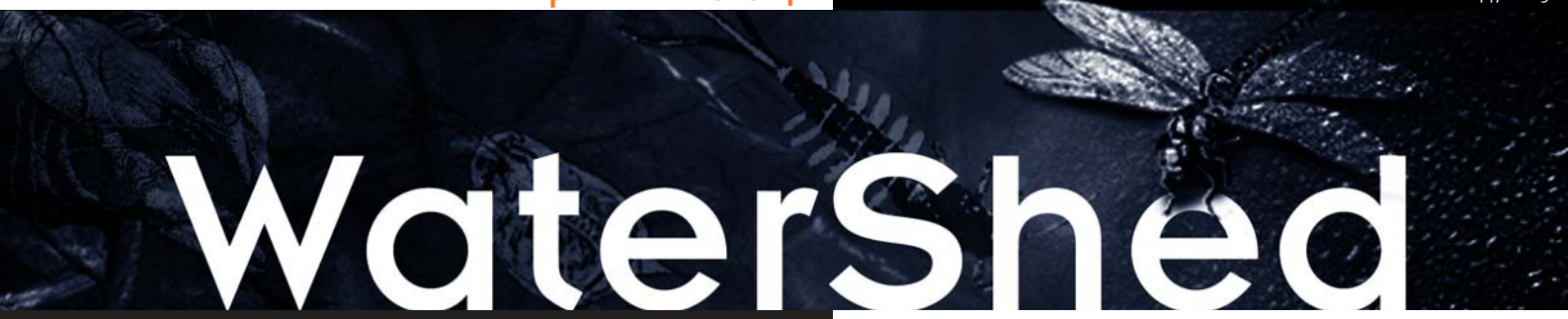
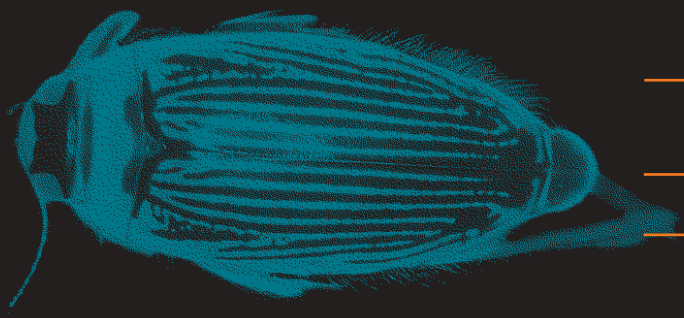
April 2004

ISSN 1447–1663



WaterShed

contents



A proposed new integrated CRC to address Australia's water future

by Professor Gary Jones

Smart use and management of water is central to Australia's growth and future prosperity. The Deputy Prime Minister John Anderson stated in August 2003: 'No country has a greater interest in getting water right for the next century and beyond than this one'.

Water availability to underpin the growth of cities, irrigated agriculture, mining and other water-consuming industries in eastern Australia is effectively a 'zero-sum game', irrespective of whether it is surface-water or from aquifers. A rebalancing of the distribution between competing interests is inevitable.

Financial and operational adjustments will be required by any industry, business or community for which water plays a role in supporting asset value and wealth generation. The environment will also become an active participant in the marketplace, competing for scarce water and public and private cash resources.

Governments have taken a strategic stake in this critical challenge for Australia through the new COAG National Water Initiative (NWI). The NWI seeks to establish the right policy balance between economic production and environmental sustainability, and to create an effective interstate market for water.

In response to these challenges the CRC for Freshwater Ecology (CRCFE) and CRC for Catchment Hydrology (CRCCH) are proposing to join forces to create a new CRC, to be called the 'eWater' CRC (the e stands for enterprise, environment and education).

Combined skills and outlooks

The eWater CRC will combine the skills and end-user networks of two CRCs that have played an important role in fostering a knowledge-based approach to the management of catchment water resources and ecosystems in Australia. At present, CRCCH works with

CRC FOR FRESHWATER ECOLOGY

http://freshwater.canberra.edu.au

The Cooperative Research Centre for Freshwater Ecology develops ecological understanding to improve and protect Australia's inland waters.

CRC AUSTRALIA

key industry groups and delivers high-value predictive models, analytical techniques and educational services to meet the needs of specific target markets; and CRCFE produces advice, methods, tools and professional education to solve ecology-related issues facing the water industry.

The eWater CRC will have a broad, industry-focused vision that extends beyond our existing public-sector partner and client base. It may include private-sector R&D partnerships with banks, mining and energy companies, urban developers or any other industry or business with a direct or indirect reliance on water. Our primary objective will be to deliver to partners practical tools and systems for successful business operations in any matters related to water use and environmental sustainability.

For the preliminary eWater-CRC business case, we have assembled a strong partnership of private-sector water retailers, public-sector water and environment managers, urban and catchment management authorities, and major research organisations across eastern and southern Australia. We have 'whole of government' support from Queensland, NSW, ACT, Victoria and South Australia. We are also holding partnership discussions with several additional private-sector companies.

Professor Gary Jones, Chief Executive of the CRC for Freshwater Ecology. Photo: L Sealie

This new alliance will allow a holistic, 'no boundaries' approach to the research, management and use of Australia's surface and groundwater resources and ecosystems, in both urban and rural areas. It will also provide integrated water planning and analysis systems for private-sector businesses operating in new national and international markets.

Building on cooperative relationships developed over the past decade, the eWater CRC and its public and private sector partners aim to achieve:

- major efficiency gains and cost-savings for the Australian water industry in sustainable water allocation, use, reuse, and systems operations & management;
- up to 50% reduction in the costs of meeting industry and community objectives for water environments;
- greater certainty for managers and private industries in securing 'water business' outcomes that are high quality and knowledge-based;
- an unprecedented level of support for, and involvement in, water and catchment science by all stakeholders;
- creation of a stable commercial revenue stream to fund on-going research and development (R&D) activities, product up-grades, and end-user support, including new international markets for Australian water management know-how.

Industry-driven product portfolio

Our preliminary business case is founded on five core product areas identified by our industry partners:

- *river operations & management tool kit* — tools for predicting and evaluating flow allocations and for planning 'water smart' river operations;
- *urban water systems tool kit* — integrated decision tools for potable water, grey water, wastewater, stormwater and groundwater use, reuse and management;
- *water and pollutant accounting* — systems for regional conjunctive surface/groundwater and pollutant balance-accounting, and to support effective water market functioning;

- *river restoration & environmental infrastructure* — a scenario-based predictive framework for optimising investments in river and wetland restoration at a whole-of-catchment scale;
- *integrated monitoring and assessment systems* — decision tools for setting robust environmental objectives and key performance indicators, and for implementing cost-effective and targeted monitoring programs.

A tool (or tool kit) could include predictive software, integrated databases, methods of assessment and analysis, guidelines, etc.

We are also seeking additional private-sector commercial partners for two other ventures:

- *water resources observation network* — a distributed network incorporating technologies for acquiring, storing, analysing, visualising and interpreting catchment environmental and water resources data;
- *environmental sustainability toolbox for water dependent industries* — a suite of products packaged to provide an environmental sustainability platform for specific water-dependent industries.

These product areas will directly inform our research programs and projects. In addition, about one quarter of the eWater CRC research funds will be directed to strategic 'foundation' research on: (i) the impact of extreme events and climate variability on the water cycle and ecological condition; and (ii) analysis of landscape-scale processes and restoration.

Successful CRC applicants will be advised by DEST in December this year, and new CRCs will start in July 2005. If our proposal is unsuccessful, the CRC for Freshwater Ecology and CRC for Catchment Hydrology will continue to operate until June 2006.

The proposed eWater CRC is an exciting opportunity for all current and future partners. We have a lot of hard work ahead of us in planning and development for the final business case, and will face plenty of stiff competition for Australian Government investment funds. As I write, we are yet to be informed if we will even get the chance to submit a full business case in early July. Nevertheless, interim eWater CRC chairman Don Blackmore and I believe we have a very strong business proposition to put forward, and remain optimistic about our prospects.

I wish to thank Rob Vertessy, until last month Director of CRCCH, who has worked closely with me and our partners on the development of the Stage 1 Business Case.

(Extracted and edited from the eWater Stage 1 Business Case)

Any enquires on the proposed eWater CRC should be directed to:
Professor Gary Jones
Chief Executive, CRC for Freshwater Ecology
Interim Chief Executive, eWater CRC
Phone: 02 6201 5167
Email: gjones@lake.canberra.edu.au

STOP PRESS

We have just been invited to submit a Stage 2 Full Business Case application.




Good management practice as a benchmark for river assessment

In a PhD project that is nearing completion, Claire Sellens has been determining the types of macro-invertebrates (water insects and crustaceans) that are present in streams subject to 'good' land or catchment management. Good management can be defined as that which protects a river from damage or from intensive land-use activities in its catchment.

The basic issue

How do you measure the condition of a river? How do you know if its characteristics (its algal activity, say, or its population of macroinvertebrates) are 'normal', or whether it is in better condition than the river in the next valley?

Faced with this problem a decade ago, river managers and researchers decided they needed to measure river condition relative to a framework defined by benchmarks or reference conditions. If all rivers in a region were rated in comparison to a single set of reference conditions, they could then also be compared to each other. Where possible, the reference conditions were those existing in undeveloped or minimally disturbed rivers in similar terrain and climatic zones.

In urban or heavily farmed regions, it is rarely possible to use minimal disturbance as a reference condition. Again, for rigorous comparison among rivers, a framework and benchmark are necessary, and that benchmark must still be the 'best available'. In these conditions, 'good management practice' could be an alternative benchmark against which to assess land and river husbandry.

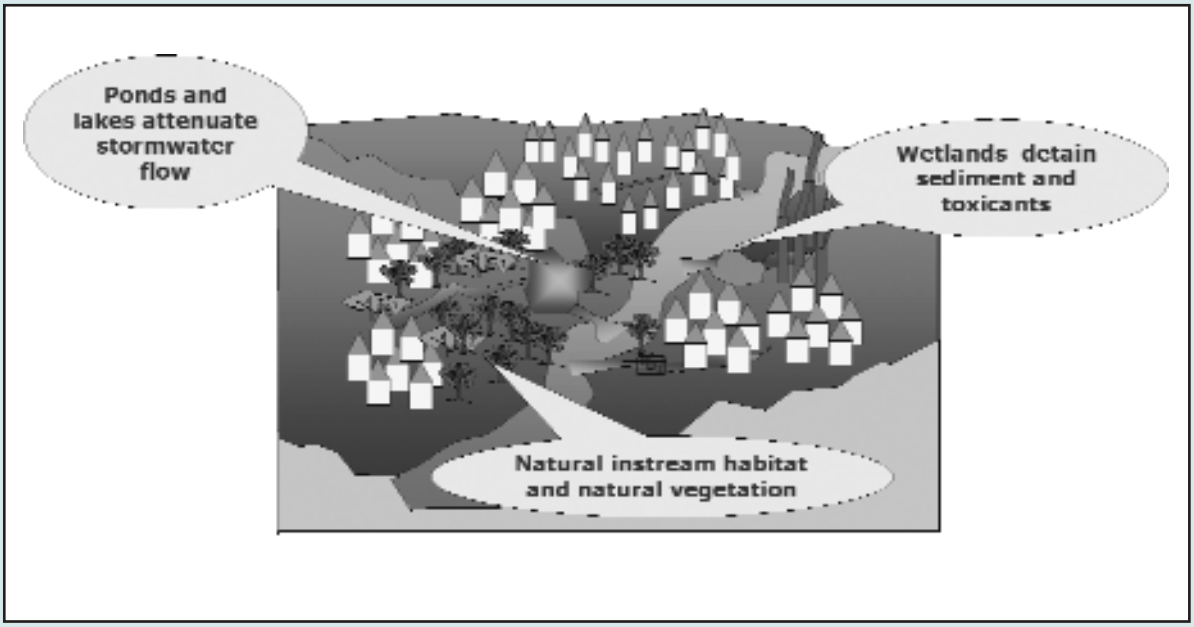
The project

Claire set out to develop a procedure for establishing a good management practice (GMP) reference condition for urban and agricultural landscapes in ACT and southern NSW. Working at University of Canberra (UC) with supervisors Bruce Chessman (Dept of Infrastructure, Planning and Natural Resources, NSW) and Richard Norris (UC), her tasks were:

- to find areas where GMP maintains and protects the riverine ecosystem;
- to define the conditions in these areas in comparison to 'traditional' reference conditions; and
- to identify the macroinvertebrates that would be present in GMP conditions.

The ultimate aim was to have enough information about the macroinvertebrates present in GMP conditions in various situations, so that AUSRIVAS-style predictions (predictive models) could be devised. In AUSRIVAS, 'predictive models' are lists of the organisms one could expect to find in samples from a river that is in reference (i.e. minimally disturbed) condition.

In the urban environment, GMP includes, for example, restoration projects or maintenance routines that allow riverside and instream areas to function as native habitat; and structures that intercept and attenuate stormwater flow (see diagram).



When establishing the GMP reference condition for the ACT urban environment, Claire found that activities which might at first seem to be 'good management practice' may not be good from the perspective of stream ecology. For example, a willow removal program has now begun to improve sediment transport and in-stream habitat, and is likely to bring long-term benefits. However, in the short term, willow removal caused bank-erosion and loss of riparian habitat. It is important to be able to recognise the point in time when the stream ecology at a site has recovered sufficiently from restoration activities for the site to be considered useful as a GMP reference site.

Is there GMP suitable to protect river ecosystem condition in rural areas subject to grazing? Yes, according to Claire's pilot study. However, she had to abandon this line of research because drought forced changes to the landholders' stream management practices at the rural study sites. Nevertheless, the drought, and also the subsequent bushfire which affected many of Claire's other study sites, have enabled her to adapt predictive models so that they take the effects of these natural disturbances into account.

Positive outcome

Using the GMP predictive models Claire developed for samples taken at the edges of ACT urban streams, ecologists can now detect when a stream is in poorer condition than a stream subject to GMP. Claire has also developed models combining both good management practice and minimal disturbance, for urban ACT. They turn out to be more useful for urban stream assessments than either the GMP reference site models or the pre-existing minimal disturbance reference site models alone. These new models are relevant to a wider range of the conditions and macroinvertebrates that occur in urban streams.

The development of a GMP reference condition, and its successful incorporation into biological predictive models for assessing stream health in urban areas is a positive outcome for management and assessment. It means not only that good management practices can now be identified for improving the ecological condition of urban streams, but also that urban stream health can be assessed more appropriately.

Willow removal caused bank-erosion and loss of riverbank habitat at this ACT urban creek site
Photo: C Sellens

For further details please contact:
Professor Richard Norris
Phone: 02 6201 2543
Email: Norris@lake.canberra.edu.au
or
Dr Bruce Chessman
Phone: 02 9895 7154
Email: bruce.chessman@dipnr.nsw.gov.au
or
Claire Sellens
Phone: 02 6201 2080
Email: sellens@lake.canberra.edu.au

Freshwater schools popular

by Michelle Bald and Rhonda Sinclair

In April this year, around 85 students in years 9–11 have attended the two annual freshwater schools run by the Murray-Darling Freshwater Research Centre (MDFRC, part of the CRC for Freshwater Ecology (CRCFE)) and Rotary.

At **Mildura**, the sixth 'Health of the River System' youth forum this year brought 37 students in years 9 and 10 to Lake Cullulleraine, Western Victoria. They came from schools across that region, from Robinvale in New South Wales to Victor Harbour in South Australia.

The students investigated the biology of fish, water bugs and water plants. They also examined many social and economic aspects of water resources management through a visit to Tandou vineyard, a visit to Lock 9 and a role-play game that determined hypothetical water allocations for irrigation development and environmental flows.

During the forum, the students worked in small groups with catchment managers and scientists, including CRCFE PhD students Jason Nicol and Sue Gehrig from Adelaide University. They got a real taste of the work these professional people do on a daily basis. It was a high-quality experience. They also expressed their own messages about the river system, in presentations.

Presentations took the form of skits or plays. In one, 'River Rescue', the river system was resurrected while the Prime Minister was at a cabinet meeting. The winning presentation explored the advantages and disadvantages of current management practices and described how the system could be managed better.

The students achieved high standards in their presentations, demonstrating great insight into the issues of river ecology and the trade-offs we need to make as a community to balance economic, social and environmental demands.

Russell Savage, MP, who attended on the Sunday (4 April) to assist in the judging of the student presentations, said 'This forum provides a great hands-on experience for students interested in river health and it is pleasing to see a focus on solutions to the issues facing our river systems'. And Chairman of the organising committee (from Rotary) Max Robinson said 'It was a pleasure to work with this group of fine young adults. They showed great enthusiasm and a real willingness to make the world a better place to live. I hope they can take some of the lessons they learnt during this forum and apply them to their lives.'

Investigations during the Health of the River System youth forum

Sampling at Lake Cullulleraine

The forum, which receives support from a number of sponsors, including the River Murray Catchment Water Management Board, the Mallee Catchment Management Authority, Simeon Wines, Mildura Rural City Council and Southcorp Wines, was highly appreciated by the students themselves. For example, one student wrote 'I learnt a lot about the health of the river system, and I also learnt that by working together as a community we can achieve much more than working in isolation'.

At **Albury**, the ninth Rotary Murray-Darling School of Freshwater Research was held during 18–23 April, and attracted approximately 50 students from secondary schools in New South Wales, Victoria, South Australia and the ACT. All the students are in year 11, and live in or near the Murray-Darling Basin.

For five days, the students worked in teams with leading scientists. Problem-solving activities, combined with intensive support and advice from staff from three institutions — MDFRC, La Trobe University and Charles Sturt University — gave the students a realistic and entertaining introduction to freshwater ecology and the environment. As John Hawking, Scientific Program Leader, said, 'To assist the students in their research, they are lectured, demonstrated to, field-tripped, advised and assisted by the staff'.

Participants worked in the laboratories at the MDFRC, and engaged in field-work at the Wonga Wetlands near the River Murray, operated by the City of Albury. For one day, the students visited the Norske Skog paper mill, where they were given an overview of mill water use and treatment processes. They toured the wastewater treatment plant and the recycling plant and examined the wastewater re-use scheme at Ettamogah Forest.

The concluding highlight of the school was the presentation by each group to a meeting of scientists and Rotarians, further enhancing the students' communication and teamwork skills. The participants left with a greater understanding of the role of scientists, their methods and the place of scientific research in Australian society.

The school is sponsored by the Rotary Club of Albury, Norske Skog, and CRCFE.

For further details please contact:
Dr Michelle Bald at Mildura
Phone: 03 5051 4055
Email: michelle.bald@csiro.au
or
Rhonda Sinclair at Albury
Phone: 02 6058 2331
Email: rhonda.sinclair@csiro.au

Students inspect a clarifier at the Norske Skog Albury wastewater treatment plant.
Photo: J Hawking

Book review: *Bioassessment of Freshwater Ecosystems using the Reference Condition Approach*

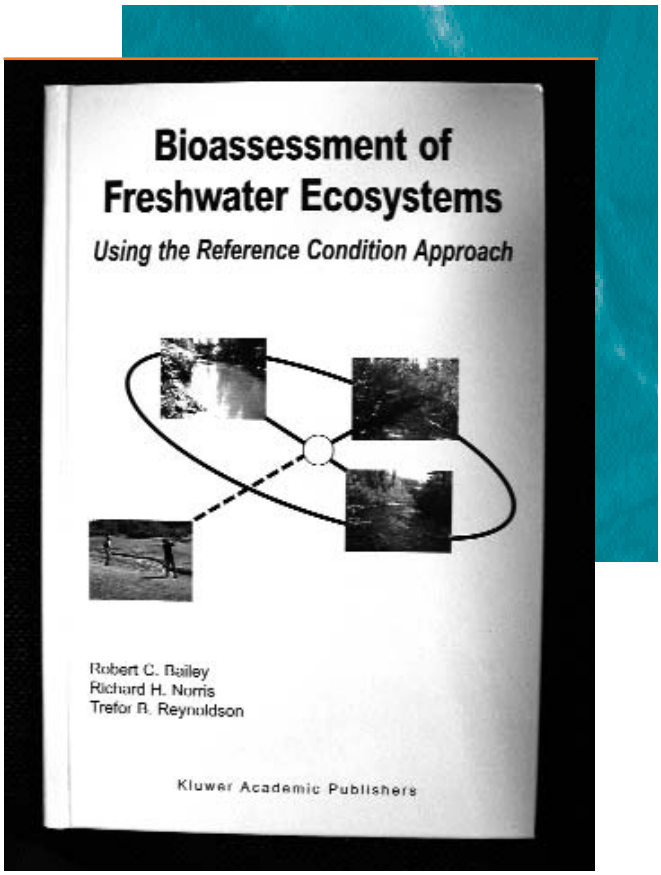


Photo: B Rennie

by Richard Marchant, Museum Victoria

There have been many developments in the bioassessment of freshwater ecosystems in last three decades. One of the most important, I think, is the reference condition approach (RCA). This short book is a manual that aims to explain the RCA and demonstrates with case studies how it can be used.

RCA specifically analyses biological variation at many undisturbed or reference sites across a landscape. Potentially or actually disturbed sites (test sites) are then compared with this large database. This process of bioassessment is more robust than that based on single control sites, immediately upstream, for instance, or in the next bay. In effect, data from reference sites provide, as the authors suggest, 'an empirical definition of ecosystem health'.

In seven chapters the reader is taken on a step-by-step tour of various concepts and techniques underlying the RCA. The first chapter outlines the main theme: to measure variability in the biota at reference sites and use statistical modelling to associate as much of this variability as possible with environmental characteristics of these sites. With such models the composition of biota at test sites can be predicted from environmental data at these test sites. Chapter 2 provides background geographic and environmental details of the case studies used throughout the book, which come from three quite different freshwater ecosystems: the North American Great Lakes, the Fraser River in western Canada, and the upper Murrumbidgee River in Australia.

The next two chapters occupy almost two-thirds of the book and deal with the design principles behind RCA (chapter 3) and the actual modelling processes employed to produce predictive models (chapter 4). One important principle is that the fundamental unit of replication in RCA is the site. Thus variation between reference sites, rather than that within a site, is what RCA aims to capture, and such variation is seen not as a problem but as a characteristic to be described. The longest chapter (4) provides a lucid account of the development of predictive models for each of the case studies.

Chapter 5 explains how thresholds for the biological descriptor (below which a site 'fails', i.e. is shown not to

be in reference condition) can be set from RCA models, and demonstrates that this procedure is closely related to the usual statistical concepts of type I and type II errors. The actual passing or failing of a site is not the end of the process. Chapter 6 shows, with data from the upper Murrumbidgee, how bioassessments need to be interpreted in the light of other information that may be available. The final chapter is a summary of the previous six.

As mentioned above, this book is a manual illustrated by case studies and does not attempt to delve into the extensive literature on bioassessment of freshwater ecosystems. It shows the benefits and pitfalls of using RCA and in my view makes a persuasive case for adopting these techniques. It is a book that should appeal primarily to those who conduct bioassessments over broad spatial scales, such as government environmental agencies, environmental consultants. It should also interest students and researchers, as the full potential of RCA is still to be determined.

The book is expensive for its size, but this seems typical of scientific publishers these days. However, I am irritated by the seemingly cavalier attitude of such publishers towards publishing standards. The table of contents omits chapter numbers and most of the informative chapter subtitles. The index occupies one page, seems to miss out a good deal of the alphabet and appears to be altogether too short to be useful. The line diagrams have not reproduced well in a number of cases (p.101, 104, 106); some appear to have been over enlarged and a number do not reach standards expected in refereed journals. I noted a few editing lapses and a number of omissions from the list of references.

Despite these imperfections, I would recommend this book to anyone who wants a clear, concise explanation of how and why to use reference sites to conduct bioassessment in freshwater.

Bioassessment of Freshwater Ecosystems using the Reference Condition Approach, by R.C. Bailey, R.H. Norris and T.B. Reynoldson, 2004, Kluwer Academic Publishers, Boston, USA. Pp 170. ISBN 1-4020-7670-3, US$90. Available via http://www.dadirect.com/books/ Search. asp

FOOTNOTE:
I'm told a second edition is planned, amending the irritations mentioned above.

The creature feature for this issue is the predacious diving beetle *Lancetes lanceolatus*.

Family: Dytiscidae
Species: *Lancetes lanceolatus*

This water beetle is found Australia-wide and is characterised by its yellow colour and 7–8 thin dark lines. It is part of the family Dytiscidae, known as 'diving beetles' because they are good swimmers and divers. Both adults and larvae are aquatic (the photo shows the adult form), living in the edge sections of both still and flowing waters. Adults grow to 1.2 cm long. The beetle is completely carnivorous and both adults and larvae are effective predators. Adults consume their prey by tearing it into small pieces first, whereas larvae pierce their prey, inject it with digestive juices, and then swallow the liquefied remains.

Lancetes lanceolatus, *the predacious diving beetle. Photo: J Hawking*

Editor's Note: Creature feature in the December 2003 Watershed mentioned only two species of river mussel in the Murray-Darling Basin. However, it has since been pointed out that a third species, *Alathyria condola*, occurs in the Murrumbidgee Irrigation Area and can be found in large numbers along the Murrumbidgee River, often with *A. jacksoni*. Compared to *A. jacksoni*, *A. condola* has a rounder, less elongated shape and a conspicuous notch in its shell.

SideStream

Customised courses for the water industry

The CRCFE is developing new initiatives in education and training, mainly directed at water industry personnel, following a survey and workshop with CRCFE partner organisations to determine relevant water issues, and education and training needs.

It is proposed that courses will use flexible-delivery systems similar to those that supply the successful AUSRIVAS Online course. They will consist of modules of information, be self-paced, and be accessible from remote locations via the Internet, with face-to-face components only where necessary. Students have been found to learn and remember much more when given time to internalise information, as in self-paced courses, than when in intensive face-to-face courses. For details, please contact Professor Richard Norris, phone 02 6201 2543 or email norris@lake.canberra.edu.au.

Fish rehabilitation workshop

A workshop on 10–11 February at Albury, NSW, discussed recently completed projects that have focused on restoration of fish habitat within the Murray-Darling Basin. This was the fifth in a series of workshops being held by the Murray-Darling Basin Commission (MDBC) to discuss issues of relevance to the implementation of the Native Fish Strategy. Participants reviewed the projects' outcomes and identified strategies and actions to improve habitat rehabilitation. All presentations and recommendations for action are reported in the workshop proceedings that staff of MDBC and CRCFE are currently preparing. CRCFE staff were involved as speakers (John Koehn, Simon Nicol, Sam Lake) and facilitators (Peter Cottingham, assisted by Ruth O'Connor, John Koehn, Mark Lintermans). The workshop was organised by Mark Lintermans (CRCFE) and Anthony Chariton (MDBC).

15th Taxonomic Workshop and new ID guides

The 15th MDFRC/CRCFE Taxonomic Workshop was held at Lake Hume Resort, Albury, NSW, on 10–11 February. Approximately 60 participants from south-eastern Australia heard from nine speakers, who described how to identify lacewings and spongeflies, fairy shrimps, freshwater mussels, adult and larval dragonflies and damselflies, caddis fly larvae and fish larvae. Six new identification and ecology guides were released during the workshop, bringing to 51 the total number of these guides published over the past 15 years. Titles, costs and ordering information for all 51 guides are listed on the CRCFE web site, or via http://mooki.canberra.edu.au/Raw_HTML_Pages/Publications_list_for_website.htm.

World Wetlands Day at Mildura

World Wetlands Day (2 February each year) is an international event marking the anniversary of the signing of the Convention on Wetlands (Ramsar Convention) in Ramsar, Iran, on 2 February 1971. Each year, a World Wetlands Day Celebration is held at Kings Billabong, Mildura.

This year about 200 people participated in the activities, which included guided wetland walks and a wetland food-web treasure hunt for the children (organised by the Lower Basin Laboratory, supported by staff of government agencies including Mallee CMA, Waterwatch, NSW Murray Wetlands Working Group, Parks Victoria, Lower Murray Water and DIPNR).

AUSRIVAS Online course

The AUSRIVAS Online training course is offered twice a year by the CRCFE and the University of Canberra. The course aims to teach the skills and knowledge needed to assess river health to an acceptable standard using AUSRIVAS methods. Those who complete its requirements successfully are eligible for accreditation from the relevant state or territory agency.

There are no prerequisites for this short (12 weeks) non-award course, other than registration and payment. The theory of assessing river health can be learnt entirely online in four interactive modules. A 4-day practical face-to-face workshop is offered as a fifth module, teaching the practical skills required.

The next AUSRIVAS Online course is scheduled to start on 26 July 2004, if there are sufficient enrolments. Please register your interest by 1 July 2004. Otherwise, the next course will begin on 21 February 2005.

To register, see http://ausrivas.canberra.edu.au/Bioassessment/Macroinvertebrates/Training/

New CRCFE people

Susanne Schmidt has just commenced a three-year Post-Doctoral appointment, investigating issues in river–floodplain diversity on the Macintyre River. Susanne is working with Glenn Wilson from the Northern Basin Lab at Goondiwindi, Neal Foster NSW DIPNR (based at Tamworth) and Martin Thoms from the University of Canberra. She has just completed her PhD on water bugs found in groundwater (stygfauna).

Scott Rayburg, a fluvial geomorphologist from the State University of New York at Buffalo, has recently joined the Narran Lakes Ecosystem Project team. Scott is working with Gerry Quinn (Monash University) and Martin Thoms (University of Canberra) to build a hydrological model for the Narran system to help investigate the influence of water resource development and climate variability on the wetting and drying regime of the Narran River.

Three new PhD students have started relatively recently with the CRCFE and the University of Canberra, co-supervised by Associate Professor Martin Thoms.

Amina Price is studying the use of slackwater patches by juvenile fish, mainly in the Broken River (co-supervisor Paul Humphries, Monash University). **Kate Brandis** is researching waterbirds' use of habitats in the Narran Lakes ecosystem (co-supervisor Richard Kingsford, NSW NPWS). **Mark Southwell** is studying river-channel–floodplain sediment interactions in the Barwon-Darling River, New South Wales (co-supervisor Jon Olley, CSIRO).

National Youth Science Forum

Dr Fiona Dyer, Associate Professors Martin Thoms and Ralph Ogden, and Professor Richard Norris, all with CRCFE at the University of Canberra, took 33 of the National Youth Science Forum 2004 students to the Murrumbidgee River in January, to learn a little about river science. The forum brings together students from all around Australia who have just finished year 11 and are thinking of a career in science, engineering or technology. It introduces them to research and researchers in the physical and biological sciences. The students, both last year and in 2004, react very positively to the CRCFE component of their 14 days'-worth of activities.

Associate Professor Martin Thoms addresses students from the National Youth Science Forum. Photo: B Rennie

ASL Early Career Excellence Award

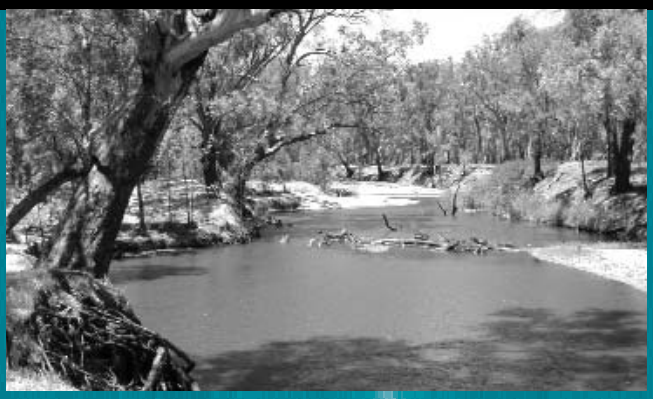
Congratulations to Dr Ben Gawne, Director of the Murray-Darling Freshwater Research Centre, who was awarded the 'ASL Early Career Excellence Award' at the Joint 42nd Australian Society for Limnology Congress and 36th Congress of the New Zealand Limnological Society held at Warrnambool, Victoria, 1–5 December 2003.

Young Water Scientist of the Year Award 2004

Each year, the Water Forum CRCs offer a prestigious Young Water Scientist of the Year Award. This year, the award will be judged and presented at Riversymposium in Brisbane, 31 August to 3 September. The award highlights the role of the CRCs in training future water scientists, managers and technologists who can do good science with strong relevance to the water industry, and communicate well. Five finalists, all PhD students in the five CRCs, will give presentations at the symposium. For further details of the award, see http://mooki.canberra.edu.au/waterforum.

cooperative research centres
waterforum
YOUNG WATER SCIENTIST of the Year

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



Feature plant

by David Williams

River red gum is the feature plant for this issue.

Family: Myrtaceae
Species: *Eucalyptus camaldulensis*

River red gum is found in every mainland state of Australia, west of the Great Dividing Range; three varieties are currently recognised across its range. It is a large tree, 15–45 m high at maturity and up to 3 m or more in diameter. It grows along rivers and watercourses but also occurs as floodplain forests or woodlands. River red gum has smooth white or grey bark with brown or red patches, and cream or yellow flowers, valuable for honey production. Seeds can germinate profusely following floods and heavy rains, with summer survival of the seedlings being critical to stand regeneration. Altered flow patterns have been shown to both increase and decrease floodplain populations of this species. Mature trees have deep roots and use groundwater, floodwaters and rainfall depending on conditions. Established trees can survive at least several years of continuous inundation. As the major riparian tree of the inland rivers, red gums play a significant part in rivers' ecological functioning. They shade the waters; their roots protect river banks; their litter, as leaves and snags, is important to river ecology. Red gum timber from the River Murray has supplied thousands of cubic metres of wood for bridges, boats, mine props, sleepers and charcoal.

Areas mentioned in this issue.

Comments and ideas are welcome and can be sent to:

Ann Milligan
Communications Manager
CRC for Freshwater Ecology
Building 15
University of Canberra ACT 2601
Tel: 02 62015168
Fax: 02 62015038
Email: amilligan@enterprise.canberra.edu.au
http://freshwater.canberra.edu.au

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

The CRCFE is a collaborative venture between:
• ACTEW Corporation • CSIRO Land and Water • Environment ACT• Environment Protection Authority, NSW • Environment Protection Authority, Victoria • Goulburn-Murray Rural Water Authority • Griffith University • Infrastructure, Planning and Natural Resources, NSW • La Trobe University • Lower Murray Water • Melbourne Water • Monash University • Murray-Darling Basin Commission • Natural Resources and Mines, Queensland • Sunraysia Rural Water Authority • Sustainability and Environment, Victoria • Sydney Catchment Authority • University of Adelaide • University of Canberra • Water, Land and Biodiversity Conservation, SA

Watershed is produced by the CRC for Freshwater Ecology Knowledge Exchange Team. Unless otherwise stated, all articles are written by Ann Milligan and Bronwyn Rennie.

Design & Production: Graphic Ark Pty Ltd, Canberra