



# WaterShed

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## The New Research Portfolio

by  
Professor Barry Hart

We have been successful in our bid to operate the Cooperative Research Centre for Freshwater Ecology (CRCFE) for a further seven years, until 2006. Central to the success of the new CRC is a portfolio of innovative research projects designed to meet key national needs.

The CRCFE research program will focus on providing the ecological knowledge needed to underpin the effective management of Australia's freshwater resources, and will address four key themes:

**Flow related ecological processes** ~ where the aim is to develop the ecological knowledge needed in decisions on environmental allocations of water as required by the COAG agreement.

**Restoration ecology** ~ where the aim is to generate the scientific knowledge needed to underpin the very important task in all states of restoring damaged aquatic systems.

**Conservation ecology** ~ where the aim is to contribute to the ecological knowledge base needed to assess and conserve Australia's aquatic biodiversity.

**Water quality & ecological assessment** ~ where the aim is to develop and apply new risk-based methods for assessing possible water quality and ecological degradation, and additionally to develop, test and apply new tools for assessing the success of management in improving the ecological condition of Australia's water resources.

### RESEARCH DEVELOPMENT

The detailed CRCFE research portfolio consists of three types of research: completing projects, new projects and associated projects. These are discussed below.

An exciting outcome of the new CRC is the inclusion of five new partners and the establishment of a new laboratory at Goondiwindi. The new partners – Qld Department of Natural Resources, Victorian Department of Natural Resources and Environment, NSW Department of Land and Water Conservation, Sydney Catchment Authority and Griffith University – have enabled the CRCFE to expand its expertise and

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Welcome to the first issue of Watershed since the Cooperative Research Centre (CRC) has been renewed. The Minister for Industry, Science & Resources, Senator Nick Minchin, advised us earlier in the year that our bid to operate the CRC for Freshwater Ecology for another 7 years had succeeded. Since then we have been very busy organising contracts that provide the legal basis for the Centre, and developing the new research agenda.

Firstly, let me thank the many supporters who helped us through this process. Our partners gave us great encouragement as we redesigned the Centre, focussing on issues where we could make significant improvements. Not only did so many people support us directly, but many of you wrote to the Minister and others in Government expressing support for what we have already achieved, and stressing the importance of continuing this work. Thank you all again.

### welcome to our five new partners

Secondly, let me welcome our new partners in the Centre. We have now been joined by the land and water management agencies from Queensland, New South Wales and Victoria. Griffith University and the newly established Sydney Catchment Authority have also joined us and are all represented on our new Board. This support in itself was a very positive aspect of our bid.

Thirdly, let me introduce you to our new research programs and program leaders:

**Conservation ecology ~**

A/Prof Arthur Georges (UC)

**Flow related ecosystem processes ~**

Dr Gerry Quinn (Monash)

**Restoration ecology ~**

Prof Stuart Bunn (Griffith)

**Water quality & ecological assessment ~**

A/Prof Richard Norris (UC)

**Education ~**

Dr Ian McKelvie (Monash)

Professor Barry Hart is Director of Research and Dr Terry Hillman is Director of the Murray-Darling Freshwater Research Centre that includes the satellite laboratory at Mildura and the soon to be established laboratory at Goondiwindi. Professor Sam Lake, as Chief Ecologist, will ensure our ecology is top class, and help build the ecological capacity within the Centre. We advertised recently for a Director of Knowledge Exchange to

# The New Cooperative Research Centre for Freshwater Ecology

enhance the effective delivery of our knowledge to our partners and others.

The Centre has also established four Program Advisory Committees to help the program teams develop and review the research proposals.

At present, the program leaders are working with various research teams to draft project proposals that address key needs. These proposals will be presented to our Board in mid November. The Board will then identify projects for further development and planning.

**Peter Cullen**  
Chief Executive



# Getting the bugs out of AUSRIVAS in New Zealand

by Richard Norris

The Co-operative Research Centre for Freshwater Ecology in Canberra recently took part in a trial on the use of an AUSRIVAS predictive modelling approach for New Zealand. The trial was funded by the Ministry for the Environment (MfE), New Zealand and was in conjunction with Environment Waikato and the MfE's Macroinvertebrate Working Group. River health assessment in New Zealand has been based largely on the Macroinvertebrate Community Index (MCI), which is similar to many biotic indices in use around the



*The Mangauika Stream: a reference site for AUSRIVAS trial in NZ.  
Photo: R Norris, CRCFE*

world. As part of the re-evaluation of the use of macroinvertebrates in water management in New Zealand the use of predictive models such as AUSRIVAS is being considered. With New Zealand's diverse geography an assessment method needs to take account of the ecosystem type and AUSRIVAS was trialled as a potential system for this.

The trial was undertaken in the Waikato Region of New Zealand, an area encompassing a diverse range of ecotypes, providing a good test of the applicability of AUSRIVAS style models to the New Zealand environment. Two models were tested, one using genus data and the other using family level data. It was found that the genus model performed considerably better than the family model in most aspects, in contrast to most Australian models that generally perform better with family level data.

As part of the trial, observed and expected MCI values were calculated for test sites and compared to traditional AUSRIVAS outputs, showing good correlations. Recent work with the National Institute for Water and Atmosphere (NIWA) has extended these calculations to a national dataset of test sites. Results of the Waikato Region Trial will be presented at the joint New Zealand Limnological Society/Australia Society for Limnology conference in December.

The trial demonstrated the ability of AUSRIVAS to supply good quality data for managing water resources in New Zealand. If implemented, AUSRIVAS could provide New Zealand with a nationally standardised way of assessing the health of its inland waters.

New Zealand is well down the track in developing a physical-based habitat classification system. If AUSRIVAS is adopted in New Zealand, serious consideration will be given to replacing the multivariate statistical component with a predictive model based on the physical factors approach at some stage in the future.

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# The New Research Portfolio

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geographical reach, in particular into the summer rainfall regions of northern NSW and southern Queensland. We also now have a new program devoted to conservation ecology. We look forward to working in partnership with all new (and existing) partners.



*Aquatic biodiversity: reeds along the Murray River, SA.  
Photo: B van Aken, CSIRO*

## Completing projects

Six large integrated projects, commenced during CRCFE Mkl, are due for completion in June 2000. These are the Granite Creeks projects, the Lower Murray project, the Yarra ecological project, the Campaspe flows experiment, the sediment-nutrient processes project and the ecological assessment project. Details on all these can be found in the last Annual report.

## New project

In developing the detailed research projects within each program we have been guided by five basic principles:

- To ensure there is close interaction between researchers and managers in developing projects

- To be inclusive rather than exclusive
- To establish a balanced research portfolio consisting of a mix of projects in each of the four programs, a mix of short, medium and long-term projects and a mix of high and low risk projects
- To focus on a small number of large, integrated, multidisciplinary research projects, but also with some smaller high quality scoping studies to provide flexibility
- To integrate post graduate students into the research programs.

I wish to thank the many people who worked extremely hard to develop the new research portfolio. The process has involved a number of steps, including:

- Identifying key national and partner needs;
- Project development meetings to consider possible integrated projects within the above four broad themes – these meetings involved CRCFE researchers, water resource managers and water industry representatives;
- From these meetings a smaller number of project teams were established. These worked hard to produce a short (2-3 page) proposal, which has been reviewed by the Research Committee and organised into a 'package' of integrated research projects for presentation to the Board on 17 November.
- Four Program Advisory Committees have been established, and these have been involved in project development.

After the Board selects the successful proposals, the project teams will develop full projects. These projects will then be peer reviewed, and presented to the Board again for approval. Successful projects should commence by July 2000.

It is estimated that the CRCFE will invest around \$40-50 million (cash and in-kind) in its new research program over the six year period 2000/01 to 2005/06.

## Associated projects

Associated projects are projects funded by partner or research granting organisations that address one or more of the CRCFE objectives. In most cases they are an excellent example of where the CRCFE can add value to the existing research program through the gaining of outside funds. Although these projects do not





*Biological monitoring in the Kiewa River, Vic.  
Photo: D Eastburn, MDBIC*

normally require CRCFE cash resources, they do require in-kind resources. It is expected that a call for new Associated Projects will occur before the end of November. These will be assessed by the Research Committee. In addition to being good science they must show that they add value to the partners.

#### Links

To gain maximum value from its research projects, the CRCFE has placed considerable stress on ensuring that appropriate linkages are established. Four types of linkages are being worked on:

***Within and between Programs*** ~ The Program Leaders are currently working on plans to ensure that where appropriate there is adequate linking both within Programs and between Programs. A detailed plan is not possible at this stage because it is not known whether all proposed projects will be successful.

***With the CRC for Catchment Hydrology (CRCCH)*** ~ A very productive meeting of Program Leaders from the CRCFE and CRCCH was held in September this year. At this meeting a number of projects were identified where collaboration between the two CRCs could enhance the research outcomes. These are being progressed in discussions between the relevant individuals and Program Leaders. We expect there will be at least one and possibly three joint project agreements established between the two CRCs.

***With the education program*** ~ Where possible, post-graduate students will be integrated into the integrated project teams. Where this has occurred in existing projects, there have been significant benefits for both the students and the project. On-going discussions are being held with the Program Leader – Education (Dr Ian McKelvie) on the most appropriate mechanism to ensure this occurs. Dr McKelvie is a member of the Research Committee.

#### ***a portfolio of innovative research projects***

***With the knowledge exchange program*** ~ It is intended that a knowledge exchange strategy will be developed for each successful integrated project, and that knowledge will be exchanged at strategic times during the project lifetime, and not at the end. These linkages will be further developed when the Director of Knowledge Exchange is appointed.

The new CRC for Freshwater Ecology is poised to move ahead with an exciting new research portfolio which will provide the scientific underpinning needed by the Australian water industry for it to manage the nation's water resources in an ecologically sustainable manner.

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*Restoring damaged ecosystems: roadside erosion near Canberra ACT.  
Photo: B van Aken, CSIRO*

# Council of Australian Governments' Water Reforms and the Environment

by Professor Peter Cullen

In recent years Australia has been implementing radical water reforms at the cutting edge of water management. Many of these reforms are about improving the efficiency of water use. Another major thrust of the reforms is to reverse the degradation of our waterways through the provision of environmental allocations for rivers. Water rights, trading and markets are also key elements in the reforms, as is more comprehensive assessment of proposals for further water developments.

After five years of Council of Australian Governments (COAG) initiated water reform we can now ask if we have achieved, or are we on track to achieve, demonstrable benefits to the environment?

This is not a trivial exercise. From an ecological perspective it is hard to measure small changes in wildly fluctuating systems. We have little agreement as to what the key indicators of success are – the return of icon species or the health of communities for instance. We are unclear how long it will take for ecological benefits to be measurable after flows have been changed. In many systems we have so little knowledge of 'river health' before we apply more appropriate flow regimes that it will be very difficult to measure change afterwards.

The Cooperative Research Centre (CRC) is frequently asked whether we can see benefits flowing to the

environment as a result of the water reforms, and since we have been actively involved in setting environmental allocations and other processes, this question is of interest to us. It is a question that persists, and one we are keen to answer.

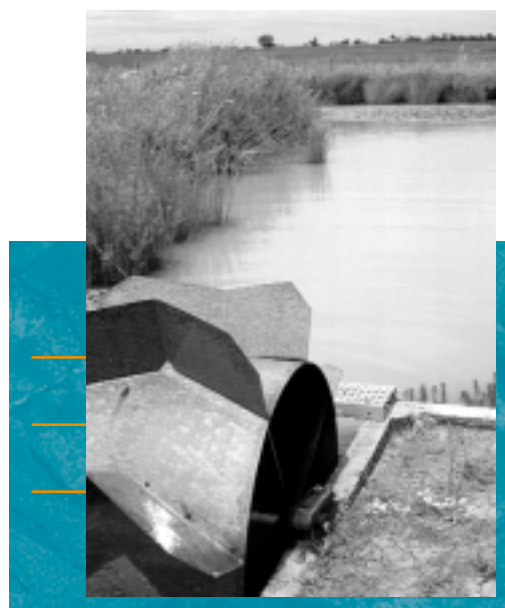
Earlier in the year the CRC assembled a group of ecologists from around Australia to address this question. The team looked at various elements in the COAG water reform process to assess likely ecological benefits. The following key points emerged:

## WATER HAS TO BE USED EFFICIENTLY

Every litre of water diverted from a river has an impact on the ecosystem. Efficient use of the water we divert will allow us to continue to enjoy the benefits of consumptive water use whilst minimising the environmental impacts of these diversions.

To ensure water is used efficiently, it needs to be sold at prices that discourage waste. Water allocations and charges should be based on the actual volume of water extracted rather than simply permission to pump for certain hours or when the river reaches a certain height.

Water trading promotes water conservation because saved water can be sold. The development of trading will allow the movement of water to its highest value uses and to the most suitable and productive lands. A critical issue for the development of water trading is the separation of water from property rights.



Supply channel and waterwheel, Murrumbidgee Irrigation area, NSW.  
Photo: B van Aken, CSIRO

## COMPREHENSIVE ASSESSMENTS FOR NEW DEVELOPMENTS

In some regions, water resources are not yet developed, and the COAG water reforms require more comprehensive assessment of development proposals than in the past. There is no excuse for repeating past mistakes. When assessing water resources it is essential to look at the whole catchment. All water must be considered not just in the channel, that moving occasionally over the floodplain and the groundwater. The downstream impacts on estuarine and coastal systems must be part of any comprehensive assessment. Assessment has to consider the ecological impacts of transferring water between basins, which introduces biota from one river basin to another. Assessment of new developments must recognise that water diversions impact throughout a river basin, they do not stop for State borders.

## WATER QUALITY

The storage and diversion of water affects its quality. Water released from large storages may be unseasonably cold and it may be anoxic. Return flows from agriculture may contain pollutants, such as nutrients or pesticides. Assessment of the impacts of diversions on water quality must consider ecosystem health as well as the needs of downstream users.

*diverted  
water has  
an impact*

## MANAGE AT A CATCHMENT SCALE

Because land use within the catchment impacts upon the quantity and quality of the water resource, it is critical that water management is integrated with catchment management. We do not know the amount of water intercepted by farm dams or the impact of this on rivers and groundwater, though it is likely to be significant in many catchments.

## ADAPTIVE MANAGEMENT

Our knowledge of the ecosystem water requirements is improving, but it is not perfect. The allocations we make should be based on best available knowledge. To learn, we must incorporate our knowledge from present allocations into future allocations and monitor their impact. A balance has to be struck between having the flexibility to react to new information whilst providing resource security for consumptive users.



*An AUSRIVAS reference site: McDonalds Creek, ACT.  
Photo: K Roberts, CRCFE*

Without some security, water users will not be able to make the necessary investments in water infrastructure. We believe a period of five to eight years between review of allocations allows this. Granting water rights in perpetuity reduces our capacity to adjust allocations in the future, if necessary.

## KNOWLEDGE STRATEGY AND INFORMATION EXCHANGE

The development of a knowledge strategy, which identifies key knowledge gaps and how they can be overcome, is imperative if water is to be managed in a sustainable way. Agencies, technical experts, landholders and community groups must share knowledge and build working partnerships. The trust and value in these partnerships will only be realised with transparent processes and effective sharing of information.

Adopting these key COAG water reform principles will benefit the environment we all live in.

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# Environmental water allocations - are they effective?

A recent report details proposals for measuring the impacts of environmental water allocations to Murray-Darling Basin wetlands.

Altered flow regimes in the rivers of the Murray-Darling Basin have had a major effect on the Basin's wetlands. River regulation has resulted in many wetlands being inundated more or less often than they would naturally be. These hydrological changes have reduced the size of wetlands and altered the composition of their plant and animal communities.

Our knowledge of the water needs of wetlands, while improving, is far from perfect. Consequently, it is important to use an adaptive management approach when managing wetlands. Adaptive management means planning carefully, taking action, monitoring the effect of these actions, and then incorporating this learning in to your management. Thus, you adapt your management interventions as you learn more. The key to adaptive management is that management interventions be planned with all the rigour of a scientific experiment and that what is learnt from these interventions be used to improve management.

For adaptive management to succeed, it is critical that the impact of management interventions be detected. This requires an effective monitoring program. The monitoring program must be able to detect a response, even an unexpected one.

The report, *"Measuring the effectiveness of environmental water allocations: recommendations for the implementation of monitoring programs for adaptive*

*hydrological management of floodplain wetlands in the Murray-Darling Basin"*, provides resource managers with the tools to design effective monitoring programs that maximise the chances of detecting ecological change. Michael Reid and Jacqui Brooks wrote the report on behalf of the Victorian Department of Natural Resources and Environment.

The report describes the three stages of developing a monitoring program:

- the selection of appropriate physico-chemical and biological indicators,
- the design of a monitoring program, and
- a pilot study.

The report identifies the key physico-chemical and biological indicators of wetland health that should be included in all monitoring programs. These primary indicators include depth, areal extent, salinity, turbidity, and surveys of aquatic macroinvertebrates and macrophytes. The monitoring program can be designed to include secondary indicators if they are of specific interest or value, for example, pH, algae, biofilms, fish, birds, mammals and riparian vegetation. The report details how to measure primary and secondary indicators.



Wetlands near Forbes NSW. Photo: K Markwort, CRCFE





*Trout Cod: endangered native fish. Photo: G Schmida*

Most monitoring programs aim to measure the extent of change both in time and space, and assess the implications of that change for management. The capacity to achieve these aims depends on how well the program is designed. The report discusses the design of monitoring programs and difficulties encountered.

Noisy signals due to natural variations in the climate, such as runs of wet or dry years, and the natural variability between sites make it difficult to measure ecological change. Simply measuring before and after intervention, or comparing sites with and without intervention is likely to give ambiguous results because the differences detected may be unrelated to management intervention. To minimise these problems, the report recommends a general approach for monitoring be based on a BACI (Before After Control Impact) design. Where possible, multiple control and impact sites should be included (MBACI). It is not always possible to fulfil the criteria for a true BACI design, however, and the report discusses these problems and offers possible solutions.

### **a monitoring program of three stages**

Michael Reid is trialing the survey strategies, sampling methods and indicators of wetland health recommended in the report in a pilot project in the Barmah-Millewa Forest. Michael said, "We have now completed two field surveys. One, during early autumn when the forest is traditionally at its driest, and another, two months after last spring's flooding."

He is pleased with the survey methods "The survey techniques recommended in the report are proving to work efficiently. A complete survey of a wetland can be done in one day. On each trip we have been able to survey 9 wetlands; 5 impacted and 4 controls."

"The vegetation survey is characterising the aquatic vegetation well. Also, the invertebrate surveys are beginning to show interesting results. However, sorting the collected samples back in the laboratory is a slow process. As we learn more about wetland invertebrates, we are confident we can speed up the sorting process."

"The monitoring program we have adopted should allow us to achieve our aim of detecting significant effects resulting from Environmental Water Allocations and other hydrological management in the Barmah-Millewa Forest."

Details and full costing of this pilot program are included in the report. The Murray-Darling Basin Commission Riverine SI&E Program, through the Natural Resources Management Strategy, provided funding for the report.

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# International Stormwater Conference

by Ian Lawrence

The Cooperative Research Centre for Freshwater Ecology (CRCFE) was a co-sponsor with the International Association for Water Quality, & the Institution of Engineers, of the Australia International Conference on Urban Storm Drainage (ICUSD), a triennial conference drawing together researchers and professionals working on a diverse range of stormwater management related areas.

For the first time in its 22-year history, the ICUSD Conference was convened in the Southern Hemisphere. The conference, held in Sydney in September, attracted 450 delegates, drawn from 30 countries. Keynote speakers and papers included:

- the Honourable Iona V Campagnolo, Chair of the Fraser Basin Council, *Darkness to daylight: Moving from adversarial to cooperative decision making*
- Graeme Head, Acting Director General NSW Environment Protection Authority, *Towards behaviour change: Non-regulatory approaches to reducing stormwater pollution*
- Jo Moss & Andre Listowski, Senior Director Environment and Development Manager, Olympic Coordination Authority, *The water cycle management at Homebush Bay*

The Conference focussed on water quality management, environmental sustainability, and integrated water cycle challenges; a notable shift in focus from sewer hydraulic issues. Other innovative areas included improved information on the sources, transport & fate of toxicants in urban stormwater and their impact on biota; the transformation and remobilisation of nutrients and metals in polluted sediments; the application of infiltration techniques; and the modelling of urban pollutant transport and interception.

Both the CRC for Freshwater Ecology and the CRC for Catchment Hydrology were highly visible throughout the conference, presenting 8 papers and chairing sessions. Frequent references were made to the CRCs as important sources of urban stormwater management research and information.



Sullivan's Creek ACT: an urban stormwater drain.  
Photo: I Lawrence, CRCFE



Photo and description courtesy J Hawking from the Colour Guide to Invertebrates of Australian Inland Waters

The feature creature for this issue:

**Class** Crustacea  
**Order** Isopoda  
**Family** Amphisopodidae  
**Genus** *Phreatomerus*  
**Species** *P. latipes*

Up to 20mm in size, these omnivores are only found crawling amongst the detritus and sediments of mound springs on the southern margin of Lake Eyre, SA.

# StreamLine

## ENVIRONMENT EXCELLENCE AWARD FOR OLYMPIC WETLAND

Willing & Partners (an associate of the Cooperative Research Centre for Freshwater Ecology), together with Woodward Clyde, Ove Arup & Partners, and the Abbey recently received the Environment Excellence Award from the Institution of Engineers (NSW Division) for the Northern Pond at the Homebush Bay Olympics site. The Pond, together with a spectacular water fountain, provides one of the gateways into the Olympic site.

The Cooperative Research Centre for Freshwater Ecology provided expert advice to the Olympic

Coordination Authority on the stormwater management strategy for the site and on water quality aspects of the design.

The Northern Pond, a 2 ha wetland, includes a re-circulation system designed to intercept and treat the stormwater runoff from the Olympic site together with backwash water from the Aquatic Centre. Treated water is transferred to a storage reservoir, then re-used to irrigate landscaped areas.

## FUNDING SUPPORT FOR MURRAY-DARLING FRESHWATER RESEARCH CENTRE (MDFRC)

Local member, Mr Tim Fischer, recently announced an allocation of \$1.4 million over the next three years from the Department of Agriculture, Fisheries and Forestry - Australia (AFFA) to provide ongoing support for the MDFRC laboratory. This funding replaces original funding from the Albury-Wodonga Development Corporation to the Centre, but subsequently taken over by AFFA. The funding follows a review by AFFA that

confirmed the effectiveness of the Centre in providing a knowledge base for the sustainable management of water resources within the Basin. The funding also follows strong support from the Murray-Darling Association and local politicians who made convincing representations to ensure Centre funding was maintained. Our thanks to all those who contributed to this successful outcome.

## LANDCARE AWARD

Congratulations to Karen Markwort and David Mussared for winning the SA Ford Media Landcare Award with their publication *Living on Floodplains*. Congratulations also to everyone who contributed. By winning the SA Award, *Living on Floodplains* is automatically a finalist for the national Award in the

same category, to be announced at next year's National Landcare Conference. This beautifully designed book, produced by the Cooperative Research Centre for Freshwater Ecology (CRCFE) and the Murray-Darling Basin Commission, is available from the CRCFE (see p.12 for contact details).

## RECENT PUBLICATIONS

Some recent publications available from the Cooperative Research Centre for Freshwater Ecology include the brochure, *Effects of a Drying Phase on the*

*Ecology of Menindee Lakes*, and the technical report, *Environmental Flow Assessment for the Lower Thomson and Macalister Rivers*.

Comments, ideas and contributions are welcome and can be made to:

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The CRCFE is a collaborative venture between:

- ACTEW Corporation
- CSIRO Land and Water
- Department of Land and Water Conservation, NSW
- Department of Natural Resources, Queensland
- Department of Natural Resources and Environment, Victoria
- Environment ACT
- Environment Protection Authority, NSW
- Environment Protection Authority, Victoria
- Goulburn-Murray Rural Water Authority
- Griffith University
- La Trobe University
- Lower Murray Water
- Melbourne Water
- Monash University
- Murray-Darling Basin Commission
- Murray-Darling Freshwater Research Centre
- University of Canberra
- Sunraysia Rural Water Authority
- Sydney Catchment Authority

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