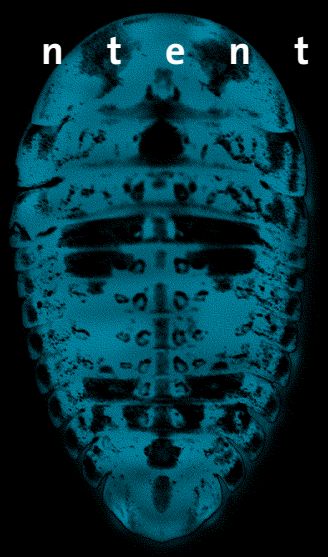
November 2000

WaterShed

contents



Research and the Australian Water Industry

by Professor Peter Cullen

As the Australian dollar collapses, attention has been drawn to our failure to invest in Research and Development (R&D) in a way that lets us become part of the new knowledge economy. It has been suggested the Australian dollar might drop to 30 cents as the world sees Australia as an old economy and invests elsewhere. Our national approach to developing infrastructure seems to be about building railways to Darwin rather than investing in the technologies of the future. Our failure to catch the IT boom, other than as a purchaser of other people's technology, was a disgrace. We are doing somewhat better with the biotechnology boom.

The consequence of this failure to invest is becoming stark. Universities are diverting funding from science faculties to business and law which can be taught cheaply. Science faculties are contracting and equipment infrastructure and libraries have declined markedly. Good students are choosing other careers because of the poor job prospects in science.

Senior scientists are now leaving Australia. Young scientists have often gone overseas to undertake post-doctoral work, but many have returned. The new shape of the brain drain is for senior scientists to leave, with no intention of returning. They are leaving because salaries and the support environment for science are fast approaching a third world situation. This has recently been documented for the mathematical sciences, but is a general problem and was reported on a recent 7.30 Report on ABC Television.

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Cooperative Research Centre for Freshwater Ecology

The Cooperative Research Centre for Freshwater Ecology improves the condition of Australia's rivers, lakes and wetlands

The CRC for Freshwater Ecology is a major provider of new knowledge to the Australian water industry. Much of our research firepower comes from University staff, so these general problems threaten the knowledge base of the water industry.

The research activities of the CRC provide three major benefits to the industry:

- New knowledge from the research to inform capital investment and recurrent spending on water management;
- A core of highly trained individuals who are available to provide critical insights to the industry to help define and solve emerging problems. They not only work with industry leaders to shape the research agenda but provide key input to the policy process; and
- A skilled workforce of graduates to work in the industry.

The water industry has a very real interest in the current issues about funding of R&D and should make their views known to government. At present we have two major reviews in front of government. The Batterham Review, "The Chance to Change", stresses Accountability, Collaboration, Commercialisation, Connectivity and Excellence as the hallmarks of R&D investment strategy. Batterham gives strong support for the continuation of the CRC program and proposes additional funding. His report recommends more flexibility in how the CRC program meets the needs of small-medium enterprises, and more flexibility in its ability to change research focus to meet the emerging needs of industry.

I believe the Australian water industry is well served by the suite of water CRCs — Freshwater Ecology, Catchment Hydrology, Water Quality and Treatment, Waste Management & Pollution Control and Coastal Zone, Estuary and Waterway Management. Together the Chief Executives meet regularly as the CRC Water Forum to coordinate and assist each other.

Batterham makes a series of other important recommendations. He proposes a doubling of the funds available to the Australian Research Council for basic research in the university sector, and increased funding of research infrastructure. He proposes a doubling of the number of Postdoctoral Research Fellows.

From my perspective there seems to be strong bipartisan political support for the CRC program. The program is attracting international recognition for its pioneering approach to linking industry and the research community. I believe the program needs more funding, and that this needs to provide more funds per CRC rather than increase the numbers of CRCs. I believe it should be possible for CRCs to get more that two rounds of funding, and this should be on the basis of the excellence of the proposals.

The main threat to the program appears to be lack of support from within the bureaucracy. The abolition of a dedicated secretariat has reduced the effectiveness of the management and promotion of the program. The ongoing reviews as to its worth have diverted much energy and resources. Perhaps it would be more efficient if the Department of Finance was encouraged to review the program about every five years rather than what seems to be every couple of years.

Now is the window of opportunity

The water industry needs to consider the recommendations made by Batterham. They should make their views known to Senator Nick Minchin, Minister for Industry, Science and Resources; to the Prime Minister and to other politicians at state and federal level.

Now is the window of opportunity to remedy some of the problems that have been damaging our national capacity to innovate and solve problems in the water and environmental area.

Prof Peter Cullen, Chief Executive of the CRC for Freshwater Ecology. Photo: M Ashkanasy, courtesy of Melbourne Water

Getting Educated at the CRCFE ~ The Centre's Education Program

Program Leader: Ian McKelvie

Apart from being a great place to work, the CRC for Freshwater Ecology is also a great place to study. With over 80 honours and postgraduate students across four states and the ACT, the Education Program offered by the CRC is a national leader in freshwater ecology education and training.

The CRC program is far reaching, catering for postgraduate, undergraduate, school and community groups, and provides students with a comprehensive ecological framework for the sustainable management of freshwater resources. It also provides ongoing training for water industry professionals.

Postgraduate programs are offered through five universities and students have access to supervisors from both industry and universities. Graduates from the Centre are highly valued by the water industry and enjoy excellent employment opportunities. The CRC offers a number of PhD scholarships.

For their professional development, students are encouraged to participate in conferences, workshops and training courses specifically tailored to meet their needs. A summer scholarship program is conducted to encourage promising undergraduate students to pursue careers in water science.

Claire Sellens, PhD student

Claire Sellens was awarded a full CRC PhD scholarship and began her studies in July this year. She says of her experience so far:

"Through my research project, 'The use of good management practices for river protection in setting the reference condition', I hope to test the value of a reference system for running waters using good management practices instead of the 'least disturbed' approach.

Recognising that very few of our rivers exist in undisturbed or pristine conditions is very important to provide a more realistic reference point for stream classification.

One of the main reasons I wanted to study for my PhD at the CRC for Freshwater Ecology was because of the excellent feedback I'd received about the education support program. Already I can confirm the value of the program. Shortly after starting, I attended the project management course at Clayton, Vic. Not only did the course provide us with skills and techniques for managing a project as large and absorbing as a PhD, but it was an excellent opportunity to meet with other CRC for Freshwater Ecology students at a similar stage into their projects. I came away from the course feeling more confident about managing my PhD project and understanding the importance of having clear manageable goals.

One of the potential downsides to a PhD study is the sense of isolation, but I have found CRCFE students are provided with a great deal of support and encouragement through regular meetings with their supervisors, the establishment of a student mail forum and annual student meetings."

Claire Sellens is based at the Canberra laboratories under the supervision of Associate Professor Richard Norris and Associate Professor Martin Thoms.

Claire Sellens hopes to improve the methods used to assess river health in impacted streams, making them more useful for water resource managers. Photo: L Sealie

David Crook, PhD student

David Crook commenced his PhD two years ago. In David's own words:

"My project, 'Habitat use and movements of golden perch and carp in the Broken River, Victoria' aims to compare and contrast patterns of habitat use and movement of a desirable native fish species (Golden perch) with those of an invasive introduced species (Carp). This will provide information relevant to the conservation and restoration of native fish populations in Australian lowland rivers.

The project methodology is based on radiotracking techniques and analysis has centred on spatially explicit approaches using Geographic Information Systems.

In addition to my Charles Sturt University scholarship, I receive a CRCFE top-up scholarship, which provides both personal and project funding. With these funds, I've bought the necessary equipment for my PhD research and have provided support for attendance at several conferences within Australia, as well as an international conference. Involvement with the CRCFE also provides unique opportunities to interact with professionals from a variety of areas within the water industry. At the Murray-Darling Freshwater Research Centre, where I spend most of my work time, experts on nutrients, bacteria, bugs and fish are all on tap. The regular seminar program and the exchange of views (usually over morning tea) provides a productive and stimulating environment in which to work."

David Crook seeks expert identification of a Golden perch. David is investigating the habitat use and movement of Golden perch (native species) and carp (introduced pest species) to help the conservation of native fish. Photo: A King

David Crook is based in Albury and studying through Charles Sturt University, Wagga Wagga, NSW, under the supervision of Prof. Alistair Robertson, Dr Paul Humphries (MDFRC) and Dr Robyn Watts (CSU Wagga).

For further information on the Centre's Education program, please visit the CRC for Freshwater Ecology's website at http://freshwater.canberra.edu.au

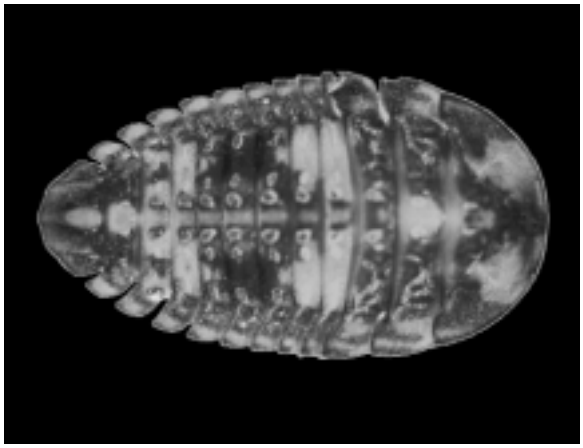


Photo and description courtesy J Hawking from the Colour Guide to Invertebrates of Australian Inland Waters

The feature creature for this issue:

Class Insecta (insects)
Order Coleoptera (beetles)
Family Psephenidae (water pennies)
Genus *Sclerocyphon*

The larvae of the aquatic water penny, *Sclerocyphon maculatus*, can be found clinging to rocks in many rivers and streams in Eastern Australia. While the larvae conceal their legs and head underneath their body, the head and legs can be seen on the short, broad adult beetle. Both are herbivores. The family has been little studied in Australia.

Research Program B - Restoration Ecology

Program Leader: Prof Stuart Bunn

The main aim of the Restoration Ecology Program is to understand the ecological processes that assist the recovery of disturbed stream and river ecosystems. With this knowledge, we can ensure that future restoration projects are undertaken in ways that maximize the environmental benefits achieved for the money spent.

Research within the Program addresses three broad themes:

1. Physical habitat restoration

A key assumption of most river and riparian restoration activities is that if you rebuild or recreate habitat then organisms will return and condition will improve. This assumption is being tested in an experimental framework in Project B1 (Restoration ecology of degraded rural streams) led by Sam Lake, and in collaboration with Ian Rutherfurd and others in the CRC for Catchment Hydrology.

We also plan to showcase practical and cost-effective methods for river and riparian rehabilitation (Project B2) and, in conjunction with Research Program A, produce guidelines for restoration of habitat and flow and the evaluation of the ecological effects of such restoration efforts. This work will be built around a number of restoration projects being undertaken by our partners, again in collaboration with CRC for Catchment Hydrology. Simon Nicol and John Koehn have also commenced their Murray River Re-snagging project as an Associated Project within the Restoration Ecology Program. This will provide information on the effectiveness of re-snagging for the rehabilitation of native fish populations and suggest ways in which such activities can be undertaken.

showcase cost-effective methods for river and riparian rehabilitation

Prof Stuart Bunn
Program Leader

If you add habitat to a stream, will the organisms return and the condition of the stream improve? The Granite Creeks project aims to answer this question and more. Robin Glaister is seen here mapping snags using GPS as part of the Granite Creeks project.

2. Habitat fragmentation and connectivity

Physical restoration of stream habitats will be pointless if ecological recovery is constrained by the ability of aquatic plants and animals to recolonise disturbed sites. To be able to predict how quickly disturbed systems will recover, we need to know how aquatic organisms disperse (ie what mechanisms do they use) and how far can they move. Project B3 (Connectivity) led by Jane Hughes aims to address this significant issue. The project received strong support from the Research Committee, PAC and peer reviewers, and will be reconsidered for approval when the Board next allocates funding. Some progress has already been made in this area through the Associated Project on the role of dispersal and recruitment in structuring stream invertebrate populations.

We need to know how aquatic organisms disperse

3. Monitoring restoration success

Most restoration projects are undertaken with the broad goal of improving "health" or "condition", and success can only be measured in terms of both biodiversity and key ecosystem processes. To a large extent, this work will be undertaken in Program D, as part of the overall goal of developing and testing new methods for ecological assessment (see project D2). However, an important question to be addressed in the Restoration Ecology Program is whether it is possible to restore key ecosystem processes (eg primary production, nutrient cycling) without completely restoring all elements of the biological communities. Project B4, led by Darren Baldwin has been proposed to address this issue, with a specific focus on in-stream nitrogen cycling (denitrification) and microbial biodiversity. Claire McKenny has recently commenced a PhD project at Griffith on the relationships between stream grazers and the composition and production of periphyton.

Urban land & water management

by Ian Lawrence

Approaches to urban water management have changed greatly in recent years, in response to the search for more sustainable land and water use and management practices, and the community wish to recover urban waterway values. The high cost of concrete pipes and other infrastructure has also driven this shift in the way we manage our urban water.

The past separate treatment of water supply, stormwater and wastewater streams is now giving way to a 'total urban water cycle' based approach, in which the significant interdependencies between the various water streams is increasingly being recognised. There is also growing recognition of the wider landscape values of stormwater. Using features such as ponds and wetlands instead of concrete pipes and channels provides the community with a variety of social, recreational, economic and environmental benefits.

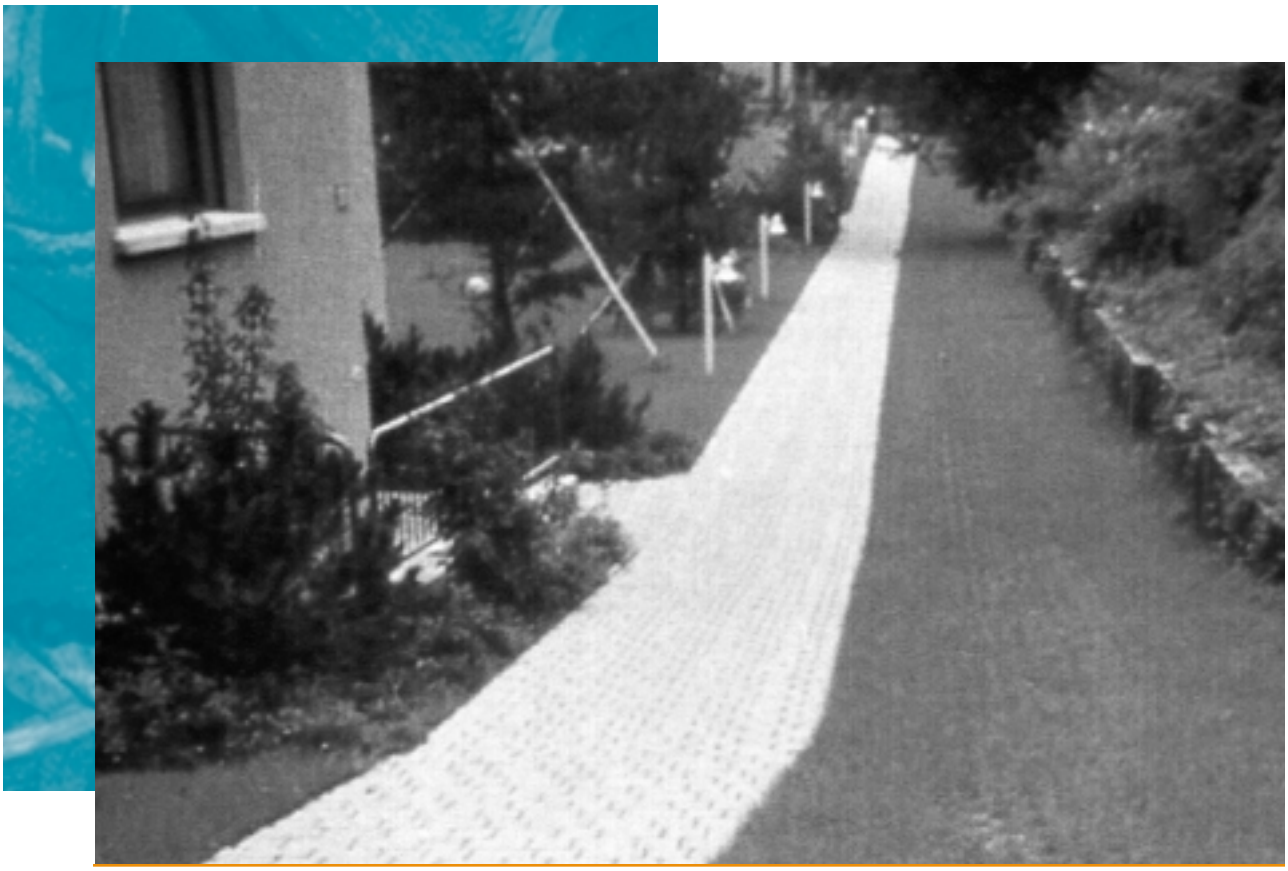
Only through a more integrated approach to land and water management can management options responsive to the full scope of social, economic and environmental benefits be identified.

At the residential block and streetscape level, the maintenance of surface drainage and infiltration rather than discharge of runoff to stormwater pipes, results in a significant enhancement in local landscape values, soil moisture balance, water recycling, and runoff and pollutant retention. Examples include the collection of rainwater from household roofs, the treatment and re-use of grey water for toilet flushing and landscape irrigation, and the retention of rainwater on the block through enhanced infiltration into the soil. The re-use of stormwater is offsetting town mains supply of water as a cheaper and more environmentally sensitive source of water supply for landscape and sportsground irrigation.

a 'total urban water cycle' approach

New subdivision designs are using fewer stormwater pipes, by integration of surface water features such as swales (see photo p. 8) and ornamental ponds into the landscape, and by enhancement of soil infiltration by the use of porous pavements and infiltration trenches.

Stranger Pond (Isabella Plains, ACT), providing an important pollution control facility protecting the Murrumbidgee River, as well as enhancement of landscape and recreational values.
Photo: Ian Lawrence



Integrated drainage and landscape: use of porous pavement on right to form a drainage swale.
Photo: Peter Michel

Using swales, porous pavements and infiltration trenches allows more water to soak into the soil; restoring a more natural moisture balance to the soil in urban areas.

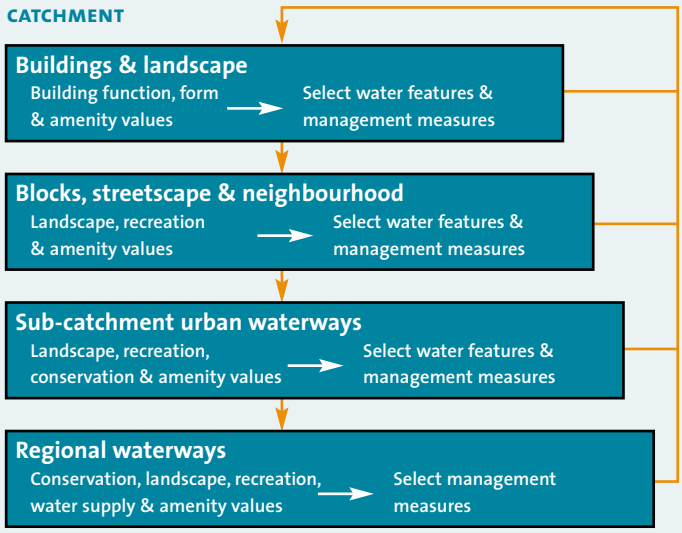
The retention of natural streams or restoration of vegetated urban waterway corridors and streams (drains), including wetlands and ponds, creates a rich and diverse landscape element. In addition to their 'drainage' function, these landscape systems constitute valuable urban landscape and open space systems, wildlife and people movement corridors, recreation and conservation facilities, and significantly reduce downstream peak flows and sediment and nutrient discharges.

The holding of stormwater in wetlands and ponds not only reduces the frequency of big stormwater discharges into the creeks, but also reduces the amount of sediment, pesticides, nutrients and faecal bacteria entering the streams. They recreate habitats for a variety of plants and animals, assisting their conservation. Particularly in dry times, water birds are one of the animals that use these ponds and wetlands for refuge.

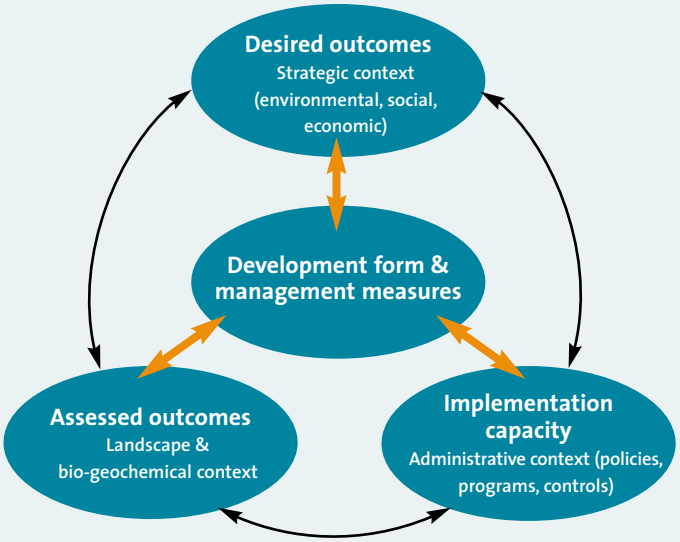
The significant social, economic and environmental benefits of either retaining natural streams, or restoring vegetated waterways, including the incorporation of wetlands, ponds & lakes into these corridors, are being recognised more widely.

Integrated urban land and water based management also makes great financial sense. At the block level, there are substantial savings in infrastructure and water supply costs, and enhancement of block values. At the urban waterway level, there are substantial savings in infrastructure costs (70%). Blocks that front on to a pond, wetland or vegetated waterway can double

Integrated framework guiding management strategies



Integrated assessment framework



Local drain using natural materials. Fadden, ACT.
Photo: Ian Lawrence

in value while blocks that offer a view of these water features can increase in value by 70%.

It's not surprising that some property developers are adopting these modern urban water design techniques.

The rapid shift in approaches is requiring new skills and techniques for assessment, selection and design of management measures. The CRC for Freshwater Ecology, in association with the CRC for Catchment Hydrology, is providing a range of tools and guidelines to assist service providers, approving agencies, consultants and the community in responding to these new directions.

For further information, contact
Ian Lawrence
phone: 02 6201 5371
email: lawrence@lake.canberra.edu.au

Rainwater spout, integrating water into the house architecture.
Photo: William Wenk

SideStream

New Director of Knowledge Exchange

Peter Cullen is pleased to announce that Dr Gary Jones from CSIRO Land and Water in Brisbane has accepted the position as Director of Knowledge Exchange for the CRC. Gary will relocate to Canberra and take up his duties early next year. Gary will be taking up a new post as Professor of Aquatic Science at the University of Canberra for the duration of his contract as Director of Knowledge Exchange.

New Technical Reports

Two new technical reports are now available:

- Characterisation of Flow in Regulated and Unregulated Streams in Eastern Australia by Jane Growns and Nick Marsh, and
- The Status of Research into the Effects of Dryland Salinity on Aquatic Ecosystems by Daryl Nielsen and Terry Hillman.

Both reports can be ordered free of charge from the MDFRC at Albury:
Phone: 02 6058 2310,
Email: enquiries@mdfrc.canberra.edu.au

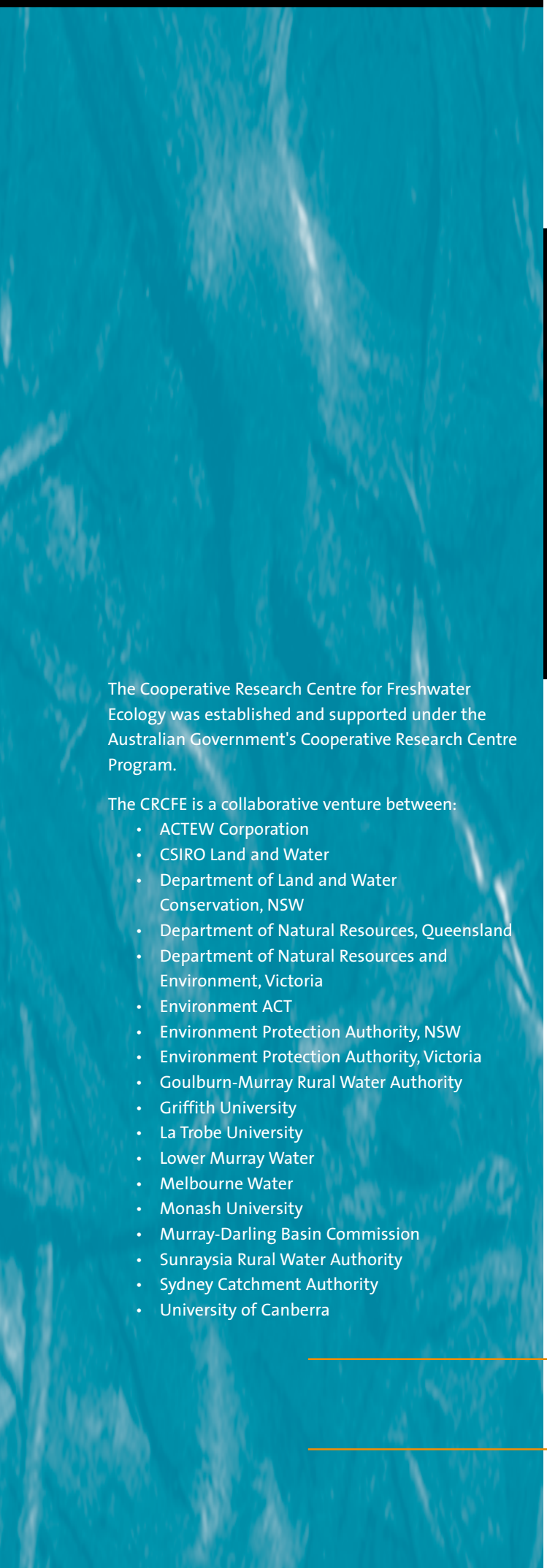
Algal Bloom Prediction Workshop (Monash University)

CRCFE staff, including Barry Hart, Rod Oliver, Ian Lawrence, Mike Grace, John Whittington, David Robinson and Peter Cottingham, attended a workshop in August examining nutrient-algae relationships. The workshop, also attended by people from DNRE, Melbourne University and the Universities of New South Wales and Western Australia and Goulburn Murray Water, was convened on behalf of DNRE to explore two key questions that are important for assessing the cost-benefit of catchment-based nutrient management plans in Victoria:

- Can we quantify the relationship between nutrient loads, nutrient availability and algal growth in waterways and reservoirs (i.e. in systems where nutrients rather than other factors limit growth)? and
- Can we identify the time frame over which reductions in nutrient loads are likely to result in reduced algal bloom frequency and intensity?

The workshop identified ways forward based on the classification of waterbodies (cf ANZECC guidelines) and the possible development of nutrient-algal bloom duration curves for those systems where N and P availability is limiting. Peter Cottingham, Barry Hart and John Whittington will report the workshop proceedings. A proposal to pilot the approaches identified at the workshop is being developed.

CRCFE web site:
http://freshwater.canberra.edu.au



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

The Communication Manager
CRC for Freshwater Ecology
Building 15
University of Canberra ACT 2601
Tel: 02 62012109
Fax: 02 62015038
Email: lsealie@enterprise.canberra.edu.au

The Cooperative Research Centre for Freshwater Ecology was established and supported under the Australian Government's Cooperative Research Centre Program.

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
- Sunraysia Rural Water Authority
- Sydney Catchment Authority
- University of Canberra

Design & layout: Simon Yates, SYGA Pty Ltd