



Environmental Water Allocation R&D Program

Current Projects

NTU21: Water regime dependence of fish in the wet-dry tropics

The Daly River catchment is currently subject to increased pressures for agricultural development. Dry season river flows are reliant on groundwater inflows; proposed irrigation developments will tap this groundwater and reduce these flows. This project will investigate the seasonal variation in fish distribution and the ecological flow requirements of fish species based on a mixture of traditional knowledge from indigenous communities and field work.

UAD24: With the wisdom of hindsight: Reconsidering institutional arrangements for water

The present Australian water allocation and management system has been developed incrementally since Federation. Using the Murray Darling Basin as a case study, this project will go back to first principles and search for alternative ways to allocate water to the environment and then allocate and manage the remaining resources. This approach may result in innovative ideas that could be used to make a significant contribution to future debates about the management of Australia's water resources.

UAD26: Flow requirements and resource delivery to the lower Murray Lakes and Northern Coorong

Lakes Alexandrina and Albert and the Coorong at the mouth of the Murray River are nationally and internationally significant ecological assets. This project will study sediment and nutrient flows and growth of algae as a result of variations in flows into the lakes from the River Murray. The outputs from this project will feed into models of higher trophic levels (fish, waterbirds, etc) so that ecological responses to different flow management options can be assessed.

DUV8: Environmental water allocation required to sustain animal species in ephemeral streams

This project looks at the habitat requirements of macro-invertebrates in ephemeral river systems. It has been assumed that animals in these habitats are adapted to periodical wetting and drying and so are able to adapt to increases in the extent and frequency of dry periods as a result of upstream water extraction. However, there is limited research to back up this assumption.

FRD3: Water use across a catchment and effects on estuarine health and productivity

Water use in a catchment can greatly impact on coastal and marine ecosystems. Tasmania's Little Swanport estuary serves as the nursery grounds for the Pacific oyster industry. This project will identify the links between freshwater inflows to the estuary and the productivity of the oyster industry and compare economic benefits of estuarine industries with catchment activities that are reliant on fresh water flows.

UNS28: Adaptive management of environmental flows in the regulated Macquarie River

This project will draw on accumulated knowledge to develop models of fish, invertebrate, floodplain eucalypt, and waterbird responses to different flow regimes in the Ramsar-listed Macquarie Marshes. These models will be combined into a Decision Support System that can be used to predict the effectiveness of different flow regimes.

UAD23: Water allocation to River Murray wetlands: A basin wide modelling approach

Changes in flooding extent and frequency following the development of dams in the upper Murray catchment mean that some wetlands along the Murray are now permanently wetted while others receive little water. This project will develop models that can predict the responses of different wetland types to different water regimes. These models will provide managers with quantifiable predictions of changes in wetland vegetation with changes in flow regime in the River Murray.

UME71: Flows and aquatic plants: An historical and experimental approach

This project, focusing on South East Australia, will assess the response of aquatic plant communities to changed flow regimes to see whether aquatic plants can be used as indicators of success from environmental water allocations. Using historical records for flows and plant diversity, the project will develop hypotheses to predict plant diversity in low and high environmental flow scenarios. These hypotheses will be tested in field trials.



knowledge for managing Australian landscapes

Acquiring knowledge to sustainably manage our water resources

Program Aims

The Environmental Water Allocation Program engages with water managers and regional communities to build upon the knowledge required for managing our rivers and waterways in a healthy state.

More effective use of water resources is required in Australia to achieve the multiple aims of viable agriculture, industries, communities and environment. Improved outcomes from limited water drives the focus of environmental water allocation as well as other water uses. This requires a depth of biophysical, technical and institutional understanding. The Program aims to achieve this understanding with a two-pronged approach.

Better managing developed systems

In developed systems, where there is pressure to balance environmental and consumptive uses, such as in the River Murray, we need to demonstrate and improve the ecological outcomes produced from environmental allocations.

Understanding undeveloped ecosystems

In relatively undeveloped systems, there are ecosystems which could come under threat from increasingly altered flow regimes. Currently there is little knowledge of the flow needs of these ecosystems, and thus little capability to design effective environmental allocations. The ecosystems of concern include ephemeral and monsoonal rivers, groundwater dependent ecosystems and estuaries.





The Program is guided by the following five research themes

Australia needs to more effectively manage its water resources in order to satisfy competing demands for agriculture, industry, communities and the environment. The National Water Initiative was signed in June 2004 to accelerate the COAG Water Reform Agenda initiated in February 1994. Water to maintain aquatic ecosystems, or *environmental water*, is recognized to be of particular importance in these agreements because rivers, wetlands, groundwater and estuaries, with their component ecological communities provide ecosystem services upon which society depends.

The National Water Initiative has identified the demonstration of the ecological outcomes from environmental flow management and the gaining of a better understanding of the interactions between surface and groundwater as two of the topics on which better information is needed. In July 2004, Land & Water Australia established the Environmental Water Allocation (EWA) R&D Program to help fill some of these knowledge gaps. In consultation with state and Australian Government water agencies, five themes were identified for the Program:

Theme 1: Improving, demonstrating and evaluating the benefits of environmental management of stressed rivers

Although there is a considerable body of research findings now available on rivers under stress, such as the River Murray, there is a need to develop methods to establish more precisely the environmental benefits that will be received as a result of different flow regimes. There is also a need to monitor and evaluate the actual outcomes against the predicted benefits to support real system adaptive management. The aim is to develop tools to assist water management committees to analyse the trade-offs between consumptive water uses and environmental water uses.

Theme 2: Environmental water allocation in poorly understood aquatic ecosystems across Australia

Unlike the well-studied stressed rivers, there is a dearth of research in the less heavily used rivers. Most lie in tropical Australia (see: www.track.gov.au), along the coastline, in Tasmania and in the semi-arid inland. In these systems, there is a need to undertake the fundamental research of ecological response to different flow regimes upon which management plans can be built.

Theme 3: Holistic water budgets of complete river systems

Water use decisions in one part of a river system can have effects, sometimes unanticipated, in many other parts of the system. A holistic water budget for a whole river system, from the uplands to the estuary, including groundwater and climate change, would allow water managers to explore the full set of potential consequences of their water allocation decisions. At present, no Australian river system has such an integrated predictive tool.

Theme 4: Economic, social and institutional aspects of environmental water allocation

Apart from improved technical understanding of ecological responses to different flow regimes, there is scope for improvements in the legal, institutional, economic and social aspects of water resources management. Consequently, the EWA R&D Program will fund social and institutional research that is clearly focussed on improved environmental water allocations, complementing research funded through the LWA Social and Institutional Research Program (see: www.sirp.gov.au).

Theme 5: Groundwater Dependent Ecosystems

Some terrestrial ecosystems are dependent at certain times of year on groundwater. These ecosystems are at risk as a result of systemic changes in the groundwater table. However little is known about the linkages between surface and groundwater use and the effects on these ecosystems. A small number of key projects will be undertaken under this theme to help quantify these linkages.



Completed projects

Completed projects have published reports and/or final reports available either electronically or in hard copy. To see what resources are available for completed projects please see www.lwa.gov.au/environmentalwater/research/

UTV2: Innovative techniques for managing multiple threats to high value aquatic systems

The key element of this project involved the landscape-scale manipulation of water regimes on Dowd Morass in the Gippsland Lakes. Dowd Morass is subject to an inappropriate water regime, having been flooded more-or-less permanently since the mid 1970s despite it having experienced annual draw down and a dry period every 2-5 years under natural conditions in earlier times before river regulation and catchment development. It is subject also to chronic salinisation from saline intrusions from the oceanic Gippsland Lakes, nutrient enrichment, acid-sulfate soils and a limited amount of weed infestation.

The project provided information on the effects of water drawdown on species composition. There was a marked improvement in wetland condition during drawdown, which was lost during the rapid and deep re-flooding of wetlands. The project also resulted in valuable practical advice for the regeneration of wetland vegetation.

BDA4: Natural resource 'buy-backs' and their use to secure environmental flows

This project investigated market-based approaches that could be used to temporarily access water for environmental flow requirements that are more cost-effective than the purchase of permanent entitlements.

Buy-backs in other resource industries were reviewed and their applicability in the Australian water market investigated. Feedback from irrigators was sought to determine both interest and feasibility of the approaches. The study concluded that no single economic instrument was superior for delivering environmental flow outcomes and that an environmental water manager would need to hold a portfolio of different economic instruments.

REM1: A framework to provide for the assessment of environmental water requirements of groundwater dependent ecosystems

This project developed management tools to help incorporate groundwater dependant ecosystem (GDE) water requirements into water allocation planning by establishing a uniform and consistent approach to the assessment of environmental water requirements. The project involved three key components:-

- i) Development of a GDE Assessment Toolbox - tools to help determine whether an ecosystem depends on groundwater and what the nature of the dependence might be.
- ii) Development of Operational Methodologies - ways for information gathered by the different tools in the Toolbox to be used to develop environmental water requirements for different ecosystem types.
- iii) Field investigations and trials - procedures for assessing and testing tools and methods.

REM2: Impacts of groundwater affecting activities on baseflow variability and ecological response

This project was phase one of a two-phase project designed to assess the impacts of human-induced changes in groundwater (such as through pumping) on riverine ecosystems and other groundwater dependant ecosystems. It will quantify the relative contribution of baseflow to stream environmental flows in different regions of Australia.

A number of sites around Australia were assessed for their suitability for the second phase, ranging from subtropical to temperate Australia. Six sites were chosen in WA, NSW, Victoria and Northern Territory where there was sufficient hydrological and ecological data for a full second stage investigation, and where there was strong support from State government agencies.



The results of these research projects will be communicated to federal policy makers, State agency and regional water managers and users through workshops, presentations, publications and the web.

The program reports to a Program Management Committee with representatives from the Australian Government Departments of Environment and Water Resources (DEW), and Agriculture, Fisheries and Forestry (DAFF) and the National Water Commission (NWC). Some projects within the Murray Darling Basin receive funding support from the Murray Darling Basin Commission.

Visit the Program website at:

www.lwa.gov.au/environmentalwater

Further information on this program can be obtained from:

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Land & Water Australia is a statutory corporation of the Australian Government within the Agriculture, Fisheries and Forestry portfolio, established under the Primary Industries and Energy Research and Development (PIERD) Act 1989. We invest in knowledge, partnerships, innovation and adoption to underpin sustainable natural resource management in Australia.