RIPRAP

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

MANAGING and rehabilitating riparian vegetation

Managing and rehabilitating riparian vegetation

The condition and extent of native riparian vegetation along Australia's rivers and streams varies greatly. There are extensive areas dominated by native riparian vegetation, but there are also large tracts that have been cleared, where the vegetation is fragmented, or where the vegetation has been largely replaced by introduced species. Where remnant native riparian vegetation occurs in agricultural regions, it is often confined to narrow strips, or is part of 'bush run' country used for grazing. Whilst much attention has been given to rehabilitating the badly degraded areas, remnant riparian vegetation has generally been left to look after itself. In many cases, it is gradually being degraded through overgrazing, high fire frequencies and weed invasion.

continued page 3

Land & Water Resources Research & Development Corporation

EDITION 14, 1999

CONtents

RIPArian lands:

WHERE LAND AND WATER MEET

From the Editor

Welcome to another edition of RipRap. This edition is focusing on managing and rehabilitating the riparian zone, a topic that is highly relevant for those groups getting ready to submit projects for Natural Heritage Trust funding. Practical information is provided on the steps that need to be followed in developing a riparian zone rehabilitation plan, with important elements such as weed maintenance and implementing an ongoing monitoring strategy highlighted. The advantages and disadvantages of different revegetation strategies are provided in an easy to read format that groups can use to select the strategy most suited to their situation.

In addition, four case studies featuring new research findings on riparian zone vegetation are included, with issues such as fire management, flooding, and the factors affecting recruitment and regeneration of native riparian species discussed. I hope you enjoy this edition and welcome any feedback and comments you might have on future themes for RipRap.

Land & Water Resources Research & Development Corporation

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

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

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

Edition 14, October 1999
RipRap is published four times a year. Contributions and comments are welcomed and should be addressed to the Editor.

Editor: Dr Siwan Lovett

Feedback and comments to:
Dr Siwan Lovett
LWRRDC Program Coordinator
River Restoration
and Riparian Lands
LWRRDC, GPO Box 2182
Canberra ACT 2601
Tel: 02 6257 3379
Fax: 02 6257 3420
Email: public@lwrrdc.gov.au
Website: www.rivers.gov.au

Designed by: Angel Ink
Printed by: Goanna Print

ISSN 1324-6941

MANAGING and rehabilitating riparian vegetation

continued from page 1

The highest priority for managing riparian vegetation should be to protect areas in good condition

It is much more cost-effective to protect these areas now, than to rehabilitate them later because of poor management. Protecting areas in good condition provides benefits for water quality, the physical condition of the stream, and aquatic and terrestrial ecology. Management strategies should aim to protect intact riparian vegetation and, in those situations where degradation has occurred, seek to rehabilitate and restore.

Developing a riparian zone rehabilitation plan

When developing a plan for rehabilitating riparian land, it is important to have a clear set of objectives. These objectives may be to restore habitat values, reduce erosion, manage weeds, improve water quality, increase farm productivity, or a combination of these things. It is important that rehabilitation ultimately results in enhanced, rather than reduced, natural values. In developing a rehabilitation plan the following steps should be taken.

1. Assess the condition of the area to be rehabilitated

This will involve documenting the vegetation's condition (the extent and health of both native vegetation and introduced species), the streambanks' condition, and the impact of adjacent land uses.

2. Conduct a local catchment survey

This survey will be less detailed than the survey of the rehabilitation site and will provide information relating to activities such as gravel extraction, forestry and stream regulation, that might affect rehabilitation efforts. It will also provide information about the best species to use in revegetation, as well as the ecological requirements and relationships between different species.

3. Collect other environmental information relevant to the rehabilitation of riparian vegetation

This information can be collected from reference sites considered to be in a natural condition, and might include data on climate, vegetation — channel morphology relationships, soil type and stream flow data, as well as information gained from reviewing aerial photos and orthophoto maps and any relevant literature. It is also useful to consult government agencies with responsibilities in land management. For example, permits are usually required before any works on rivers can proceed.

4. Ascertain the appropriate approach

In doing this, ask

1. are there any native species at the rehabilitation site?
2. are there intact stands of riparian vegetation nearby?
3. is uncontrolled grazing a problem?
4. what problems other than vegetation-related ones need resolution?

If the answer is 'yes' to the first three questions, the initial step will be to remove or reduce the grazing pressure in order to protect the remnant native vegetation. This can be done in a number of ways, the most effective being fencing, with either a permanent fence or an electric one. It is worth fencing and then waiting to see if there is any regeneration of native species from the soil-stored seed bank. If the answers to questions 1 and 2 are 'no', but the answer to question 3 is 'yes', stock will need to be excluded and the site will probably have to be planted with suitable native species. For question 4, it is important to make sure the riparian zone (for example, streambanks) is stable before committing the resouces to rehabilitation.

5. Select species that suit the particular situation

The priority should always be to replicate nature, but there will be many situations where this is not possible. Decisions will need to be made about what species are most suitable: using Australian natives not found in the area or using introduced species will affect the outcome of the rehabilitation project.

6. Work from the stream out

It is important to resolve any problems relating to stream channel stability before embarking on revegetating the streambanks. For example, if channel widening continues, much of the revegetation work might be wasted.

7. If the decision is made to revegetate, consider the most appropriate technique for the site and resources

Try to gather as much information about the species — flowering periods, time of seed set, germination requirements, typical habitat, and so on — that are present on or near the site to be rehabilitated and incorporate it in the revegetation strategy. In addition, soil cores can be collected and placed in trays to see what germinates. This will provide some indication of the capacity for natural regeneration, as well as information about which species are likely to germinate. Some form of treatment, such as heat or smoke, may be required for the regeneration of some species. It is

important to get the timing of the different stages of rehabilitation right. For example, don't plant or direct seed if you need to take machinery onto the site for instream works at a later date.

8. Minimise disturbance during revegetation work

Riparian land is sensitive to the use of heavy equipment and other forms of physical intervention, so it is important that careful planning precede actual site preparation and revegetation.

9. Implement a weed management strategy

Weed management on riparian land requires careful consideration because of the potential to affect water quality and streambank and channel stability. Pesticide use has implications for aquatic environments: studies demonstrate adverse impacts on aquatic fauna such as tadpoles. Long-term management of weeds in both the riparian zone and aquatic habitats is often best done by maintaining healthy native bush with intact canopy, by limiting disturbance to a minimum, and by limiting the flow of nutrients to both habitats. Before any weed eradication along rivers takes place, seek advice from the relevant agencies. They will provide information about the best methods for a particular situation as well as outlining health and safety considerations.

10. Implement a stock management strategy

Much has been written about the adverse impact of stock on the riparian zone. The overall management objectives should be to manage stock in such a way as to avoid degradation of riparian land and to sustain those ecosystems present. Riparian lands should be treated as a component of the property's entire pasture system. In this way, it should be seen as an integral component of the whole farm, and managed as a sensitive area with special management requirements. Different grazing strategies can be used (for example, cell grazing) that enable the timing, intensity and frequency of grazing to be modified so that it causes least impact to riparian zone vegetation. For example, grazing riparian land in the growing and flowering season should be avoided, as it can markedly reduce germination or seed set from occurring. If it is necessary to graze riparian land, adjust both the stocking rates and the frequency of use to suit the sensitive nature of the land. By following these simple rules, the riparian zone can be used by managers to supplement feeding, provide shelter as well as improve the quality of water upon which their animals depend.

11. Other factors to consider: fire and feral animals

Fire is an important component of the Australian landscape and is often used as a tool in vegetation management. Because of the moist environment, fire is uncommon in many riparian lands, and there is little information available about riparian vegetation's response to fire. Whilst many species may be able to recover following fire, they may not necessarily benefit from it. Fire can initially reduce vigour and flowering potential, as well as alter patterns of dominance within vegetation types. Few species can tolerate frequent burns, which inhibit successful regeneration as new growth or kill seedlings before they have time to become established. Over time, frequent fire can exhaust the soil seed store, resulting in the removal of particular species from a site In general, therefore, whilst fire can be a useful tool, it is also a serious threat to the integrity of riparian vegetation. In most instances fire exclusion, rather than use, will be the management aim. Fire should only be used in riparian land under special circumstances, for example weed control. Its use should be carefully managed and its reason for use carefully considered, as there may be more appropriate options available. (See Case study four for an example of fire being used as a management tool.)

Feral animals, like wild pigs, horses and rabbits, can severely degrade riparian vegetation. In such cases, before implementing a rehabilitation strategy, it is important to consult with an expert (such as a National Parks and Wildlife officer) about how to limit the impact of feral animals in the riparian zone.

12. Site monitoring

Monitor the riparian zone regularly to reduce the risk of problems developing or becoming more serious. Monitoring can be based simply on familiarity with a particular area and taking action when necessary. Many government agencies provide kits that landowners can use to assess the condition of their property, including the riparian zone. Such an assessment will provide the basis for continued monitoring of riparian areas. Regular monitoring of riparian vegetation should aim to measure

- changes in species composition and the structure of plant communities
- the extent of recruitment and regeneration of native species
- changes in the composition and extent of weed species
- the health of native species.

Following completion of a rehabilitation plan, the task of revegetating the riparian zone usually involves three different methods. These are not mutually exclusive, and a mix of revegetation methods can be used at any one site. **READ ON!**

Revegetation methods

Natural regeneration

This method of re-establishing vegetation is especially worthwhile for individuals and groups with limited resources. The area can be fenced off, allowing natural regeneration to occur and further action can be delayed for a year or two. If the regeneration fails or is poor, direct seeding or planting seedlings can be considered.

Natural regeneration results from soil or canopy stored seed, or seed transported to the site by water, wind or animals. The areas to be revegetated are usually fenced to exclude stock and allowed to regenerate naturally. Some form of pre-treatment, such as a burn or herbicide treatment, may be applied to the site. As with other methods, implementation of a long-term weed-management strategy is important.

Advantages

Natural regeneration should always be the first choice. It is cost-effective and utilises species which are adapted to the site.

- Natural regeneration is relatively cheap to establish, requiring only the cost of fencing and then continuing weed maintenance.
- The labour requirement is minimal.
- Growth of natural regeneration can outstrip plantings.
- Seedlings have well-developed root systems and tap roots and so are better able to cope with climatic extremes.
- Natural regeneration mirrors the local flora and successional processes.
- Natural regeneration can result in vegetation communities that are diverse in composition and structure.
- The method can be used in conjunction with other revegetation techniques.

Disadvantages

- Successful natural regeneration usually requires a nearby source of propagules. These propagules will come from local plants, from vegetated areas upstream or from seed stored in the soil.
- Regeneration can be patchy, either confined to one side of the stream or in patches along both sides. This is not necessarily a bad thing and may be part of the successional process, but if areas of bare ground persist, direct seeding or planting may be necessary.
- Once grazing is excluded, weeds may become a problem if not treated.

Direct seeding

Direct seeding is regarded as an efficient means of re-establishing native vegetation. It is cost-effective compared with other methods, and is relatively easy to do. A diverse mixture of plants can be established through direct seeding, the main limit being the availability of seeds. Seeds are broadcast by either hand or machine, directly onto prepared ground.

Advantages

- Direct seeding is relatively cheap.
- Direct seeding requires less labour and time than planting seedlings.
- Large areas can be sown rapidly.
- Seedlings develop good root systems and tap roots, which means the plants will cope better with climatic extremes and will require little maintenance.
- A diverse seed mix can be sown, using trees, shrubs and groundcovers to mimic the natural situation.
- The mix of species can be varied for different soil types and different topographic conditions.

Disadvantages

- Direct seeding can be less reliable than planting seedlings, especially for small-seeded species.
- Results can range from prolific germination of a diverse range of species through prolific germination of one or a few species, to very little or no germination.
- Seed predation by ants can be a problem.
- Poor seasonal conditions, such as low rainfall, will affect germination.
- Poor soil conditions, such as heavy clay soils or highly erodible soils, will affect germination.
- Particular species require particular germination conditions.
- Requires careful pre-planning and site treatment for effective weed control.

MANAGING and rehabilitating riparian vegetation

Revegetation methods

For details on how to get your copy of the Riparian Land Management Technical Guidelines see page 21

Planting seedlings (tubestock)

Planting seedlings is the traditional method of revegetating areas and is widely used. As with direct seeding, site preparation is essential and will involve weed control and fencing. Plants can be propagated by a nursery and brought to the site when conditions are suitable. Propagation can be by seed or by cuttings. Another method, often used with tussock-forming species, is division, whereby plants are separated at their bases into parts and planted.

Advantages

- Techniques for seedling planting are well developed and generally produce reliable results.
- Plants have a 'head start' compared with direct seeding, and this provides instant satisfaction for the effort.
- The method is good for sites requiring fixed spacing of plants or where a particular species is needed in a particular space.
- Seedling planting can be done in combination with direct seeding to provide back-up in areas or patches where the response has been poor.
- The method is useful for species that do not germinate readily and need to be propagated by cuttings or have special treatment.
- It is a useful method in areas where access for machinery is limited.

Disadvantages

- Generally the costs of seedling planting are higher than those of direct seeding and planting is more labour intensive. This assumes importance when large areas are to be planted.
- 'Transplant shock' may occur — seedlings may take a while to begin to grow following planting.
- The roots of seedlings are not as well developed as those of seedlings from direct seeding or natural regeneration.

This information has been drawn from

Askey-Doran, M. 1999. 'Guideline E: Managing and rehabilitating riparian regetation', in P. Price & S. Lovett (eds), *Riparian Land Management Technical Guidelines Volume Two: On-ground Management Tools and Techniques*, LWRRDC, Canberra.

References

Buchanan, R.A. 1989, *Bush Regeneration: recovering Australian landscapes*, TAFE Student Learning Publications, Sydney.
Dalton, G. 1993, *Direct Seeding of Trees and Shrubs: a manual for Australian conditions*, State Print, South Australia.
Greening Australia 1990, *Sowing the Seeds*, Proceedings of Direct Seeding and Natural Regeneration Conference, Adelaide.
Harvey 1997, 'Riparian vegetation by direct seeding in the Mount Lofty Ranges, *RipRap*, no. 7, LWRRDC, Canberra.
Mercer, J. 1994, *Practical Methods of Riparian Rehabilitation on Salinised Lands*, Agriculture Western Australia, Albany, & the Oyster Harbour Catchment Group, Western Australia.
Raine, A.W. & Gardiner, J.N. 1995, *Rivercare: guidelines for ecologically sustainable management of rivers and riparian vegetation*, LWRRDC, Canberra.
Scheltema, M. 1993, *Direct Seeding of Trees and Shrubs*, Greening Western Australia, Perth.
Stewart, D. & Stewart, R.E. 1995, *From Seeds to Leaves*, Agmedia, Melbourne.

Direct seeding at Crocodile Farm in the Johnstone Catchment, Queensland. ***Top:*** *The site in March 1998.* ***Middle:*** *The same site in April 1999.* ***Bottom:*** *Planting seedlings by stepped technique at Bamboo Creek in the Johnstone Catchment, Queensland. All photos by Pete Gleeson.*

REVEGETATION costs

Greening Australia

When you need to assist the recruitment and regeneration of vegetation in riparian lands, three techniques are most commonly used. This article from Greening Australia, provides answers to some of the most frequently asked questions about revegetation, and provides an indication of the costs of protecting or establishing vegetation. The following prices are estimates. They do not take into consideration availability, price fluctuations and seasonal variations. Some of the items listed are optional and depend on local conditions (* = optional).

There are currently three main approaches to revegetation — direct seeding, tubestock planting and fencing to allow natural regeneration. Direct seeding is a cheap and effective way of establishing trees and understorey. Tree planting using tubestock is another well-known form of tree establishment suitable for all sites and conditions.

Direct seeding

Direct seeding involves the spreading of seeds directly into prepared ground using a direct seeding machine or hand broadcasting. The result is germinated seedlings that develop strong root systems and mature to provide 'natural' looking vegetation. Seeds can be collected locally or included in a direct seeding fee for service.

Site preparation is necessary for direct seeding and often beneficial for planting. Preparation for seeding includes weed control to reduce competition for water and nutrients. Two applications of herbicide are recommended in autumn and before seeding occurs in spring.

Site preparation (Herbicide only)

Spring herbicide	
@ 1.2m strips x 4m intervals	$8/km ($20/km)
Autumn herbicide	
@ 1.3m strips x 4m intervals	$8/km ($20/km)

Seeding

Hand seeding, purchased or collected seed	
Direct seeding site charge	$100
Direct seeding rates (<5km)	$45/km ($100/ha)
Direct seeding rates (>5km)	$20/km ($50/ha)
Seed free on average	$60/km
Average number of trees established using this method:	1000+ trees/km ($2500/ha)
Cost per km (excluding site visit)	$130/km ($320/ha)
Cost per tree established	$0.13

Planting tubestock

The planting of tubestock can be undertaken on any site, by anyone, including children of all ages. Tubestock can be home grown or purchased from local nurseries, and the trees can be selected and positioned for specific purposes. The optimal size of plants for planting are between 10 and 20 cm.

Site preparation, including the deep ripping of hard compacted surfaces, is often necessary and beneficial for directing and holding moisture and for ease of planting. Tree guards are useful for protecting plants from small herbivores such as rabbits or for areas subject to harsh winds.

*Ripping

Contract	$25/hour ($62/ha)

Planting

Homegrown tubestock	$0.10
Purchased tubestock	$1
Average number of trees established:	300/km ($1000/ha)

*Tree guards

Plastic sleeves + 3 bamboo stakes	$0.75
Grocones	$2–2.85
Milk cartons + 3 bamboo stakes	$0.42

Weed mats

Fibre	$0.30–0.35

Fencing

Whether for existing or re-established native plants, fencing is necessary to exclude or better manage stock from vegetated areas. Fencing is generally the greatest cost in managing or establishing vegetation.

Fencing materials

Electric	$1000–$1200/km
Hinge joint	$1500–$2000/km
Rabbit proof	$3000–$4000/km

The next edition of RIpRap will have information on the use of long-stemmed native tube stock to replace the use of willow and poplar cuttings for bank stabilisation.

For more information
Sue Streatfield
Greening Australia
Kubura Place
Aranda ACT 2614
Tel: 02 6253 3035
Email: gaact@dynamite

CASE STUDY

NATURAL regeneration of riparian vegetation in Western Australia

by Neil Pettit

Introduction

The purpose of this study was to provide baseline information on the processes involved in the recruitment and regeneration of riparian vegetation. As there is a paucity of basic ecological studies on riparian vegetation in Australia, the project is fairly broad in scope, and aims to provide a general picture of vegetation recruitment and regeneration processes in the riparian zone, as well as providing a starting point for more detailed work. The project also examined the impact of grazing on riparian vegetation.

The study sites for this project are located on two rivers, the Blackwood River in the south-west, and the Ord River in the Kimberley region of north-west Western Australia. The Blackwood River was chosen as being representative of river systems in the south-west of Western Australia while, in contrast, the Ord is a tropical northern Australian river influenced by monsoon rains that result in large seasonal flows. Table 1 provides a snapshot of the two rivers.

Riparian vegetation

The structure of the vegetation on the Blackwood River consists of an overstorey dominated by *Eucalyptus rudis*, with a shrub understorey at ungrazed sites and annual species dominant in areas grazed by livestock. On the Ord River, there is a much more diverse overstorey and an understorey dominated by perennial grasses. Figure 2 provides information about the number of species and percentage cover of different vegetation types at each of the sites. Figure 3 shows the size class of trees at each site, as well as the difference in distribution as a result of stock access and grazing.

Figure 3 shows the difference in tree size class distribution between grazed and ungrazed sites. Exclosure experiments conducted as part of the project have showed little improvement after three years, with only minor increases in the occurrence and cover of native species. Establishment of these species may be difficult because of the increase in abundance of exotic

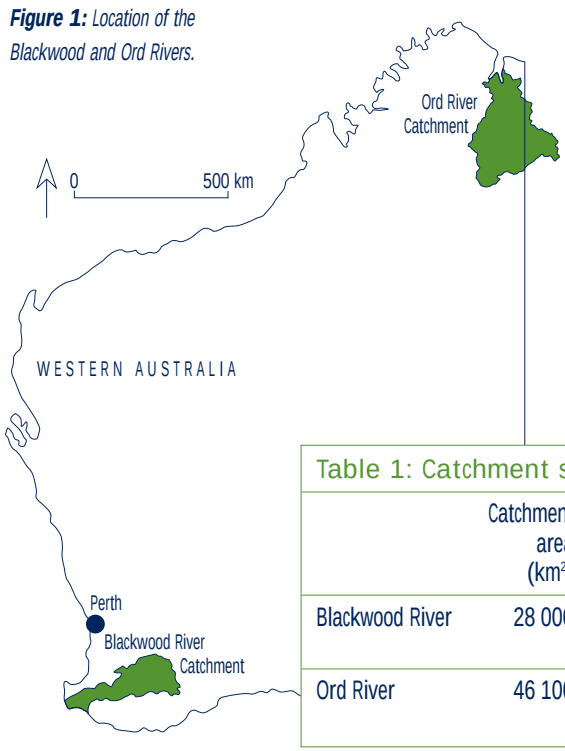


Figure 1: *Location of the Blackwood and Ord Rivers.*

Table 1: Catchment statistics for the two rivers in this study.

	Catchment area (km^2)	Rainfall range ($mm\ yr^{-1}$) (x $10^6\ m^3$)	Mean annual flow ($m^3\ sec^{-1}$)	Maximum recorded discharge	Water quality	Disturbance
Blackwood River	28 000	350–1000	659	1190	Brackish	85% cleared farmland, sheep and cattle grazing
Ord River	46 100	400–700	4320	31 000	Fresh	Cattle grazing, regulated in lower reaches

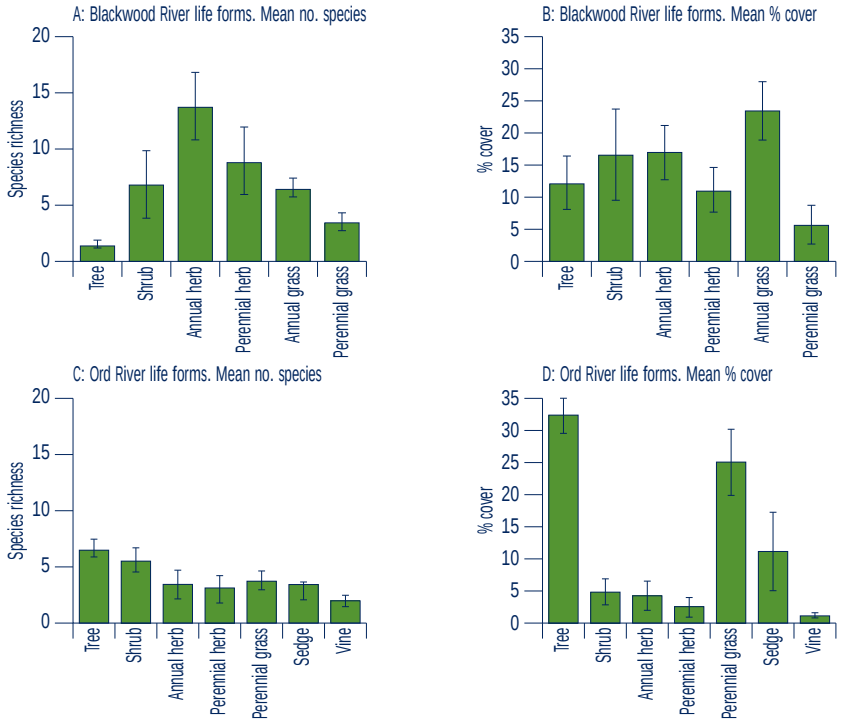


Figure 2: *Number of species and percentage cover of the major life form types on the Blackwood River (A and B) and Ord River (C and D). Values are means (±S.E.) for six sites on the Blackwood River and five sites on the Ord River.*

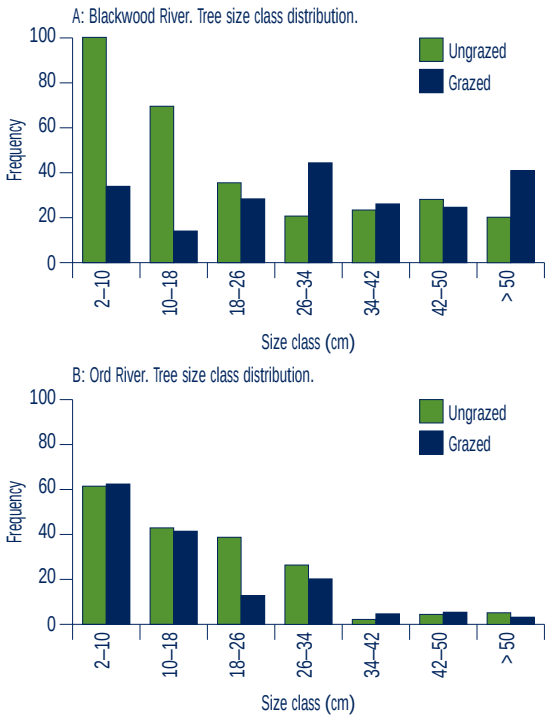


Figure 3: *Comparison of size class distribution of overstorey species at grazed and ungrazed sites on the Blackwood River (A) and Ord River (B) sites.*

grasses and annual herbs that occurred as a result of the absence of grazing. However, these results are only based on the short-term, and a much longer period of time is required to look at the vegetation dynamics and successional processes of these sites. For example, these sites may need some episodic disturbance such as a flood and/or particular climatic conditions for a successful recruitment event.

Photo at left: *Structure of riparian vegetation on the Blackwood River.*

Photo this page: *Structure of riparian vegetation on the upper Ord River.*

Photos by Neil Pettit

Phenology — study of periodicity phenomena in plants such as timing of flowering in relation to climate

Allogenic — processes operating outside the system, for example, physical processes

Autogenic — processes operating within the system, for example, successional processes

Regeneration processes

The project found that the regeneration of vegetation from soil seedbanks is important for annual species of herbs and grasses, but of only minor significance for perennial species. For perennial species, particularly overstorey species, direct seedfall from existing vegetation occurs and enhanced dispersal by floating downstream with flood debris, a consequential recruitment mechanism. This finding shows the important relationship between flow and regeneration. Figure 4 (see page 10) shows this by contrasting the different reproductive *phenology* of four species monitored in the study, each of which appear to be well adapted to the hydrological regimes of the river.

Historical flow records can be used to develop a picture of the natural flow regime for a particular river, and this can be related to patterns of vegetation development such as reproductive phenology, seedling establishment and population structure, as well as plant community patterns in the riparian zone. Variability in natural flow regimes as a disturbance, therefore, can be used in conjunction with other abiotic and biotic factors in developing a model of vegetation dynamics for the riparian zone.

NATURAL regeneration in Western Australia

In the Ord River, the regime of intermittent high frequency large flood disturbances prevents the establishment of stable states of vegetation and, as a result, the ecosystem is characterised by long periods of transition between short-lived stable states. This finding means that the riparian ecosystem is driven by *allogenic* rather than vegetation *autogenic* processes (Baker & Walford 1995).

In contrast, lower energy seasonal flooding on the Blackwood River allows mature stands of trees to develop throughout the river profile. Recruitment is continual, although species can also respond to large flood events. This disturbance regime results in long periods of stable states with short periods of transition. Riparian vegetation in this system is subjected to longer periods of *autogenic* processes and, because of lower frequency flooding disturbance, shorter periods of *allogenic* processes.

These results highlight the very different fluvial regimes of the two rivers and their effect on vegetation dynamics. The implications for management of riparian vegetation is that it should take into account the frequency of change in vegetation, as well as recognise that disturbed states, and long periods of transition between states, are part of the natural process. This suggests that altering natural flow regimes, such as that which occurs through river regulation, has significant effects on riparian vegetation dynamics.

In summary

This work has relevance for the management of riparian zone vegetation. Clearly, for regeneration and recruitment process to operate within the riparian zone, the importance of fluvial processes and the need to understand the natural flow regime of a target river is a critical first step. Where the riparian zone is highly modified, through such things as livestock grazing and/or weed invasion, natural regeneration of the riparian vegetation may be a long term process. If intervention such as replanting is appropriate, care should be taken that species selected are adapted to particular site conditions such as, flooding regime, landscape position and river geomorphology.

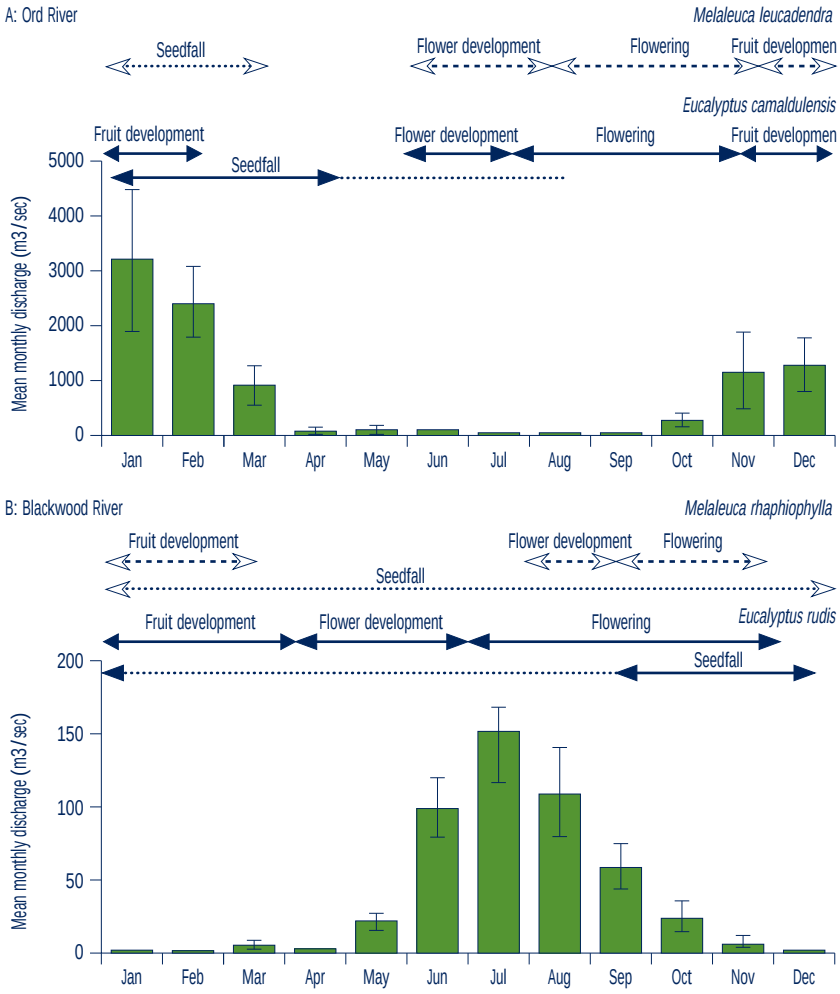


Figure 4: *Relationship between phenology of selected riparian species with monthly river flow levels for the Ord River (A) and the Blackwood River (B).*

References

Baker, W.L. & Walford, G.M. 1995, 'Multiple stable states and models of riparian vegetation succession on the Animas River, Colorado', *Annals of the Association of American Geographers* vol. 85, pp. 320–338.

George, M.R., Brown, J.R. & Clawson, W.J. 1992, 'Application of non-equilibrium ecology to management of Mediterranean grassland', *Journal of Range Management*, vol. 45, pp. 436–440.

Westoby, M., Walker, B. & Noy-Meir, I. 1989 'Opportunistic management for rangelands not at equilibrium', *Journal of Range Management*, vol. 42, pp. 266–274.

For further information

Neil Pettit
School of Natural Resources
Edith Cowan University
Joondaplup WA 6027
Tel: 08 9400 5056
Fax: 08 9400 5509
Email: n.pettit@cowan.edu.au

Aerial view of riparian vegetation on the lower Ord River.

CASE STUDY 2

FLOODPLAIN vegetation in Cooper Creek: a variable, arid zone catchment

by Sam Capon

Introduction

Floodplains can be perceived as large riparian zones, since they can both influence, and be influenced by, the rivers that flow through them. Consequently, floodplain vegetation performs similar ecological functions as fringing riparian vegetation. For example, floodplain vegetation can affect surface stability and the transport of sediments and nutrients into the river, as well as providing habitat to terrestrial fauna such as birds and mammals. During times of flood, the floodplain is also home to fish and aquatic invertebrates. Furthermore, floodplain vegetation can be of socio-economic importance, for example, native pasture growth used for grazing.

Understanding the processes which influence floodplain vegetation are, therefore, imperative for long-term catchment management strategies and the preservation of ecological values. Whilst a substantial amount of study has been conducted around the world in this field, the majority of work has been concentrated in temperate and tropical floodplain catchments, with relatively predictable and regular hydrological regimes. In Australia, however, some of our most extensive and productive floodplains are found in the arid inland catchments where the surface flows vary greatly, both seasonally and annually. This article provides details of the results of a preliminary study into the effects of flood frequency on floodplain vegetation in one such catchment; Cooper Creek in south-west Queensland.

Riparian vegetation forms a natural network across the landscape in semi-arid areas such as the channel country of south-western Queensland. Photo by G. McTainsh.

Background

Plants that inhabit floodplains must be able to survive through periods of inundation and its associated conditions, such as reduced availability of oxygen and the accumulation of toxic materials in the soil. Flooding can also be beneficial for plants, providing an increased supply of nutrients and moisture. Flood tolerance, or the ability to survive flooding, varies widely between species and may include physiological adaptations, for example, the production of new roots during inundation, and life-history adaptations such as dormant seeds that germinate only when floodwaters have receded. Such variation in flood tolerance between species plays a role in shaping the composition of vegetation communities at positions of different flooding intensity within a floodplain.

Previous studies investigating floodplain vegetation have consistently found flooding to be the primary agent structuring plant communities within floodplains. The main aim of this study was to determine whether this also applied to the extremely large, arid-zone floodplain of Cooper Creek, where flooding is highly variable and can range from several years of no flow, to floods that inundate millions of square kilometres. Plants inhabiting this floodplain require some degree of flood tolerance, in addition to drought resistance.

This study was conducted on the Cooper Creek floodplain and the smaller floodplain of its tributary, Kyabra Creek. Local people assisted by identifying sites that flooded at varying frequencies, for example, once every 2 years, 5 years, 10 years and more than 10 years. Both existing vegetation and potential vegetation, via the soil seed bank, were investigated.

Effects of flood frequency on floodplain vegetation

The main finding of the study was that, despite the size of the floodplain and the variability of flooding, flood frequency does appear to exert an overriding influence on the composition and structure of the vegetation. At both locations, sites that had been flooded at similar frequencies shared many common floristic characteristics. Sites that were more frequently flooded were dominated by a small number of flood tolerant species including lignum, bluebush, sedges (*Cyperus* spp.) and nardoo. The least frequently

flooded sites were generally more diverse, and included species which had invaded from neighbouring sand-dune and mulga communities.

Other significant results included dominance by annual and short-lived grasses in the most frequently flooded sites, and perennial grasses in the least frequently flooded sites. Annuals probably survive better in these wetter areas since they can quickly complete their life cycle in between flood events.

Woody vegetation was mainly restricted to the Kyabra Creek floodplain and included Eucalyptus and Acacia species. Patterns were also evident with relation to flood frequency, for example, more species were present at lower flood frequencies. Conversely, a higher number of seedlings were recorded at more frequently flooded sites. The recruitment of tree species appears to be closely linked to individual flood events that coincide with favourable climatic conditions. The dominant tree species in the canopy probably change with time depending on which seeds germinate successfully after these events.

The study found the soil seed bank to be dominated by grasses, sedges and other herbs and forbs. Very little correlation existed between the soil seed bank flora and the existing vegetation, and many of the species recorded in the soil seed bank were completely absent from the existing vegetation at the time of the survey. These cryptic species, residing in the soil seed bank, are responsible for the lush ephemeral growth that occurs after inundation. Included amongst such ephemeral species are the Channel Millet and Cooper Clover, two native pasture plants that make the Cooper Creek floodplain some of the most productive grazing land in Australia.

Potential impacts of flow regulation

The results of this study indicate that flood frequency is an important factor influencing the structure and composition of floodplain vegetation, even in the variable, arid-zone catchment of Cooper Creek. A major implication of this finding is that changes to flood frequency, as would be expected following flow regulation, are likely to be reflected by changes in these vegetation communities. Potential impacts could include a narrowing of the floodplain and the zones within it. Very flood tolerant species (hydrophytes) may also be gradually replaced by more *mesic* species (species that are adapted to an environment containing a moderate amount of moisture). This has occurred on the semi-arid floodplains of the Murray River, where river red gums have invaded Moira grass plains since flow regulation. Similar changes to floodplain vegetation could occur in other floodplain catchments subjected to such regulation, including Cooper Creek. To approach sustainable management of all our catchments, it is important for us to recognise floodplains and their vegetation as integral components of river ecosystems.

For further information

Ms Sam Capon
Centre for Catchment and In-stream Research
Faculty of Environmental Sciences
Griffith University
Nathan QLD 4111
Tel: 07 3875 7407
Fax: 07 3875 7615
Email: samandsimon@mailcity.com

Patrick Bunn in Cooper Creek, Windorah. Photo courtesy of Stuart Bunn.

Getting a GRIP

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

Virtual fencing — grazing animal control for the 21st century

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

The search for innovative alternative methods for managing grazing animal movement has attracted a great deal of interest because of its proven potential to protect fragile vegetation and increase productivity. A project part-funded by LWRRDC, investigated the feasibility of further developing this technology in Australia.

The study was comprised of two components. The first included a nation-wide review of extensive and intensive beef and dairy enterprises to identify the costs currently associated with conventional control management (fence installation, monitoring and maintenance, mustering costs, management opportunity costs, estimated productivity relative to pasture condition). This information was collected to indicate what various producer groups might be prepared to pay for effective alternatives.

The second component involved the contracting of an engineering firm to ascertain if a device conforming to certain specifications could be developed in Australia. They were also contracted to provide a conceptual design for such technology, provide a costing for the device on a production per volume basis and identify possible commercial manufacturers for the device.

Outcomes

~ Survey results suggested producers currently use a variety of methods to control their animals, with wire fencing (both non-electric and electric) the most prevalent. Producers noted the main advantages associated with current fencing was that is was already in place, it worked to various degrees and they understood the system and its limitations. Conventional fencing systems were praised for their benefits to management, allowing for selective segregation of animals. The main disadvantages included the high cost of installation, maintenance and monitoring. Virtual Fencing technology must be capable of delivering all the benefits of the current systems and should at least reduce, if not eliminate, most of the negatives.

~ The engineers suggested two basic conceptual designs for Virtual Fencing. Both of these involve an on-animal device whose main purpose is to receive a transmitted message and instruct the host animal to alter its movement accordingly. The first design is one that creates a virtual exclusion zone. As pre-conditioned animals approach the radio wire, they are signaled to turn around and walk in the opposite direction. The second design is one that creates a virtual exclusions zone and consists of a transmitting device being mounted on what is referred to as a remotely controlled shepherding vehicle.

~ The major disadvantage Virtual Fencing shares with its conventional counterparts is the need for animal training and the initial investment costs.

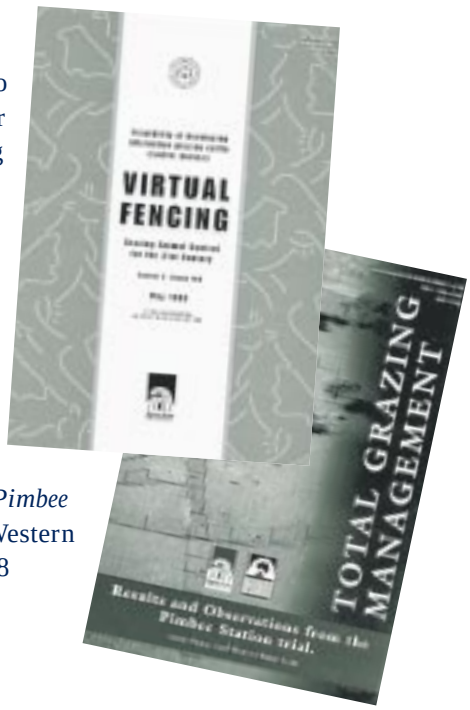
As a result of this study, Agriculture Western Australia has filed a provisional patent on Virtual Fencing technology which it intends to license out to commercial developers in the subsequent phases of the technology's development. At least two North American companies have intentions to develop similar devices, but this should not interfere with Australian development plans.

Publications

This project has produced two booklets that provide further information about this exciting piece of research. They are

Rouda, R. 1999, *Virtual Fencing: Grazing Animal Control for the 21st Century*, Agriculture Western Australia, ISSN 13265-415

Pearce, D., Elliott, G. & Rouda, R. 1998, *Results and Observations from the Pimbee Station Trial*, Agriculture Western Australia, ISSN 1326-4168



For further information or a copy of these booklets

Dr Robert Rouda
Agriculture Western Australia
PO Box 522
Carnavon WA 6701
Tel: 08 9941 0111
Fax: 08 9941 8334
Email:
rrouda@grs.agric.wa gov.au

LOCAL government focus
all levels of government working together

Planning initiatives in the Sydney drinking water catchments

Emerging from Sydney's drinking water crisis in late 1998, a whole of government approach to new arrangements for the planning and management of the water supply catchments is taking place. A number of government departments are working to ensure catchment landuses will not jeopardise drinking water quality. Overseas data shows that it is much cheaper to achieve water quality goals through careful catchment management and restricted land use, than by relying on treatment plants.

Sydney's water supply is drawn from 'inner' catchments and from 'outer' catchments. The main water storages are located in the inner catchments such as the Warragamba, Upper Nepean, Woronora and Blue Mountains. Outer catchment rivers include the Wollondilly, Nattai, Wingecarribee, Kowmung, Cox's and the Shoalhaven River above Tallowa Dam. In some catchments such as the Shoalhaven, water is lifted into the inner catchment by a series of pipelines and pondages.

The Sydney Water Corporation and the NSW National Parks and Wildlife Service (NPWS) will be joint managers of the catchments' 'Special Areas' that protect the main water storages such as Lake Burragorang. A Special Areas Strategic Plan of Management (SASPoM) is being drafted as a basis to the new management arrangements.

The NSW Government is preparing a Regional Environmental Plan (REP), expected for implementation in 2000. The REP will strengthen the State Environmental Planning Policy (SEPP No. 58 — Protecting Sydney's Water Supply) enacted to ensure development in the supply catchments does not have a detrimental impact on drinking water resources. The proposed Sydney Drinking Water Catchments REP will provide innovative protection mechanisms and incentives for conservation and remediation of catchment bio-physical resources.

The NPWS is providing input to the formulation of the REP on the basis that there is a strong link between stream health and conservation of biological diversity. Of major importance to regional water quality are the high conservation value sub-catchments containing conservation reserves, undisturbed riparian lands and native forest, woodland and grassland communities. Similarly, the role of upland peat bogs, swamps and chain-of-ponds in yielding high quality water and distinctive fauna and flora assemblages including threatened species cannot be under-valued.

Seven City Councils and nine Shire Councils comprise the Local Government Areas that occur within Sydney drinking water supply catchments. Those administering landuse in rural lands of the outer catchment have a major role. Integration of a range of programs will be necessary to understand and manage catchment processes and development, therefore the co-operative working of all levels of government is foreseen to achieve long-term ecological health in the catchments.

For more information

Phil Craven
Environmental Planning Unit
NSW National Parks
and Wildlife Service
Queanbeyan NSW 2620
Tel: 02 6298 9739
Email:
phil.craven@npws.nsw.gov.au

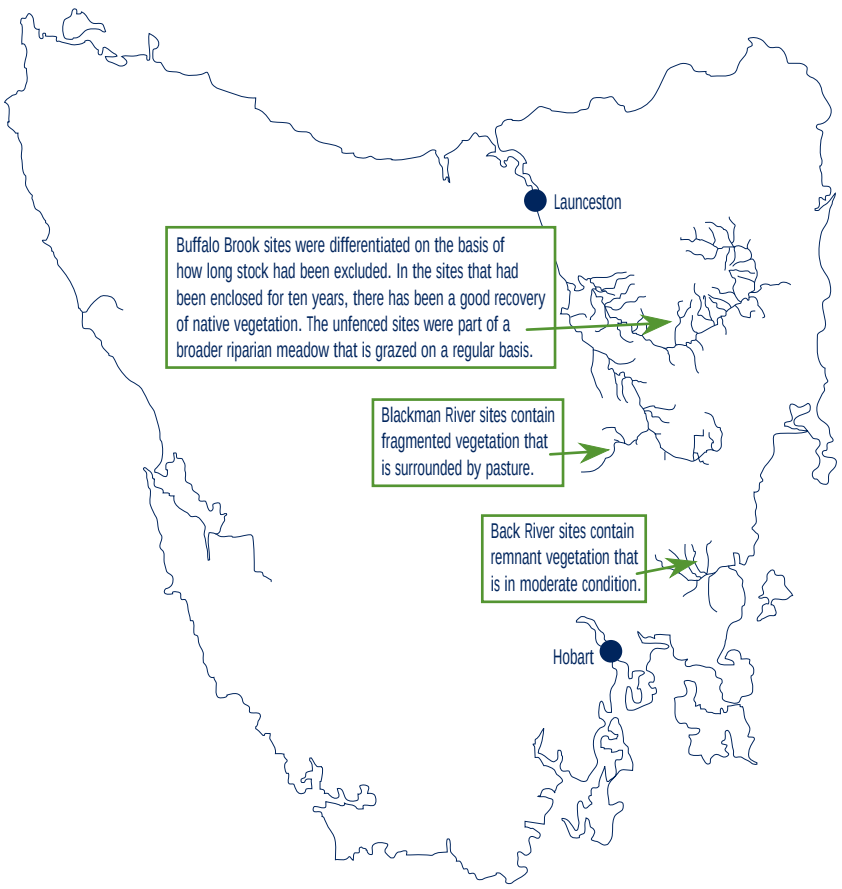
CASE STUDY 3

RIPARIAN vegetation in Tasmania: factors affecting regeneration and recruitment

by Michael Askey-Doran and Wendy Potts

The majority of Australia's rivers flowing through agricultural land lack continuous areas of native vegetation. Unfortunately, they have been replaced by introduced species such as willow or by pasture grasses. Where native vegetation does exist, it is usually as small, isolated remnants.

With an increasing focus on the management and rehabilitation of Australia's rivers, there is a need to better understand the factors influencing maintenance and regeneration of native vegetation. A LWRRDC funded project undertaken in Tasmania by the Parks and Wildlife Service, has identified some of the factors which influence the ability of native riparian vegetation to establish and maintain itself within these impacted environments.



Background

It is widely recognised, both here in Australia and overseas, that stock have an enormous impact upon riparian lands and their native vegetation. Stock not only graze the existing vegetation, but are very effective at preventing new plants from being recruited into these remnants. Stock can remove seedlings either through direct grazing or by trampling. Preferential browsing of particular species limits their presence in favour of less palatable species. As a consequence, the riparian vegetation loses its diversity, both in the species that are present and its physical structure. When these impacts are great, the health of the stream may begin to decline, as can the riparian zone's value as wildlife habitat.

Appreciating the impact stock have on riparian vegetation, this project established a number of study sites to monitor the affects of grazing using fenced and unfenced areas. The project investigated a number of aspects.

~ The impact of stock on the floristic composition of riparian plant communities.
~ The impact of stock on the species richness of riparian plant communities.
~ The role of soil seedbanks in riparian land used by stock.

Other factors also affect the germination and regeneration ecology of native species including flooding and fire. Whilst it was not possible to measure the impacts of flood during this project, it was possible to look at some of the impacts of fire.

Approach

Four study sites were chosen for this project, the locations of which are shown in Figure 1. All four sites are in agricultural regions in areas of subdued topography, relatively fertile soils and low rainfall (< 800 mm/annum). At each of the locations, grazed and ungrazed sections were established to monitor and assess vegetation change over the three years of the study.

RIPARIAN vegetation in Tasmania

Buffalo Brook, Tasmania in 1986 (above) and in 1996 (below). Photos by Michael Askey-Doran.

Floristic composition

Change in the composition, structure and diversity of the flora at the grazed and ungrazed sites investigated, was small. Floristic change was less in the remnant bush areas (Back River) than the pastured sites (Blackman River and Buffalo Brook). Interestingly, the floristic units present in the remnants at the time of fencing still formed the dominant associations. These sites did not experience the same grazing pressure as the two pastured sites and were, therefore, at a more stable point in their vegetation development.

More sampling may show that grazing is in fact determining the distribution of these species rather than seasonality.

There was a change detected at the two pastured sites (Blackman River and Buffalo Brook) however, these differences were still relatively small. The changes that did occur, mainly involved introduced species and could, in part, be indicative of seasonal variation. For example, at the Buffalo Brook tributary site three introduced annuals, *Aphanes arvensis*, *Myosotis discolor* and *Bromus hordeaceus* were largely confined to the fenced sections. More sampling may show that grazing is in fact determining the distribution of these species rather than seasonality.

Species richness

The majority of germinants were grass and herb species with very little germination of woody species at any of the sites over the sampling period. The most noticeable change at the different sites was in the growth of a number of species. Grasses and sedges, which can be heavily grazed by stock, recovered once grazing pressure was removed. Palatable shrub species such as Dogwood and *Micrantheum* were also able to recover in the absence of grazing. This improvement in the physical structure of riparian vegetation increases structural diversity and hopefully improves habitat availability for wildlife.

Grasses and sedges, which can be heavily grazed by stock, recovered once grazing pressure was removed.

Soil seedbanks

The response of different vegetation was similar in the seedbank trial to that observed in the field studies. That is, grass, sedge and herb species were the most common, whilst shrub/tree species were much rarer. One reason for these differences lies in the method by which species store their seeds. Tree species such as *Eucalyptus*, and shrubs such as *Leptospermum lanigerum* and *Allocasuarina littoralis*, store their seed in the canopy and rely on disturbances such as flooding or fire to drop their seed. Seeds of species such as *Acacia* and *Allocasuarina* can be removed by ants, affecting their ability to germinate or even be sampled in seed bank experiments.

New vegetative shoots emerging from Lomandra longifolia, *following fire. Photo by Michael Askey-Doran.*

One important aspect of the seedbank experiment was the difference between the seedbank flora and that occurring above ground. For example, the Buffalo Brook tributary site was dominated by introduced species, whereas the seedbank contained a greater proportion of native species. One native shrub species was recorded at this site yet it did not occur above ground. The Blackman River, which has a mix of native and introduced species, contained a higher proportion of introduced species to natives. These findings have implications when using existing seedbanks to restore riparian vegetation, namely, what is growing above ground may not necessarily be the same as the seed stored in the bank.

What is growing above ground may not necessarily be the same as the seed stored in the bank.

Impact of fire

Many of the species present at the study sites were found to to recover following fire. Plants such as silver tussock and sagg can regenerate vegetatively from their bases, whilst species such as *Eucalyptus* can resprout from epicormic buds under their bark, or at their bases. A transect was used to monitor germination following a burn of part of the exclosure and the control at the Back River. The transects were established directly under a dense line of shrubs adjacent to the river. Following the fire, there was prolific germination of *Acacia*, *Leptospermum*, *Pomaderris* and *Eucalyptus*. The study found, however, that mortality rates were very high, and of the 545 germinants that were first discovered, only 14% were still alive 9 months later. The factors affecting this high mortality rate are grazing (possibly by snails), trampling by stock, and drought.

Some management recommendations

Given the results from this study, it is clear that recruitment and regeneration of native vegetation is affected by many factors. It is a priority, therefore, that areas containing native riparian vegetation in good condition should be protected. It is much more cost effective to protect now than to have to repair later. Continuous access by stock will simply lead to loss of native vegetation and degradation of the stream. It is important to manage their access, excluding them during sensitive periods when plants are setting seed or germinating, or when the soils are too moist and damage is easily caused to the stream or its vegetation. A particularly important time to exclude stock is after a large flood, or if there has been a fire. These large, rarer disturbance events are often triggers for mass germination of species and an opportunity for the vegetation to renew itself.

It is much more cost effective to protect now than to have to repair later.

For further information

Michael Askey-Doran
Department Primary Industry, Water and the Environment
GPO Box 44a
Hobart TAS 7000
Tel: 03 6233 6168
Fax: 03 6233 3477
Email:
michaela@dpiwe.tas.gov.au

CASE STUDY 4

FIRE management in tropical savannas: links between streams and riparian zones

by Michael Douglas

Introduction

Tropical savannas of northern Australia cover approximately 25% of the continent. One of the most striking features of these environments is the very high frequency of fire during the long dry season. For example, in the Top End of the Northern Territory, about half of the savannas are burnt every year. Most of these fires are lit by people, as fire is the most commonly used land management tool in the region. Yet, despite the widespread use of fire, there is surprisingly little known about the effects of fire management on the region's flora and fauna. Previous research has focused on the potential effects of fire management on terrestrial ecosystems, primarily woodland and open forest vegetation. In contrast, very little was known about the effects of burning on riparian or aquatic ecosystems. A project seeking to fill this knowledge gap has discovered some interesting riparian and ecosystem responses to fire.

The Kapalga fire and water experiment

In 1990, CSIRO commenced a catchment-scale experiment at Kapalga Research Station in Kakadu National Park. The aim of the experiment was to examine the effects of different fire management regimes on the savanna ecosystem. A multi-disciplinary team of researchers from CSIRO, as well as a range of government agencies and universities took part in the experiment. A particular focus for the experiment was to see what influence fire management had on riparian vegetation, aquatic plants and aquatic invertebrates.

Between 1991 and 1994, three unburnt catchments were compared against three that had been burnt each year, late in the dry season (from September to October). Each catchment contained a small 'intermittent' stream, which typically flowed from January to June. Because most of the streams in the region dry out completely each year, fires lit late in the dry season usually burn right down to the stream bank and, in some cases, straight across the stream bed.

Riparian vegetation

The experiment found that the riparian vegetation surrounding the streams were very sensitive to late dry season fires. Compared with the burnt catchments, unburnt riparian zones had twice as many species and about three times the density of woody plants. Vines and climbers were also much more abundant and diverse in the unburnt riparian zones, and one of the most common Eucalypts along these streams, *Eucalyptus alba*, set seed in the unburnt catchments but did not flower once they had been burnt. In short, late dry season burning seemed to either kill the woody plants and vines, or reduce reproduction. These results showed that burning of riparian vegetation, late in the dry season, clearly has a detrimental effect. Within the stream itself, however, it was a very different story.

Aquatic vegetation

Probably the most obvious life in these streams are the lilies, wild rice and other aquatic plants that are common in pools at the end of the wet season. The experiment found, however, a dramatic difference between aquatic plants in burnt and unburnt catchments. Streams in burnt catchments contained six times as many different species and over ten times the biomass of aquatic plants. In contrast, it was difficult to find *any* aquatic plants in most of the unburnt catchments.

Aquatic invertebrates

Less obvious than the water plants, are the multitudes of aquatic invertebrates that inhabit these streams. Like the aquatic plants, these tiny animals also seemed to benefit from catchment burning. Throughout the wet season, streams in burnt catchments had 50–100% more species of aquatic invertebrates than streams from unburnt catchments. At certain times of the year, there was also a greater abundance of aquatic invertebrates.

Opposite and overleaf:
Riparian vegetation being burnt (mainly Pandanus spiralis*), Kapalga, Kakadu National Park, Northern Territory. Photos by Michael Douglas.*

FIRE management in tropical savannas

The question raised by these results was why burning caused different patterns of response for riparian vegetation and aquatic biota? One explanation is that aquatic plants respond to the increased light provided when the riparian canopy is reduced following a fire. In addition, the nutrients and sediments that are eroded and washed in from the burnt, more exposed catchments, provide an environment that supports a greater abundance of aquatic plants. Under these conditions, the increase in aquatic invertebrates can be explained because they rely on aquatic plants and leaf litter for food and cover.

The benefits of early dry season fire management

Given the very different outcomes for riparian vegetation and aquatic biota, is late dry season burning or total fire exclusion the best approach to fire management for these streams? The answer now appears to be: none of the above! Instead, research at Kapalga over the last three years indicates that burning *early* in the dry season seems to provide a mixture of desirable management outcomes (see Table 1).

Table 1: Response of biological feature to fire management regime

Biological feature	Fire management regime		
	Unburnt	Early	Late
Riparian richness	High	Med	Low
Riparian density	High	High	Low
Canopy cover	High	Med	Low
Aquatic plant richness	Low	Low	High
Aquatic plant biomass	Low	Med	High

Catchments burnt early in the dry season had riparian zones with similarly high richness of woody plants to that found in unburnt catchments. Riparian tree density, riparian canopy cover and the biomass of aquatic plants in the early burnt catchments was somewhere between the results for unburnt and late dry season burnt catchments. The richness of aquatic plants, however, was as low as it was in unburnt catchments. Overall, therefore, burning early in the dry season seems to be a reasonable trade-off between maximising the benefits for riparian vegetation and aquatic biota.

FIRE management in tropical savannas

For further information

Michael Douglas
School of Biological Sciences
Northern Territory University
Darwin NT 0909
Tel: 08 8946 7261
Fax: 08 8946 6847
Email:
michael.douglas@ntu.edu.au

NB: Michael is in the USA until early January 2000 so use his email address to follow-up the information in this article.

So why do early dry season fires seem to provide some sort of balance?

Preliminary explanations about why early dry season fires seem to provide some sort of balance rest on three main reasons. When fires are lit early in the dry season, they are usually less intense and, therefore, less damaging to riparian vegetation. Secondly, some areas of the riparian zone are still moist enough at the beginning of the dry season to resist burning, and this patchy, low-intensity burning results in these intermediate effects. Finally, areas that have been burnt early in the dry season, also act as fire breaks and reduce the risk of more severe fires burning the riparian zone later in the year.

Of the three fire regimes studied, early burning is also the most practical alternative for managers. Late dry season fires are more difficult to control and may pose a threat to life and infrastructure, while trying to keep areas unburnt is extremely difficult in such a fire prone environment.

Conclusion

Regardless of the fire management regime used, the research undertaken has shown that there is a strong link between tropical savannas, streams and their catchments. Consequently, fire management, which has been traditionally considered a 'land' management issue, has clear implications for the management of riparian and aquatic resources.

RAMBLE DOWN a river and explore river and riparian management with the next generation of managers

Educating Future Generations about river and riparian lands management is a new area of development for LWRRDC. With the help of some experienced educators, Hilary Huggan and Michael Sisley, we are developing an interactive web based *River Ramblers* educational program that uses the LWRRDC River Landscapes poster and Riparian Management Issues Sheets 1–7 as a base from which to explain the ecological, economic, social and cultural importance of rivers and riparian zones in Australia. The material will be developed at a level suitable for learning by primary/secondary students and their teachers and parents.

The first component of the River Ramblers program will be launched during National Water Week, at Aquafest on 20 October 1999. If you would like to explore the *River Ramblers* program, go straight to our terrific new website at www.rivers.gov.au

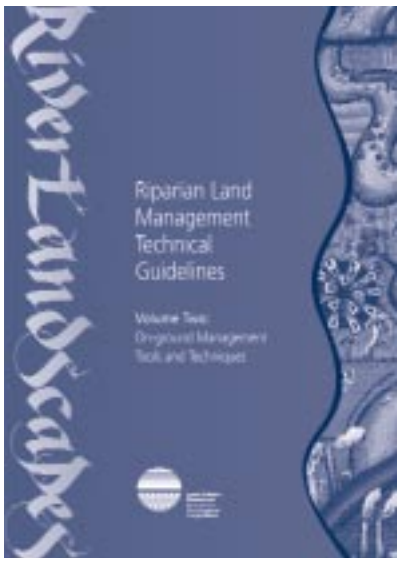
For more information

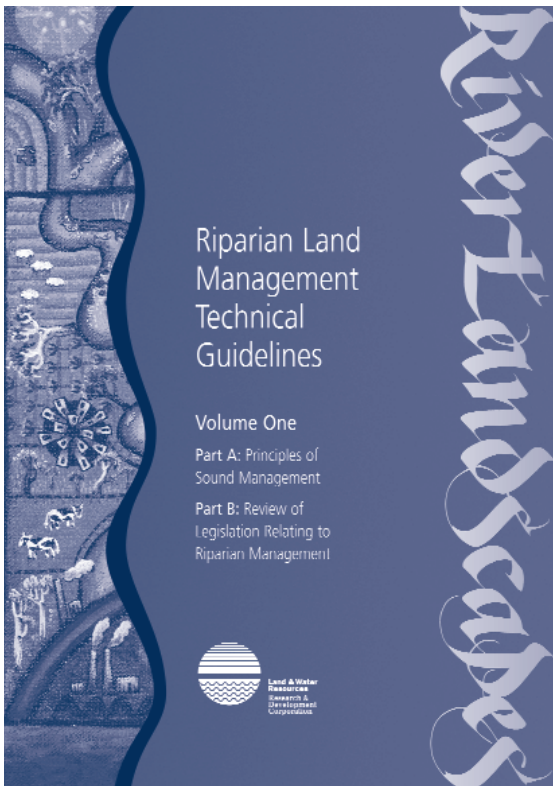
Contact the webspinner Michael Sisley at dreaming@spirit.net.au

For more details on Aquafest and the launch of this site see page 28

A NEW PUBLICATION

that all those involved in riparian lands management will want to have





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 be available from the **end of November 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	Information Centre, Department of Land & Water Conservation 23–33 Bridge Street, Sydney NSW 2000 Tel: (02) 9228 6415 Fax: (02) 9228 6458 Email: infocentre@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.

THE SEYMOUR Back-to-Basics Seminar:
The basics of riparian management

The River Basin Management Society (RBMS) held a Back-to-Basics Seminar in Seymour, central Victoria, on 21 July. The seminar was entitled 'The Basics of Riparian Management' and was developed to provide basic information on riparian management for those who have had little specialised training. In particular, the RBMS was hoping to attract Catchment Management Authority (CMA) staff and Implementation Committee Members, Municipal and Departmental staff as well as those involved in Landcare.

The seminar consisted of 11 presentations, within three sessions. The sessions were

1. Physical Processes and Interactions in the Riparian Zone
2. Elements of a Healthy Riparian Zone
3. Strategic Issues

The seminar proved to be extremely popular with all places filling shortly after the closing date for registration. In total, 130 people attended the seminar, of whom 11 were speakers, and a further 20 people had to be turned away. Those who attended the seminar were a mix of CMA staff (eight of Victoria's nine CMAs were represented), Municipal staff, Landcare representatives, consultants and staff from the Department of Natural Resources and Environment, Victoria, the Department of Land and Water Conservation, NSW and the regional water authorities. Some staff and students from tertiary institutions also attended.

The number of participants attending the seminar, and the range of backgrounds from which they came, indicates a high level of interest in riparian management. It is encouraging that this interest seems to be coming from all levels of management, that is, from the grass roots (Landcare) through to local and State Government levels. An evaluation sheet was handed out on the day and a preliminary analysis of the completed surveys indicates that, in general, most of the participants found the seminar informative and stimulating.

Given the level of interest generated by the seminar and the fact that a number of people had to be turned away, the RBMS is proposing to re-run the seminar in the first half of 2000. The seminar will, however, only be re-run if there is sufficient interest, so we are asking for all those who would be interested in attending a repeat of 'The Basics of Riparian Management' Seminar to register their interest by contacting either Jennifer Davis or Wayne Tennant as soon as possible.

Finally, the seminar organisers and the RBMS would like to thank all those who attended the seminar, particularly the speakers, the majority of whom are RBMS members. The seminar organisers and the RBMS would also like to thank the seminar sponsors: the Goulburn–Broken CMA, the North East CMA, the East Gippsland CMA, the West Gippsland CMA and the Department of Natural Resources and Environment, Victoria.

For further information and to register your interest in attending a re-run of the seminar

Jennifer Davis
Department of Civil and Environmental Engineering
University of Melbourne
Parkville VIC 3052
Tel: 03 9344 9792
Fax: 03 9344 6215
Email: j.davis@civag.unimelb.edu.au

OR

Wayne Tennant
Goulburn-Broken CMA
PO Box 1752
Shepparton VIC 3632
Tel: 0417 503 436
Fax: 03 5831 6254
Email: waynet@gbcma.vic.gov.au

The River Basin Management Society was established to "advance a balanced approach to land, water and natural resource management on a catchment basis". It does this by being open to all involved or interested in its aims; holding conferences on topics relevant to its aims; publishing a regular newsletter; assisting students undertaking research work at honours and post-graduate levels; assisting in information gathering and dissemination; supporting a non-profit foundation; and being an independent body of opinion.

River Basin Management Society Inc.

A LAY PERSON'S GUIDE

to your catchment management internet discussion list

Do you want to get the most recent information on Integrated Catchment Management (ICM) from around the world? Well, why don't you join and contribute to ICM-L, the River Basin Management Society supported internet discussion list.

How does it work?

Basically this is a service that allows you to submit a message to all list members, now about 350 worldwide, by sending a message to one email address icm-l@vicnet.net.au You have to be a member to send and receive messages.

What happens on the list?

ICM-L is an internet mailing list designed to facilitate communication between scientists, managers, farmers, recreationalists, fishers and practitioners in the area of Integrated Catchment Management, internationally. ICM is a holistic approach to natural resource management of land and water. It aims to integrate the various scientific, engineering, management and practical disciplines to enable sustainable management of the land and water resources within a catchment. ICM is based upon the concept that a catchment or river basin is the smallest geographic unit that can be managed holistically. This list will also be used to keep RBMS members informed on current ICM and Society issues. Unlike other lists you will not be inundated with messages and you can log off at any time if you wish.

How do I join?

Simply send this message to: majordomo@vicnet.net.au - subscribe icm-l@vicnet.net.au <lancelloyd@ozemail.com.au> <put your email address in rather than Lance's>

How do I use the list?

All you have to do is send a message to one email address: icm-l@vicnet.net.au Remember that if you do not contribute at all, it is unlikely that others around the world will continue to use the list. In other words, **use it** or **lose it**! So please send an introductory message to the list with some information about your interests in Integrated Catchment Management and, if possible, pose a question or idea for others to respond to!

If for any reason you wish to unsubscribe: Send the message below (in the body of the message **not** the subject line) to: majordomo@vicnet.net.au - unsubscribe icm-l@vicnet.net.au <your email address>

Help?

If you need help in joining up, please contact me by

1. Email at rbms@vicnet.net.au and indicate your request.
2. Visit the RBMS website at www.vicnet.net.au/~rbms for specific help.

For further information

Lance Lloyd, Lloyd Environmental Consultants
PO Box 3014, Syndal VIC 3149
Tel: 03 9884 5559, Fax: 03 9886 6902
Email: lancelloyd@ozemail.com.au

THE MURRAY–DARLING

Basin-wide Salinity Audit

MURRAY·DARLING BASIN COMMISSION

As a result of land and water management changes introduced over the last 150 years, many rivers and considerable areas of land in the Murray–Darling Basin will become significantly more saline in coming decades. A Basin-wide salinity audit, with predictions for the next 20, 50 and 100 years, will be published by the Murray–Darling Basin Commission in late October 1999. Based on the findings of the Audit, a draft salinity management strategy will be submitted to the Murray–Darling Basin Ministerial Council in mid 2000.

Unlike other regions in Australia, the Basin's salinity strategy will focus particularly on measures designed to reduce salinity impacts on water quality. There is surprisingly little information available regarding the environmental impacts of increasing salinity on freshwater ecosystems. However, the research that has been done indicates that the impacts are often significant and sometimes devastating. Given the importance of riparian vegetation in influencing sub-surface water flows and, thus, the quantity of nutrients, salt and other contaminants, the results of the audit and the consequent strategy should contain information about how best to use our riparian lands to minimise salinity impacts.

For further information

Daniel Connell
Murray–Darling Basin Commission
GPO Box 409
Canberra ACT 2601
Tel: 02 6279 0100
Fax: 02 6248 8053
Email: daniel.connell@mdbc.gov.au

It's a WRAP

Editor's note
All States and Territories are encouraged to provide articles for It's a Wrap. If your State or Territory is missing it is because they did not contribute to this edition.

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 Queensland, page 26.

Tasmania

Evaluation of rivercare planning shows positive benefits

In Tasmania, community groups seeking Natural Heritage Trust funds to do river works are required to develop detailed Rivercare Plans before conducting on-ground works. Tasmania is the first state to introduce this as a condition of funding. A Rivercare Technical Panel reviews the plans and, once approved, they can be implemented using NHT funding. Groups are required to enter into a formal on-going maintenance scheme as part of the plan. Guidelines were produced to assist groups develop their plans. The *1998 Guidelines for Planning Rivercare Projects in Tasmania* outlines a ten-step process to constructing a Rivercare Plan.

In March and April 1999, the Tasmanian Natural Heritage Trust Evaluation Team conducted a review to find out how groups were coping with the task of preparing plans. A representative sample of 20 community groups participated in the review.

The review found that all groups had some positive experiences in developing their plans and had gained some benefits from the process. Groups overwhelmingly supported the requirement to develop a Rivercare plan before conducting on-ground works. Most people interviewed believed it was essential. Benefits from preparing Rivercare plans included

~ The community groups had a planned approach with agreed priorities that would guide them for many years to come.
~ The planning process resulted in more people participating and those involved had a better understanding of issues to do with rivers.
~ The Rivercare plans provided a baseline from which to measure progress and achievements.
~ The planning process helped groups to consider, and seek advice on a broad range of river issues, not just river engineering.
~ Groups found the technical advice they received useful, and appreciated the assistance they received from coordinators and consultants.

Nearly all groups found the planning guidelines helped them prepare their Rivercare plans. Writing such plans is not necessarily something they would normally do, and the guidelines outlined what was required and provided contact details of people who could assist them with technical advice and support.

It is not surprising that the review also found that every community group had experienced some problems along the way. Some of the difficulties encountered were finding the time it took to develop a plan, hold-ups in funding, getting assistance and technical advice when it was needed and getting their plans approved in an appropriate time frame. Another problem was that there were not enough technical experts in Tasmania to provide advice to the increasing number of groups needing such advice, especially in river engineering and geomorphology.

The Rivercare planning process and supporting groups' efforts have been evolving over the last two to three years. Improvements such as developing and revising the planning guidelines and improving the way technical support is provided, have been, and continue to be made. The review identified some critical issues that are now being addressed to help achieve the best possible outcomes from the investment of people's time and expenditure of Natural Heritage Trust funds. The issues being addressed are

1. Improving communication so information from all sources to community groups is consistent and there is a clear line of contact with managers of the approval process.
2. Raising the awareness of community groups and support staff about all aspects of

For further information

Max Giblin
Land and Water Resources Management Branch
Department of Primary Industries, Water and Environment
GPO Box 192B
Hobart TAS 7001
Tel: 03 6233 3347
Fax: 03 6234 7559
Email: max.giblin@dpiwe.tas.gov.au

AUSTRALIA
Natural Heritage Trust
Helping Communities Helping Australia

New South Wales

Wingello Creek riparian rehabilitation project

A small remnant of rainforest along Wingello Creek has been saved from urbanisation by its Department of Education Crown Land title. This remnant has managed to retain a high level of biodiversity and is utilised by the community as an access thoroughfare. The upper catchment has been protected under Gosford City Council's Open Space System and, in between, is managed as a Flooding and Drainage Reserve — an open grassland swale. However, stormwater has impacted heavily on the quality of the water, and bank erosion is clearly depositing sediment into Narara Creek and the Brisbane Water.

The Central Coast Riparian Rehabilitation Project is engaging community support for a restoration project which will see these two areas linked using indigenous vegetation grown from seed provenance. It is hoped to reclaim some of the other values of the creek, for example, its role as a wildlife corridor, fish nursery, aesthetics and nutrient and sediment filter etc. The project was launched at Wyoming's Maiden's Brush Primary School on the banks of Wingello's turbid creek.

Project manager Diane Warman, was overwhelmed by the success of the day which saw community residents, school and stakeholders come together despite heavy rain. A local aboriginal artist and educator healed the rainforest with a song and talked about the indigenous values of the creek. Central Coast Waste Board and Australia and New Guinea Fish Association and National Parks and Wildlife Service, Council's Stormwater Project Officer gave demonstrations. The project secured volunteer commitment for bush regeneration, a Plan of Management and Water Quality Monitoring to fulfil short-term objectives for community awareness.

The project's main aim is to integrate the work of Council, State Government, regional, community, school and universities, with a high level of community involvement. Results will be used in case studies for State of the Environment reporting, Regional Biodiversity studies, and school catchment studies.

For more information

Diane Warman
Project Manager
Central Coast Community Environment Network
University of Newcastle
PO Box 127
Ourimbah NSW 2258
Tel: 02 4349 4491
Fax: 02 4324 7374
Email: dwarman@tac.com.au

Open grassland swale. Restoration site at Wingello Creek. Photos by Diane Warman.

Tasmania continued

Rivercare projects and, in particular, the Rivercare plan approval process and the formal maintenance schemes available. In addition, local government needs to be better informed about formal river maintenance schemes.

3. Creating a greater understanding of the plan approval process by getting everyone involved and structuring the process to ensure timely responses and consistent procedures.
4. Overcoming the current lack of technical support available, specially in river engineering and geomorphology. While more resources are ultimately needed, the current resources are being reviewed to make them more efficient and effective.

The outcomes from Rivercare planning is that community groups in Tasmania are implementing Rivercare projects that are well thought out, planned, prioritised and supported by the community. The maintenance schemes put in place will ensure that the investment of people's efforts and money expended will not be wasted.

Water resource environmental planning

The Queensland Government set up a Task Force in 1996 to identify and prioritise potential water infrastructure planning and development projects to 'support economic development'. After due consideration, the Queensland Government endorsed the 'Water Infrastructure Planning and Development Implementation Plan' (WIPDIP) for which the Department of Natural Resources (DNR) has responsibility.

To provide greater planning certainty and assist a more regional, integrated and proactive approach to decision making, the Environmental Protection Agency (EPA) has entered into a service agreement with DNR to provide information and plans for the complementary conservation of ecological, geomorphological and cultural resources of relevance to water resource and associated developments. As part of this process, the Water Resource Environmental Planning Program (WREP) was formed within the EPA, with this Program working in conjunction with DNR.

WREP's environmental planning tasks and goals include

- ~ providing information to DNR to assist in assessing the impacts of water infrastructure and associated development proposals on instream, riparian and terrestrial values
- ~ identifying criteria for defining the sustainability (including limits of acceptable change) of aquatic, riparian, terrestrial and cultural heritage systems impacted by development proposals
- ~ assessing the effectiveness of methods of mitigating the impacts of water infrastructure and associated developments, activities and operations
- ~ developing techniques and conservation strategies that could be used to compensate for unavoidable impacts and to complement development strategies
- ~ developing strategies for evaluating the conservation values and priorities of Queensland's waterways.

As part of this planning process a number of tools are being developed. These include strategic planning tools, as well as tools that can be used in the development of conservation strategies. These 'conservation tools' will provide a sound technical basis for the strategic planning tools.

Walla Weir, Burnett River. Photo courtesy of the EPA.

A: Strategic planning tools

The WREP team, in conjunction with DNR, are developing an environmental assessment strategy to guide the planning and impact assessment processes for water resource and associated developments. The strategy comprises both a strategic level and project specific level of environmental impact assessment. Strategic assessments at the planning stage form the basis of a holistic approach to water infrastructure development assessment. They allow project options within WIPDIP's catchment planning studies to be comparatively assessed, resulting in a listing of preferred development options. They also allow for the assessment of potential cumulative effects of multiple infrastructure developments. This process is most advanced in the Burnett River catchment where there are more than 50 individual water infrastructure projects proposed (ranging from small weirs to large dams). Similar catchment studies are currently being progressed for the Fitzroy, Burdekin, Upper Herbert, Cairns/Atherton Tableland and Gulf regions of Queensland. The strategic level of assessment also focuses further survey and assessment programs to address project specific impacts.

A guideline is also being developed for evaluating the ecological sustainability of water infrastructure development proposals (including ecological, cultural heritage, geomorphological and human amenity issues) at catch-

ment and project levels. This evaluation guideline will be used to aid decision-making. At the strategic, catchment study level, criteria in the guideline are being trialed through input into DNR's process of evaluating development options. DNR is also trialing a multiple objective decision support system (MODSS) for the evaluation of preferred options. This process involves the ranking and scoring of criteria relevant to environmental, economic, social, cultural, engineering and hydrological aspects of projects. The prioritising of projects is then undertaken by using the MODSS in consultations with affected stakeholders. This process aims to optimise the use of resources and time involved in subsequent stages of assessment and project decision making. Related to this evaluation guideline is a guideline for determining information requirements for impact assessment relating to water infrastructure development at catchment and project levels. The guideline will be of use in developing Terms of Reference for studies.

A guideline for assessing the sustainability of water infrastructure proposals is also being planned and will be used, along with the evaluation guideline, in aiding the decision making process.

B: Conservation strategy tools

The WREP team aims to proactively work with DNR to develop conservation strategies that complement DNR's development strategies. Tools for determining conservation values of rivers, including methods for classifying rivers, are being developed to assist the development of conservation strategies. A trial is being undertaken to determine the conservation values of the Burnett River. The trial classification of stream types will be based on ecological, geomorphological and physical attributes at a range of spatial and temporal scales. It aims to utilise ecologically meaningful attributes including both pattern (for example, species distribution and abundance) and process (for example, nutrient cycling) attributes. The classification will allow the identification of uniqueness and representativeness of stream types throughout a catchment and will aid in the identification of reference sites. The delineation of conservation value of stream sections will trial the use of similar types of attributes as for the classification (but differ in the specific measures used). The conservation values address the principles of biodiversity, uniqueness, role in supporting rare and threatened species, condition and naturalness.

A GIS tool for querying conservation value of particular stream sections, along with data and decision rules used to derive values will be produced as part of this project. The project is based on existing information but will ultimately be capable of incorporating new information. The project also aids in determining data deficiencies and provides a sound technical base to maximise the efficiency of the planning tools discussed above. To support this work, a guideline is being developed for the evaluation of conservation values that includes ecological, geomorphological, cultural heritage values and human amenity issues and utilises reference sites as a comparative measure.

If successful, this method could ultimately be used to determine the conservation value of all rivers throughout Queensland.

For further information

John Bennett or Ngaire Phillips
Environmental Planning
Environmental
Protection Agency
160 Ann Street
Brisbane QLD 4000

John Bennett
Tel: 07 3227 6453
Fax: 07 3227 7237
Email:
john.bennett@env.qld.gov.au

OR

Ngaire Phillips
Tel: 07 3225 1740
Fax: 07 3227 7237
Email:
ngaire.phillips@env.qld.gov.au

Australian Capital Territory

Aquafest — raising community awareness through experiential learning

Aquafest provides the main focus for National Water Week celebrations in the ACT. National Water Week is 17–23 October and Aquafest, which is held on 20 October, uses "learning by experience" to promote the message of "protect, conserve and get involved". Hands-on activities relating to water issues are presented in the hurly burly of a festival atmosphere, with the emphasis being on participation and enjoyment. The aim of Aquafest is to encourage changes in community behaviour ultimately leading to healthier waterways.

The festival is now in its sixth year and is held at Lake Tuggeranong College. Aquafest 99 is being organised by the College, Waterwatch and Environment ACT, and is supported by an ACT Environment Grant. The target audience for Aquafest is students from Year 5 to Year 10, although students outside this age group and the general community are encouraged to attend. About 1700 students, and members of the community participate in Aquafest each year.

The staging of the event is a collaborative venture between the education, government, research and corporate sectors, and draws on their combined expertise and resources. It brings together water managers, water providers, researchers and environmental groups with schools and community-based organisations. Aquafest 99 will include displays from local business, anglers associations, ACT Waterwatch, ACT Parks and Conservation, CSIRO, LWRRDC, Australian National University Centre for Resource and Environment Studies, Canberra South Region Environment Centre and many others.

A Resource Kit, which describes each display, suggests pre and post Aquafest activities, provides worksheets for the displays and teacher and student evaluation sheets, is delivered to each participating school prior to the event. This gives teachers the opportunity to include preparation for Aquafest in their curriculum and to choose suitable activities and worksheets for their particular group. The Resource Kit facilitates the inclusion of water related studies in the school curriculum and ensures that Aquafest is more than just a one day event. In addition, a number of schools have joined Waterwatch and other environment programs as a result of attending Aquafest.

Students, teachers and exhibitors are asked to assist in the evaluation of the festival. This provides the organisers with both positive feedback on things which work, and also ways in which Aquafest can be improved. These evaluations provide the basis for between year comparisons and also help the organisers to come up with innovative ideas to keep Aquafest a lively and interesting occasion.

For more information

Louise Backhouse
ACT Waterwatch Facilitator
Environment ACT
PO Box 144
Lyneham ACT 2602
Tel: 02 6207 2246
Fax: 02 6207 6084
Email: louise_backhouse@dpa.act.gov.au

School children participating in Aquafest activities. Photos courtesy of ACT Waterwatch.

Victoria

Victoria's state fishway program

Provision of fish passage is a key component of maintaining healthy rivers. A report commissioned by the Victorian Government has identified 2500 barriers that potentially restrict fish movement and migration in Victorian rivers and streams. Constructing fishways across these barriers can increase the amount of available habitat and provide renewed access to critical spawning and habitat areas. In this way the provision of fishways considerably aids the conservation of native fish.

Victoria's State Fishway program was officially launched on 11 August 1999 at the Bromfield Street Weir in Warrnambool by the Deputy Premier and Minister for Agriculture and Resources, Patrick McNamara. This weir on the Merri River is just one of a total of 34 barriers on which fishways have been constructed in Victoria over the past three years. A further 56 fishways will be completed in the next two years.

Basic monitoring is conducted following the construction of fishways. It has been observed that a rock fishway on the lower Barwon River allowed in excess of 10 000 native fish to pass upstream in a single night. It seems apparent therefore, that even relatively simple and inexpensive structures can be highly effective and often result in almost immediate benefits to the waterway and its users. The Department of Natural Resources and Environment recognises that long-term monitoring of fishway use will be necessary in the future.

It is not only the Department of Natural Resources and Environment that has funded and constructed fishways in Victoria. Catchment Management Authorities and Melbourne Water have already contributed substantially to the success of the State Fishway Program. It is envisaged that, in future, Catchment Management Authorities will play an increasing role in maintaining and improving fish passage as part of their integrated catchment-wide programs.

It is estimated that the efforts of the State Fishway Program have already made thousands of kilometres of additional habitat available to native fish. While fishways will continue to be progressively installed on priority rivers, it is also important that existing migratory pathways be protected. In the future, dams, weirs and culverts will be constructed so that they do not obstruct the movement of native fish.

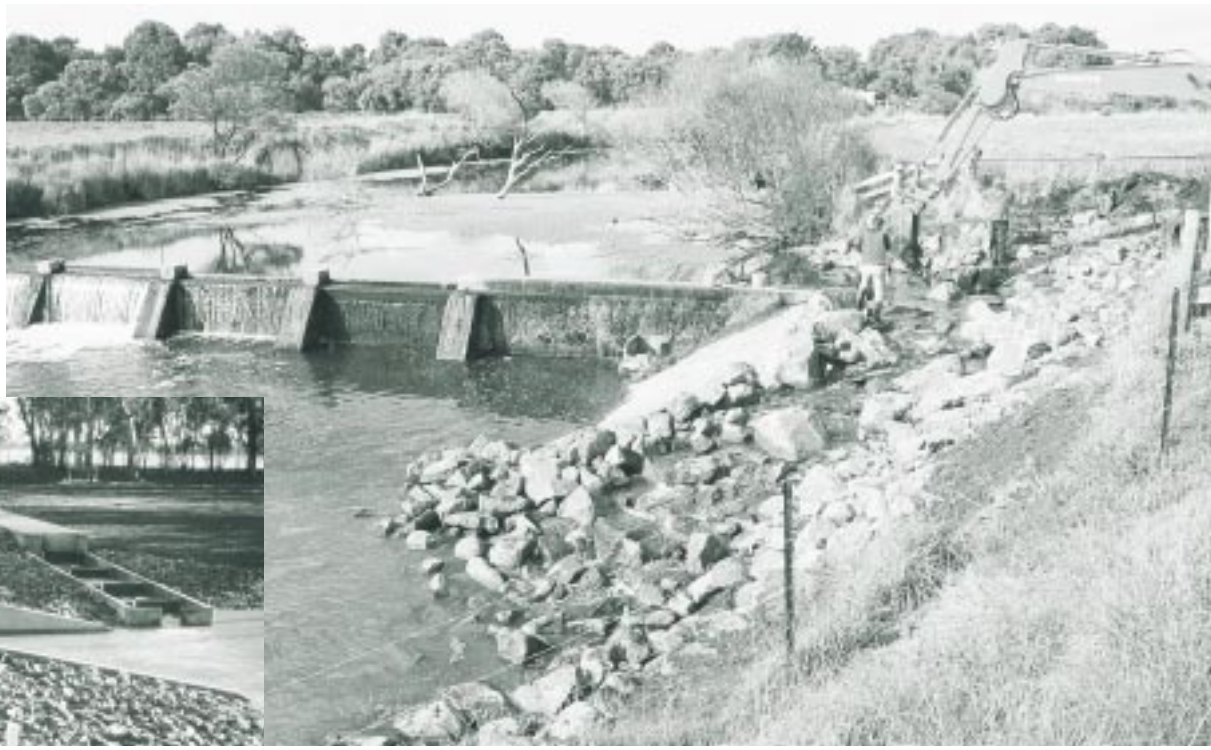
For more information contact

Paul Bennett
Program Leader,
Environmental Flows
Department of Natural
Resources and Environment
1/240 Victoria Parade
East Melbourne VIC 3002
Tel: 03 9412 4050
Fax: 03 9412 4049
Email:
Paul.Bennett@nre.vic.gov.au

OR

Tim O'Brien
Freshwater Ecology
and Research
Department of Natural
Resources and Environment
Arthur Rylah Institute
123 Brown Street
Heidelberg VIC 3081
Tel: 03 9450 8633
Fax: 03 9450 8730
Email:
Tim.O'Brien@nre.vic.gov.au

Right: *Bromfield Street Weir, Merri River.* ***Below:*** *Kennedy's Weir, Broken Creek. Photos: Tim O'Brien.*



How to apply for rivercare funding — some handy hints

Each year, a number of applications seeking funding for projects under the Natural Heritage Trust are rejected or returned for clarification. Since the Trust began three years ago, the standard of applications and the assessment processes at regional and State levels have improved markedly. However, as applications for funding always exceed the level of funds available, it is important that applicants put forward the best possible case to support their projects, using the Trust guidelines to best effect and completing the application form accurately.

Recently, a series of five seminars were organised by the Western Australian Department of Agriculture to explain the application process to people in pastoral regions. With new Trust guidelines about to be issued, the seminars were most timely and well received by the 40 or so people who attended.

The seminars began with some general information on what the Natural Heritage Trust is and what it is trying to achieve, and then went into some detail about what activities are eligible. This information is covered in the guidelines but, basically, there are five criteria for Trust funding. These are that the project

1. will lead to long-term on-ground improvements in the management of the environment and natural resources
2. represents good value for tax-payers' money
3. is feasible and technically sound
4. does not replace activities that would normally be the responsibility of the applicant, or are more appropriately funded by others
5. contributes the level of funds required to match investment from the Trust and has strong community support.

At the seminars, the most important tip to putting in a successful application was to get early advice from facilitators and coordinators about your project and its eligibility. It was found that projects went through the assessment process more smoothly when people asked for early feedback on projects and incorporated that feedback into the project they submitted.

This aspect cannot be stressed enough. If you don't know who your facilitator or coordinator is, you can call your State Natural Heritage Trust contact to find out. If you are unable to do this, you can complete your application up to question 10 and send it to your State Natural Heritage Trust contact. The form will then be sent to the applicant's local facilitator or coordinator who will provide assistance in developing the project, particularly in relation to its objectives, eligibility, work program and monitoring and evaluation. The aim is to provide a safety net for applicants who are not experienced in developing Trust projects. You will find more details on this process in the *Guide to New Applications 2000–2001*.

More information on the COAG water reform framework can be found at the internet address: http://www.affa.gov.au/water-reform

More information on the National Water Quality Management Strategy can be found at: http://www.affa.gov.au/nwqms

The State priorities are found in the NHT partnership agreement for your State at: http://www.nht.gov.au/partnership/index.html

For regional priorities, or reference to the documents containing regional priorities, use the Supplementary State Information booklet which is sent out with the NHT Guidelines or can be obtained from your State NHT contact officer.

Getting feedback on your proposal is voluntary, and will not necessarily guarantee the success of your project, but it is a suggestion to ensure that you don't do a lot of work on your application only to find you have been on the wrong track. Feedback may suggest, for example, how a project needs to be altered for it to be eligible. It would be up to you to decide whether

For more information

Andrea Mayes
Manager Rivercare Program
Agriculture Forestry Fisheries – Australia
GPO Box 858
Canberra ACT 2601
Tel: 02 6272 3932
Fax: 02 6272 4526
Email: rivercare@affa.gov.au

Natural Heritage Trust
Helping Communities Helping Australia

to make changes, but the project would still have to compete on its merits in the One-Stop-Shop process.

Another tip is to explain how your project fits into national, State and regional priorities. The national priorities for Rivercare are the Council of Australian Governments (COAG) water reform framework and the National Water Quality Management Strategy. The major elements of the COAG water reform framework are water pricing — based on the principle of full cost recovery, provision for water entitlements and the trading of those entitlements, environmental requirements, institutional reform, public consultation and education and research.

Overall, Rivercare projects need to focus on activities that

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

There are also three questions that need to be answered in relation to Rivercare projects under the question on activity details.

1. Upstream activities — Will activities upstream from the site of your project jeopardise achievement of your project objectives?
2. Downstream impacts — Will your project contribute to better river management or water quality downstream?
3. Will your activity contribute to new problems downstream, for example added pressure on infrastructure due to changed flow regimes?

A simple yes or no answer to these questions is not enough. In the question about upstream impacts, the assessment panels are looking for evidence that you are aware of what is happening in your catchment. For example, if there is massive erosion upstream and you are stabilising the banks and revegetating the river, you would need to outline how you are going to make sure that the erosion occurring upstream does not impact on your project. The question about downstream impacts is equally important. For example, if you are pulling out willows or doing major works in the river there could be a substantial amount of erosion downstream, and your application would need to explain how you are going to control this erosion.

This year's guidelines should be easier to follow, with an improved layout, including an index, and simplified text using plain English. The Guidelines will be available from your State or regional Trust contact or you can call 1800 803 772. There are plenty of people who will help you develop your project at a local, regional, State and National level. The sooner you get started the more time you'll have to get advice from people to make your project one of the successful ones.

The Guidelines will be available from your State or regional Trust contact or you can call 1800 803 772. There are plenty of people who will help you develop your project at a local, regional, State and National level.

NATIONAL LAND AND WATER RESOURCES AUDIT:

Riverine Vegetation Mapping

The National Land and Water Resources Audit has commissioned a National Review of Riverine Vegetation Mapping. The Review is to include the preparation of a Position Paper outlining practical approaches to determine the extent and integrity of riparian vegetation and summarising current metadata on riparian mapping on a State-by-State basis. The Position Paper is to be prepared in consultation with an External Specialist Panel and key stakeholders and data custodians in each State and Territory. It will form the basis for discussions at the National Riverine Vegetation Mapping Workshop, the goal of which is to obtain consensus on methods for mapping riparian vegetation at a nation-wide scale. The scope of the Review related specifically to the extent and classification of vegetation along creeks, streams and rivers across Australia. The next edition of RipRap will provide an overview of the findings of this important review.

For further information

Dr Ian Cresswell
National Land and Water Resources Audit
GPO Box 2182
Canberra ACT 2601
Tel: 02 6257 9516
Fax: 02 6257 9518
Email: ian.cresswell@nlwra.gov.au

National Land & Water Resources Audit

RIPRAP

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

Clip or copy this coupon ☛ and return to

Dr Siwan Lovett,
LWRRDC Program Coordinator
River Restoration
and Riparian Lands
Land and Water Resources
R&D Corporation
GPO Box 2182,
Canberra ACT 2601
Tel: 02 6257 3379,
Fax: 02 6257 3420
Email: public@lwrrdc.gov.au

Some LWRRDC publications are available from the AFFA Shopfront situated in the Edmund Barton Building, Core 2 Entrance (off Blackall Street) Barton ACT 2601
Tel: 1800 020 157

Disclaimer

☐ Would you or a colleague like to be on our mailing list for RipRap or other LWRRDC newsletters?

Your name: Mr, Mrs, Ms, Dr (please circle) First name: .....

Surname .....

Position: .....

Organisation: .....

Postal address: .....

..... State ..... Postcode .....

Tel: ..... Fax: .....

Email: .....

Suggest a theme for future issues: .....

.....

☐ Riparian Management Issues Sheets ☛

currently being reprinted but available at www.rivers.gov.au

☐ Yes! Please put me on the mailing list for the following LWRRDC R&D newsletters:

- ☐ *RipRap* — Riparian Lands Management
- ☐ *Waterwheel* — National Irrigation R&D Program
- ☐ *Intersect* — LWRRDC general newsletter
- ☐ *Focus* — Dryland salinity
- ☐ *Rivers for the Future*