare group member, John Walker, entertained delegates and guests using humour to highlight the need for an environmental consciousness. John congratulated the students on their hard work in preparing for the conference and in raising awareness of environmental issues.

Conference Convenor, Arron Wood hopes that the conference will become an annual event.

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RIPRAP

LWRRDC'S RIPARIAN LANDS MANAGEMENT NEWSLETTER
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Edition 13, 1999: Benefiting from overseas knowledge and experience
Edition 14, 1999: Managing and rehabilitating riparian vegetation
(Copies of these editions are available.)

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