

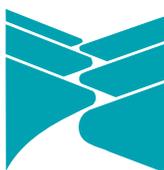
# Rivers

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## Native Fish Habitat Rehabilitation and Management in the Murray-Darling Basin

# *Native Fish Habitat Rehabilitation and Management in the Murray-Darling Basin*

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*Statement, recommendations  
and supporting papers*

*Workshop held in Albury, NSW,  
10–11 February 2004*

*Mark Lintermans  
Peter Cottingham and  
Ruth O'Connor (editors)*

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# Statement and General Recommendations

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## Introduction

1. We, the participants of the workshop on Fish Habitat Rehabilitation and Management in the Murray-Darling Basin, held in Albury on 10–11 February 2004, and representing a range of stakeholders, professions and interests, call upon the Commonwealth and State and Territory Governments and other agencies, community groups and those with an interest in the management and rehabilitation of aquatic ecosystems to receive, adopt and support the following statement and recommendations arising from consideration of expert papers and discussions.

## Summary

2. Aquatic systems of the Murray-Darling Basin are complex and diverse, incorporating rivers, lakes, floodplains, wetlands, ephemeral water bodies, and groundwater systems, all of which may serve as important habitat for native freshwater fish. Aquatic systems vary through time and from place to place, and their boundaries are often difficult to define. Furthermore these systems do not act in isolation, but reflect changes in adjacent terrestrial environments. Consequently, aquatic systems cannot be independently partitioned from their terrestrial counterparts. The maintenance of functioning wetland and floodplain habitats was recognised as a critical element to sustaining in-channel fish populations. However, a comprehensive review of the management and research needs of wetland and floodplain habitats was beyond the scope of the workshop, which largely concentrated on the management and rehabilitation of in-channel or riparian habitat. It is recommended that the management and rehabilitation of wetland and floodplain habitats in the Murray-Darling Basin be the subject of a future workshop, to allow full consideration of the issues, techniques and solutions that are available for these habitats.

3. Habitat degradation is one of the greatest threats to freshwater aquatic systems in Australia, and a concerted effort is required to prevent further degradation and to rehabilitate river systems. The protection and restoration of native fish habitats is a priority if the decline in native fish communities in the Murray-Darling Basin is to be reversed. There have been substantial advances in our understanding of the habitat requirements of native fish species, and in the techniques available for rehabilitating specific fish habitats that will assist this endeavour.
4. We now recognise instances where historical river and catchment management works have been to the detriment of both the quantity and quality of aquatic (including riparian) habitats. However, work over recent decades by State and Commonwealth agencies and community groups has now developed adequate frameworks to guide rehabilitation activities. Further loss of aquatic habitat is unacceptable, and agencies and other stakeholders must be proactive in protecting existing high quality habitats, and work towards rehabilitating or enhancing stressed aquatic habitats. Management and rehabilitation of aquatic habitats should not just be viewed as a 'fish' issue, but must be considered in the broader context of catchment and natural resource management.
5. Strategic frameworks are required to promote coordinated and integrated stakeholder input to aquatic habitat management and restoration. Some States have developed frameworks to guide future rehabilitation activities. However, some Basin jurisdictions still lack these strategic frameworks. Framework development is considered to be a priority.
6. The rehabilitation of habitat, and restoration of native fish communities across the Basin, will require long-term commitment by agencies, governments and community stakeholders, including indigenous communities. Conservation and rehabilitation of fish habitats cannot be secured by government agencies alone, and the workshop recognised and acknowledged that the full range of stakeholders must be clearly identified and involved from the inception of habitat management and rehabilitation programs.



7. The workshop recognises that while there have been many examples of work to rehabilitate native fish habitat in recent decades, monitoring of the physical and biological outcomes has been limited. It has been estimated that well designed monitoring and evaluation components of a project may be 7–10 times the cost of actual physical works (Rutherford *et al.* 1999, 2004). It was recognised at the workshop that only a limited number of rehabilitation projects are likely to have sufficient resources available for high quality monitoring and evaluation programs. It was also recognised that under-resourced programs that adopt sub-optimal experimental designs, inappropriate timescales or geographic scales, inappropriate response indicators (or all of these) may consume an inordinate proportion of project resources but deliver little useful information. It is better to monitor a few interventions well, than all interventions poorly. High priority should be given to evaluation and reporting when a project is likely to generate knowledge that can inform or be adopted for habitat rehabilitation elsewhere.



## *Specific recommendations arising from the workshop*

The following specific recommendations have been formulated to guide future habitat rehabilitation and management actions. Recommendations 1–13 and 18 apply generally to habitat management and rehabilitation programs (including demonstration reaches), while recommendations 14–17 apply specifically to demonstration reaches, as proposed in the Native Fish Strategy (NFS) and the NFS Investment Plan.

### *Protecting aquatic habitats*

While many aquatic habitats are degraded, some are in a relatively healthy condition. It has been well documented that the cost of rehabilitating degraded habitats exceeds the cost of protection by several orders of magnitude (Balmford *et al.* 2002). Further degradation of aquatic habitats is, therefore, unacceptable on economic as well as ecological grounds. Some jurisdictions have commenced inventory programs to gather information on the diversity and status of aquatic habitats, but significant knowledge gaps exist for large areas of the Basin.

1. A Basin-wide inventory of fish habitats and their condition is urgently required if priority areas for protection or investment are to be identified.
2. Habitats in good condition should be identified and protected from further degradation.

### *Managing rivers holistically*

There has been a tendency in the past to manage terrestrial systems and aquatic systems separately, and to manage components of aquatic habitat (e.g. wetlands, snags, flow) independently.

A more holistic approach to river management requires recognition of the links between adjacent habitats as well as the links between adjacent land uses and their potential impacts on aquatic habitats.

3. Management of freshwater ecosystems should be incorporated into catchment management planning (where this has not already occurred) to provide better coordination in natural resource management.

4. Habitat degradation is only one of a number of threats facing aquatic biota. The workshop participants emphasised the need to address multiple threats within a river reach simultaneously, thus improving the likelihood that management interventions would have positive results in the shortest possible time.

### ***Involving the stakeholders in protecting and restoring rivers***

If habitat rehabilitation is to be successful in the long term, stakeholders need to be informed and engaged about the current condition, threats, values and potential management options. Information sharing between all stakeholders is essential, and it was recognised at the workshop that community stakeholders possess a considerable appreciation of how aquatic systems have changed through time. The workshop recognised that there are a number of existing networks through which information on aquatic habitats can be disseminated, and that such networks should be used and promoted. More specifically the workshop recommended the following:

5. Social science and communication specialists should be consulted on the best methods for disseminating information and encouraging stakeholder participation, and the use of extension officers in native fish habitat programs should be investigated.
6. A comprehensive education and information-sharing program needs to be developed, which clearly identifies target groups, partners and messages, and also provides information on the diversity, current threats and management options available for aquatic habitats across the Basin.
7. Stakeholders should be included in the process of defining the value of aquatic habitats, current threats and potential solutions. Simple, small coordinated community activities can play a large part in halting and reversing habitat decline.

### ***Building knowledge and capacity for integrated management of aquatic habitats***

The general requirement for holistic management of aquatic habitats is often impeded by inappropriately short timeframes for collecting information, or by perceived quick fixes such as fish stocking. Holistic management of aquatic

habitats will be enhanced if rehabilitation programs have ready access to relevant ecological information and restoration guidelines, are adequately resourced and have wide and ongoing stakeholder support.

Habitat rehabilitation in Australian streams is a relatively new field with few precedents. Adoption of an Adaptive Experimental Management (AEM) approach to habitat rehabilitation provides an opportunity to 'learn by doing' and so extend the knowledge base from which we can make management and rehabilitation decisions. AEM encourages the setting of specific hypotheses that may be tested by rehabilitation projects. Implicit in the AEM cycle (see Figure 2 in Koehn (this proceedings)) is monitoring and evaluation of the ecological responses and outcomes that in turn can inform future management decisions. As rehabilitation is likely to require many years, but individual projects are of limited duration, it will be important to consider and plan for the potential impact of natural climate variability (e.g. floods, droughts), bushfires and other natural or human-induced events.

The workshop recommended the following:

8. All interventions should be considered an opportunity to increase our knowledge of fish habitat rehabilitation. The implementation of appropriate, effective and rigorous monitoring programs to generate such new knowledge is considered an integral part of habitat rehabilitation.
9. Conceptual models need to be developed so that the scale and the type of disturbance to be addressed are clear and match the scale of proposed management interventions.
10. Stakeholders' knowledge, values, and understanding of the history of particular disturbances need to be considered when developing rehabilitation objectives and designing works.
11. Priority should be given to the development of strategic State-wide frameworks for setting priorities and guiding aquatic habitat management and restoration.
12. An AEM approach should be adopted whereby rehabilitation goals and hypotheses are clearly defined at the start of a project, appropriate monitoring is implemented, and evaluation and feedback occurs so that new knowledge is shared. We need to recognise



that the initial recovery trajectory/response may not be in the direction we expected. Therefore long-term monitoring needs to be incorporated to assess long-term trends.

13. Activities to rehabilitate one habitat must not be detrimental to another habitat (whether aquatic or terrestrial). For example, the removal of large woody debris from floodplains for use in in-stream re-snagging programs can have dramatic impacts on terrestrial reptile and invertebrate faunas.

### *Demonstration reaches*

The workshop recommended the following:

14. Demonstration reaches should be established in each State/Territory jurisdiction within the Basin as soon as possible in order to raise the profile of aquatic habitat rehabilitation and promote community interest and participation.
15. The objectives and expected outcomes of individual demonstration reaches must be clearly defined at the commencement of the project.
16. The establishment of demonstration reaches needs to be viewed as a long-term commitment by all stakeholders in order for the demonstrations to be successful.
17. There is a need and role for the establishment of coordination mechanisms for the setting-up of demonstration reaches, to ensure that communication is effective, open, timely and targeted.



### **Background to the concept of demonstration reaches**

The Murray-Darling Basin Commission's Native Fish Strategy (NFS) proposes the establishment of demonstration reaches as a mechanism for delivering outcomes in native fish conservation. Demonstration reaches are designed to showcase the potential benefits for native fish when all the necessary river-management works, including habitat protection or rehabilitation, are integrated and focused in one place. The concept, developed as a knowledge transfer component of the NFS, is to coordinate and enhance rehabilitation programs as one large project under an adaptive management framework.

Large demonstration reaches (perhaps 100 km in length) will be established in each State of the Murray-Darling Basin. The major factors or issues affecting native fish populations in each reach will be documented in collaboration with local communities. A program will then be implemented that addresses the major issues concurrently. A thorough scientific investigation will assess the ecological and native fish responses to actions, and results will be widely publicised among stakeholders and the Basin community. The criteria for selecting demonstration reaches have been listed in the Investment Plan for the NFS (see <http://www.mdbc.gov.au>) and include river reaches that are:

- degraded but able to demonstrate results from rehabilitation actions;
- able to gain strong community support;
- substantial, accessible and visible to the public;
- able to trial rehabilitation techniques and approaches;
- able to give examples of solutions to problems;
- able to transfer solutions to other sites;
- affected by several different threats or ecological issues; and
- able to allow the testing of scientific hypotheses and the measurement and monitoring of results.

It is anticipated that the selection of demonstration reaches will be by competitive nomination, and assessed by State jurisdictions and the Murray-Darling Basin Commission, according to the criteria described above.

### Priority research needs

The workshop participants identified a number of knowledge gaps and information needs for a range of stakeholder groups, notably research, management and community stakeholders. The top priority information needs (as ranked by workshop participants) for each stakeholder group are listed in **Table 1**. It was recognised at the workshop that these priorities may change as knowledge grows.

The workshop recommended the following:

18. A long-term Research and Investigations program should be established by the Murray-Darling Basin Commission and other relevant organisations and institutions to address the priority information needs in Table 1.

Additional knowledge needs identified by the workshop participants are listed in Appendix 1.

These knowledge needs were not considered the highest priority, but still represent significant information gaps which should be addressed if habitat rehabilitation, based on information about restoration ecology, is to progress.

### References

Balmford, A. *et al.* 2002. Economic reasons for conserving wild nature. *Science* 297 (5583): 950-953.

Rutherford, I.D., Jerie, K. and Marsh, N. 1999. *A Rehabilitation Manual for Australian Streams, Volume 2*. Land and Water Resources Research and Development Corporation, and Cooperative Research Centre for Catchment Hydrology. 400 pp.

Rutherford, I.D., Ladson, A.R. and Stewardson, M., 2004. Evaluating stream rehabilitation projects: reasons not to, and approaches if you have to. *Australian Journal of Water Resources* 8(1):57-68.

Table 1. Priority knowledge needs and questions for research, management and community stakeholder groups

Priority knowledge needs and questions	Research	Management	Community
What are the habitat requirements for aquatic species at different life-stages?	X		
How can we restore specific habitat features (e.g. macrophytes)?	X		
What is the transferability of current knowledge to different geographic areas and projects?	X	X	
We need quantitative autecological information on the population dynamics of native fish.	X		
Will proposed rehabilitation activities gain stakeholder acceptance?		X	
What is the likelihood of success of rehabilitation actions?		X	
We need an accessible repository of available information on habitat rehabilitation.		X	
We need specific technical information for habitat rehabilitation (i.e. how much, how long, where, when, what cost, etc).		X	
How do we communicate appropriately and effectively with stakeholders? (need to utilise expertise from the social sciences).			X
How do we access knowledge from stakeholders, including traditional owners? And how do we utilise stakeholder knowledge?			X
How can we quantify and explain the ecological and economic benefits and values of rehabilitation?			X
How do we capture or identify stakeholder values and stakeholder commitment?			X



