Survey returns positive comments for *Watershed*

Thank you to all those *Watershed* readers who participated in the survey conducted recently by the independent consultancy group, Econnect. We commissioned the survey as part of our effort to improve communication with the water industry, science community and general public. Your comments were much appreciated and will be incorporated into all future editions of this newsletter. A summary of the Econnect survey follows.
– Karen Markwort, Editor

In general, there was enthusiastic support for *Watershed* with the comment "this is an excellent publication" typical of written comments and responses to survey questions.

The responses to the general questions indicated that:

- A clear majority of respondents regarded *Watershed* as easy to read and to understand
- A clear majority of respondents regarded *Watershed* as attractive in general style and layout
- Two-thirds of respondents typically read all or most of the newsletter
- There was support for the belief that *Watershed* made an important contribution.

The results also indicate that the respondents to the survey were most likely to read articles about issues relating to water management, updates on R&D progress, and updates on CRC activities. Respondents were least likely to read articles on non-research topics and people profiles.

Generally, respondents preferred the current length of the newsletter and its current frequency of distribution. There was majority support for varied length of articles, with some preference for short concise articles. There was very little support for longer more detailed articles.

Approximately half of the respondents indicated that they followed-up a few articles. A majority of respondents (80%) indicated that they passed on information most of the time, sometimes, or occasionally. Eighty-six percent of respondents indicated that there was enough contact information in *Watershed* to help follow up stories or get further information. However, in the comments section of the survey some respondents said more contact details (especially email) were needed.

Biological assessment techniques developed as part of Australia's National River Health Program are being trialed in Indonesia with a view to incorporating these methods into the Indonesian Clean Rivers Program (PROKASIH).

This collaborative, international program is part of the Bapedal and East Java Pollution Control Implementation Project (PCI Project). CRCFE Deputy Director for Research, Prof Barry Hart, is leading this AusAID funded project which is being conducted by a joint venture of three Australian companies, CMPS&F, SAGRIC and Sinclair Knight Merz.

Prof Hart said that many countries, including Australia, were using biological tools such as macroinvertebrates to assess the 'health' of rivers. Macroinvertebrates, more commonly known as bugs, can provide a lot of information about the condition of waterways. They provide complementary information to that provided by the more traditional physical and chemical water tests.

CRCFE staff—along with staff from Environmental Research Institute of the Supervising Scientist (ERISS), the Northern Territory University and the University of Tasmania—with expertise in biological monitoring techniques, have been in East Java training key Indonesian staff to sample and identify macroinvertebrates.

CRCFE research assistant, Justen Simpson, has recently conducted a two-month training program for six Indonesian scientists where 84 sites were sampled in the upper Brantas River to assess the condition of this system.

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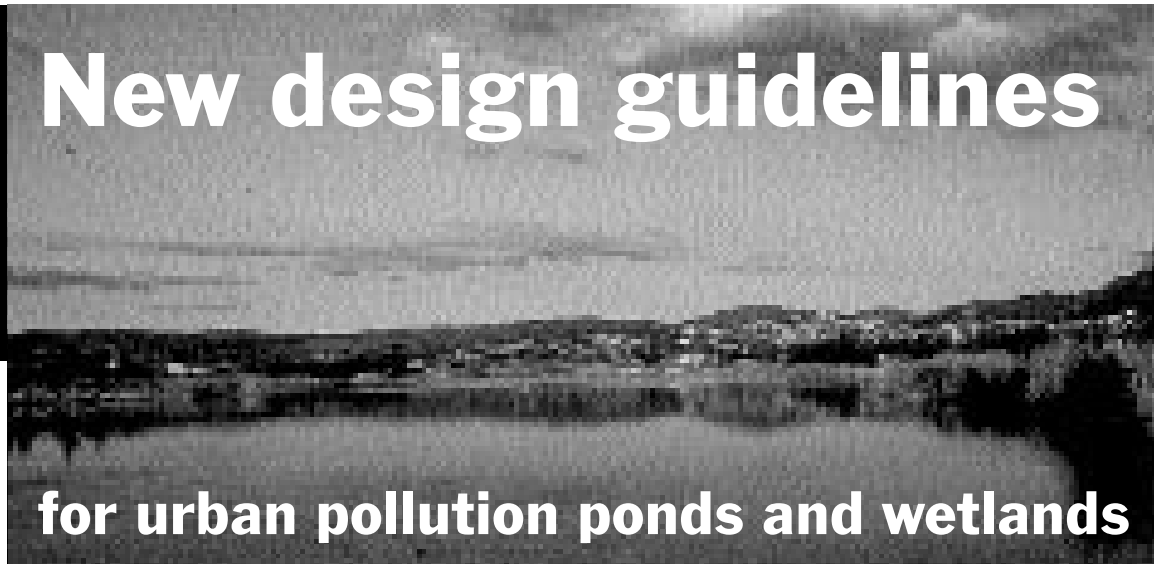
WaterShed

contents

The CRCFE was established under the Commonwealth Government's Cooperat Research Centre Program in July 1993.

The Cooperative Research Centre for Freshwater Ecology provides ecological understanding to improve inland waters through collaborative research, educa and resource management.

Stranger Pond – a pollution control pond designed to intercept stormwater pollutants in the Tuggeranong region of the ACT before they can make their way into rivers. Intergrated urban water management in the ACT is designed to protect the downstream waters of the Murrumbidgee River.



New design guidelines for urban pollution ponds and wetlands

The CRCFE is a collaborative venture between:

- *The ACT Government*
- *ACTEW Corporation*
- *CSIRO Land & Water*
- *EPA Victoria*
- *Goulburn–Murray Water*
- *La Trobe University*
- *Melbourne Water*
- *Monash University*
- *Murray–Darling Basin Commission*
- *Murray–Darling Freshwater Research Centre*
- *NSW Fisheries*
- *University of Canberra*
- *Southern Rural Water*
- *Sydney Water Corporation*
- *Wimmera–Mallee Rural Water*

A major study of water pollution control ponds in three cities has provided new insights into the nutrient processes that drive urban ponds.

The three-year study of ponds in Canberra, Sydney and Melbourne was conducted by the CRC for Freshwater Ecology through a joint program conducted with the CRC for Catchment Hydrology.

Joint program leader, Ian Lawrence, said the project, as well as wider research within both CRCs, had provided a number of breakthroughs in understanding the dominant water quality processes that operated in urban wetlands and ponds.

"We have firmly established the need to base pond and wetland design on local climatic and geochemistry conditions," Mr Lawrence said. "While there are certain general principles that can be applied to all pond and wetland design throughout Australia, there is a need to consider local soil types and climate in the final equations."

Another major finding was that diffuse discharges (such as stormwater runoff) to ponds and wetlands were typically high in suspended solids. Nutrients, metals and organic material bind to the surface of these solids and are removed from the water column as the solids settle to the bottom of the pond.

However, these nutrients, metals and organic material were susceptible to being remobilised following deposition of organic material during heavy storms. This remobilisation process could substantially reduce the effectiveness of the pond or wetland to intercept pollutants, and exacerbate pollution by transforming pollutants to forms that could more easily affect living organisms.

The major physical, chemical and biological processes that influenced the movement of pollutants within these waterbodies were also identified. Other findings related to appropriate pond sizing relative to receiving waters and the tendency of highly turbid ponds and wetlands to stratify, whereby the water column separated into warm upper and cold bottom layers, during hot summer and calm wind conditions.

"The work provides a scientific basis on which urban managers and communities can base the design of ponds and wetlands," Mr Lawrence said.

"Our urban areas continue to grow and with them the need to better manage how we provide water for domestic and industrial use as well as how we remove wastewaters. Recent government legislation and the growing awareness of the need to protect the environmental values of our

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Developing a research portfolio
– an exercise in collaborative science

The CRC for Freshwater Ecology has commenced the second phase of its research portfolio, which emphasises integrated, multidisciplinary work.

This second phase of research, which will take us through to the end of our seven-year life, has been developed through a long process of consultation and collaboration with research staff and partners. The project proposals were reviewed both internally and externally before funding was granted.

At the start of the process we asked our research staff to nominate projects that might be supported under a new round of funding. We stressed that nothing but excellent science would be good enough. That science, we added, must also be relevant and address industry needs. A third proviso was that projects that took advantage of the strengths of the CRCFE —its ability to conduct large, integrated, multidisciplinary work—would be favoured.

This last condition fostered a great leap in our understanding of collaboration. Chemists, biologists, hydrologists, geomorphologists and ecologists—all of whom have their own preferred paradigms —sat down at the same table to ponder new research directions, to compare conceptual models and to challenge each others' ideas. Postgraduate students sat at the same table as more senior researchers, giving everyone within the CRCFE the same opportunity to express their views.

What we achieved from this process was much more than a research program. The process, while painful at times, was just as valuable as the intended outcome. The building of trust between researchers, particularly those from different disciplines, was a significant outcome, as was the team building and the resultant sense of shared ownership of the research program. Collaboration between our multidisciplinary teams also stimulated new ways of seeing familiar concepts. Geomorphologists and ecologists, for example, often see similar processes from entirely different angles. From this new scientific insights developed.

The resultant research program is defined by four over-arching themes. These were areas that the researchers agreed were of most relevance to the water industry and included identified knowledge gaps. These were:

- Water regimes and allocations
- Energy and nutrient dynamics
- Ecological assessment
- Restoration and rehabilitation ecology

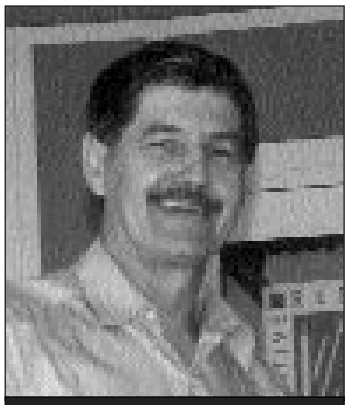
Large, integrated projects within these themes have received funding as part of the second phase of the CRCFE's research program. These include:

- Ecological functioning of lowland rivers (see last edition of *Watershed*)
- Sediment–nutrient processes
- Biological assessment of river health
- Restoration of degraded rural streams: the Granite Creeks Landcare project (see pages 4 and 5).

The process we've been through in setting up our new research portfolio has certainly been given the thumbs up and was loudly endorsed by the panel of international scientists that recently reviewed the CRCFE's progress and scientific excellence.

The first stage of the CRCFE's 5th Year Review was conducted at the Murray–Darling Freshwater Research Centre in Albury last month. The panel included internationally-respected aquatic ecologist, and former Australia Prize recipient, Prof Gene Likens from the Institute of Ecosystem Studies in New York; Prof Colin Townsend, another eminent aquatic ecologist from the University of Otago, New Zealand; and Mrs Christine Forster, a Victorian farmer, and member of the Victorian Catchment Management Council and Land and Water Resources Research & Development Corporation. This stage of the Review focused on our research effort while the second stage, to be conducted later this month, will examine the Centre's relevance to industry and its success in getting industry to adopt its research findings.

The fifth year is somewhat of a turning point for all Cooperative Research Centres, because it is at this stage of their seven-year life that final judgement is passed on their performance. Have they met the Program's underlying philosophy of addressing the needs of Australian industry? Have they been successful in increasing dialogue between industry and research? Can they demonstrate that their research activities over the last five years have made a difference to the industry they service? The likelihood of CRCs being granted funding beyond their seven-year life hinges on this review.



Acting Director, Barry Hart

The panel's response to our Review presentation— a recommendation to extend the CRC for Freshwater Ecology for a further seven years— certainly indicates that we on the right track.

In its 23-page report, the panel stated that the CRCFE was "making major contributions toward achieving its vision by conducting significant and relevant scientific studies, the results of which form the basis for all smart management, restoration and conservation efforts on critical freshwater resources".

It paid tribute to Prof Peter Cullen, whom they said was doing a "magnificent job in leading the Centre's research and training activities".

The panel was particularly impressed with the innovative approaches to research being developed by the CRCFE. They commented that the integrated, multidisciplinary and team approach was most

likely to produce the new knowledge required by the Australian water industry.

Following the second stage of the 5th Year Review, the CRCFE will be required to submit an application for re-funding under the CRC Program, administered by the Department of Industry, Science and Tourism (DIST). We are currently finalising our submission with representatives from a number of new organisations that have expressed interest in joining a new CRC for Freshwater Ecology.

While the outcome of this submission won't be know until early next year, what is certain is that the competition for funding will be very tough. Already more than 145 intentions to submit applications have been received by the CRC Secretariat. Another certainty is that the CRC for Freshwater Ecology won't be offering more of the same. We are developing a new research portfolio that addresses the research interests of our potential new partners and that extends some of the areas that we have examined during the first CRCFE.

What we will also be offering is the corporate knowledge of an organisation that has grown from a fledgling cooperative Centre to a truly collaborative venture that is now trialing new ways of doing science and transferring the results of that work to pertinent stakeholders.

Barry T Hart, Acting Director

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Studying the ecology of Menindee Lakes

Since the 1960s Menindee Lakes, located in north-west New South Wales, have been operated as a storage system, effectively bumping up the amount of water that is available to irrigators in the Murray Valley.

These permanent and ephemeral floodplain lakes, formed where the River Murray meets the Darling River, have significant natural and cultural heritage values. They are immensely productive systems that provide breeding sites for birds and fish.

A CRC for Freshwater Ecology project, funded by the NSW Water Management Fund, is looking at alternate management options that will maximise the environmental values of the lake as well as optimising the water available for irrigation and domestic use in NSW, Victoria and South Australia.

Four small lakes—Malta, Balaka, Bijiji and Tandure —as well as three large lakes—Pamamaroo, Menindee and Cawndilla —make up the Menindee Lakes system.

The project, being conducted by the Murray–Darling Freshwater Research Centre's Lower Basin Laboratory, involves studying and comparing the ecology of lakes Malta, Bijiji, Balaka, Menindee, Cawndilla and Tandure while they undergo their flooding and drying cycle.

During high flows water from the Darling River is impounded behind the main weir and diverted through Lake Pamamaroo into Lake Menindee and Lake Cawndilla. The water is retained there and released slowly over time into the Darling River and then into the Murray. A proportion of the flow is also allocated to the anabranch to meet the irrigation, stock and domestic demands of nearby farms.

To date scientific work on the ecology of the lakes has been very limited. Most of the previous work has been limited to surveys of commercial fish species and birds as well as the gathering of water quality data.

The current study will examine the chemical and physical characteristics of the water and sediments as well as survey the lakes' algae and aquatic plants and fauna including zooplankton, bottom-dwelling invertebrates, fish and birds.

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An almost dry Lake Bijiji – part of the Menindee Lakes system that has been operated as a water storage since the 1960s. Photo: Karen Markwort

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waterways has certainly fuelled a demand for better knowledge about urban water management.

"This work, and that of the entire urban program, is geared towards providing urban communities with the knowledge required to make informed decisions about urban water management, particularly relating to stormwater management and its integration in the urban water cycle."

This new knowledge has been incorporated into a recently produced guide, *Design guidelines: Stormwater pollution control ponds and wetlands* by Ian Lawrence and Dr Peter Breen.

The publication is available from the CRCFE for $20, plus $5 postage.

For more information about this publication, or to arrange a workshop to discuss the outcomes of this work, contact Ian Lawrence by phone on (02) 6201 5371 or email at: **lawrence@lake.canberra.edu.au**

Looking to the past to manage the future

Historical research is a necessary part of any stream rehabilitation project, researchers working on the degraded Granite Creeks in north-eastern Victoria have concluded.

"If you don't have an idea of what the streams used to look like, how they have changed and what's driving that change, you're really flying blind," said Dr Jennifer Davis, a geomorphologist who has recently completed an historical study of the creeks.

"Even if you are successful in rehabilitating the stream, you won't be certain that processes that degraded the stream in the past won't occur in the future."

The one-year geomorphological study of the Granite Creeks is part of a major rehabilitation project being conducted on those streams by the CRC for Freshwater Ecology in conjunction with the Granite Creeks Landcare Group, an amalgamation of smaller landcare groups from Strathbogie Ranges in Victoria. The CRC for Catchment Hydrology is providing some financial support and expertise for this $355,000 project, which is funded by the CRCFE.

This system of creeks, made up of six separate streams in granite country, is plagued by problems of sedimentation, gullying, incision and bank erosion.

(While incision and gullying both refer to erosion into the stream bed, incision is typically associated with permanent streams while gullying usually relates to streams that only flow after rain.)

The catchments of streams in this system are made up of two distinct sections:

Historical records indicate that sections of some streams in the Granite Creeks system have been incised by up to 10m since European settlement. Photo: Alena Glaister

a granitic upland segment which is characterised by steep gradients and a single, main drainage line; and a lowland segment that meanders across the Riverine Plain and comprises multiple channels or anabranches.

Prof Sam Lake from Monash University is leading this multidisciplinary project that aims to determine the levels of sediment input and movement within the streams and to assess the disturbance to biota by this sediment.

The project is looking at the best means of monitoring stream restoration in the region. It is also investigating whether increased habitat structure assists restoration and whether habitat fragmentation impedes restoration.

Underpinning this work is an understanding of the historical condition of the streams and the processes that have led to their current degraded state.

"The geomorphological study was aimed at finding out where the sand was coming from, what 'activities' had triggered its release in the past and were there likely to be problems in the future", Dr Davis said.

The study focused on three specific creeks which were deemed to be representative of other streams within the Granite Creeks system—Castle Creek, Pranjip-Nine Mile Creek and Creighton's Creek.

In order to find out what these creeks looked like before European settlement the researchers turned to the oldest written records they could find: explorers' diaries, historical maps and field notes and land selection files.

Major Mitchell, they found, had moved through the area in 1836 and described the area. Information from his diary was checked against that from the diaries of one of the Overlanders, Alexander Mollison who made several trips from NSW down to Port Phillip and back again.

Surveyors commissioned by government to report on the potential of the unsettled regions also left behind detailed maps and field notes that provided useful descriptions of the Granite Creeks area.

Land selection files provided additional detailed information. The Land Selection Acts were passed between 1860 and 1880 in an effort to open up Victoria to settlers. Each time a parcel of land was selected a file was created. These files extended from the time the land was first leased up until the lease was converted to freehold. The file typically contained all the communication between the Lands Department and the occupier and included details such as the condition of the land and any 'improvements' the selectors may have made, eg. ring barking, clearing, fencing.

Records from local shires and government agencies such as Natural Resources and Environment, VicRoads

Cut off stream meanders are contributing to gullying and incision problems in the Granite Creeks system by initiating erosion heads that move back up the creeks. Photo: Alena Glaister

and the Public Transport Corporation provided the researchers with more recent information about land management activities and problems in the Granite Creeks catchments. Anecdotal evidence from landholders also provided an insight into activities and changes within the catchments.

From these early descriptions we know that the creeks are very different today," Dr Davis said. "Perhaps the most impacted are the upland sections. The swampy flats are still visible but the creeks no longer flow over them.

"Channels are incised or cut down into these swampy flats and the flow is now confined in deep channels. As a consequence of this incision and gullying a lot of sediment was liberated, and this can now be found in the lowland sections of these creeks. The lowland channels are being smothered by the sand that is moving out of the upland reaches of these creeks."

So what triggered these catchment changes? The researchers looked at a number of possible activities including gold mining; channelisation; agriculture; floods, bushfires and drought; channel modification; sand and gravel extraction; and internal triggers.

While there was limited gold mining in the catchment the researchers found that quite a bit of channelisation had occurred through activities such as bridge and road building and the draining of swamps. These activities had confined shallow but broad flowing streams to much narrower paths which increased stream power and the stress on the creek beds resulting in massive incision.

Agriculture had also played a hand in the changes through the clearing of vegetation that reduced the resistance of the soils to erosion and increased runoff. The introduction of hooved animals also contributed to these impacts through soil compaction by reducing the soil's ability to take up water, potentially increasing runoff in the catchment. Trampling of streambanks and drainage lines by stock has also caused erosion and initiated bed incision.

There was also evidence that floods, bushfires and droughts had impacted on the catchments in the past.

Channel modification, through activities such as dredging and removal of vegetation and snags, had set up conditions conducive to the initiation of erosion heads, which had moved back up the creeks causing gullying and incision.

"This historical study has really shown us that it is the upper catchment that seems to have been impacted most by the activities mentioned," Dr Davis said. "Land in the upper catchment is particularly fragile and responds quite quickly to inappropriate management. "This indicates that if we're trying to manage these creeks better and rehabilitate them then we really need to be looking at the upper catchment. We need to manage near stream areas appropriately by fencing out stock, for example."

The historical research also highlighted the integrated nature of the Granite Creeks catchment and the fact that rehabilitation measures needed to deal with the entire creek system to ensure good results. This is related to the fact that erosion heads tend to move quickly up the system causing gullying and incision in the upper reaches of these catchments, in turn releasing sediment which moves down the system smothering the lowland channels.

It also highlighted the need to get landholders involved in managing the entire Granite Creeks system; to recognise that land management activities on their own farms could potentially impact on the creek for kilometres upstream and downstream.

For further information, phone **Dr Jennifer Davis** on **(03) 9344 9792** or email: **jwilson@civag.unimelb.edu.au** or **Prof Sam Lake** on **(03) 9905 5653** or email: **sam.lake@sci.monash.edu.au**

Deposits of sand in the lowland sections of the Granite Creeks are a legacy of the incision and gullying that is occurring in the upper reaches of the system. Photo: Alena Glaister

New insights into algal blooms in dams

A large multidisciplinary experiment conducted on Chaffey Dam near Tamworth, New South Wales, has provided CRCFE scientists with new insights into the processes that drive algal bloom formation in reservoirs.

The project, conducted over three years by a team of biologists, chemists, physicists and algologists, was aimed at improving knowledge of the processes that lead to degraded water quality in reservoirs.

It looked especially at the capacity of artificial destratification, a method that mixes the water layers within the dam, to improve water quality in the reservoir.

The project, led by Drs Phillip Ford and Bradford Sherman from CSIRO Land and Water, was conducted in close collaboration with the NSW Department of Water and Land Conservation, the agency that manages Chaffey Dam, located on the Peel River in northern NSW.

A slick of blue-green algae on Chaffey Dam, near Tamworth, NSW. Recent studies have shown that destratification, while not eliminating blue-green algae, can help in reducing the severity of the blooms. Photo: Brad Sherman

Liaison officer for the project, Dr John Whittington, said that Chaffey Dam had been plagued for nearly a decade by massive blue-green algal blooms which could occur at virtually any time of the year.

Artificial destratification, using a compressor to create plumes of bubbles that circulate water throughout the reservoir, had not been successful in reducing these blooms of *Anabaena* and *Microcystis*.

Dr Sherman explained that water in storages such as Chaffey Dam typically stratified into layers according to temperature, with the warmer layers near the surface. It was in these warm surface layers, he said, that toxic blue-green algae thrived.

"What we found was that the destratification unit in Chaffey Dam was not powerful enough to eliminate blue-green algal blooms, but could reduce the internal phosphorus load to the water column by up to 85%, which was useful in decreasing the severity of blooms," he added.

"Algal growth in reservoirs is generally controlled by the amount of either light or nutrients available. In the case of Chaffey, the algae probably had plenty of access to light because most of the population was buoyant and could accumulate in the well-lit surface layers.

"It was most likely that algal growth was limited by the availability of phosphorus or nitrogen during the summer."

The Peel River supplied at least half of the phosphorus within the dam that was available for algal growth during an average year, the researchers discovered.

This phosphorus load was highly variable, however, and ranged from nothing during drought years to almost 23,000 kg during 1995–96.

Much of this incoming phosphorus was stored in the sediments of the dam, waiting to be released by chemical reactions, often set in train by bacteria.

"What we've found is that the concentration of phosphorus in the bottom waters significantly affected the amount of algae in the following growing season," Dr Whittington said. "Much of the phosphorus in the bottom water was released from the sediment during periods of low oxygen concentration".

"During years where destratification was attempted, however, there were lower phosphorus concentrations in the bottom waters and less algae in the following growing season than those years without destratification."

Dr Whittington said that the project results had provided the Department of Land and Water Conservation with a significantly better understanding of the processes operating in their dam.

"This improved understanding should enable them to operate the dam more efficiently," he said. "There are also general principles that can be applied to the management of dams throughout Australia".

The results of the work are also making a significant contribution to research undertaken by the CRC for Water Quality and Treatment who, in collaboration with Dr Sherman, will trial the effectiveness of an impeller (a large inverted propeller) to circulate the water layers within Myponga and Happy Valley reservoirs in South Australia this summer. The project has also provided a model of effective, interdisciplinary research that is now being applied more broadly to research approaches within the CRC for Freshwater Ecology. In addition it has provided a number of CRCFE students with the opportunity to work within a multidisciplinary team on a user-oriented research program.

A brochure summarising the project's main findings is available from the CRCFE. Contact either Dr Whittington on (02) 6058 2329 or email: johnw@mdfrc.canberra.edu.au; or Karen Markwort (details on the back page).

A change in management has been proposed for the Menindee Lakes that would see some of the lakes being allowed to dry over summer, as they would under natural flow regimes. Photo: Karen Markwort

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Most importantly, the work will look at the food web interactions between these species, with an emphasis on fish behaviour including studies of their diet and habitat preferences.

Project leader, Dr Ben Gawne, said that the study should provide a better understanding of the ecology of Menindee Lakes that would be needed to determine any change in management practice.

"From a water supply point of view they're one of the major storages in the Murray–Darling Basin," Dr Gawne said. "They provide a lot of flexibility in the way that flows within the Murray system are managed to ensure that South Australia gets its allocation (of water from the Murray).

"From an environmental standpoint we're not really sure how important they are. Arid region floodplain lakes, like Mendinee, that dry out are known to support very large populations of birds for short periods of time. We also think that they are important breeding sites for fish. They have a reputation at least of being very productive systems. Some of them are fairly diverse systems."

The project is aimed at providing appropriate data to determine the effect of a proposed management initiative to install a regulator between lakes Menindee and Cawndilla. This regulator would enable managers to fill Menindee Lake without filling Cawndilla, thereby subjecting the latter to more dry phases.

"The reason people are so keen on this idea is because this would reduce the amount of water lost to evaporation in Lake Cawndilla," Dr Gawne said.

"It will essentially half the surface area available for evaporation. There will be a lot more water available for other purposes. Because of the cap (on water allocations taken from the Murray) the extra water cannot be used for irrigation, but there are a number of other purposes to which the extra water could be put, such as environmental flows which would be very worthwhile."

Ultimately, the project will determine the environmental consequences of imposing this dry phase on Cawndilla.

"What we want to find out is what restoring this part of the historical flow regime means to the ecology of the lakes," Dr Gawne said.

"Which species would be advantaged by such a change and which species would be put to disadvantage. Because the system has changed so much it's possible that the current role of Lake Menindee in the ecosystem as a whole is not the same as the role it would have been playing in the past. The new environmental regime may mean that the Menindee lakes are serving a novel and useful role in the Darling River ecosystem."

Evidence from studies on small wetlands indicates that introducing a more natural flow regime, including a dry phase, may boost the productivity of wetlands and increase their value as habitat for some species of aquatic plants and birds.

The Menindee project will also investigate the mechanisms behind this 'productivity boost' —is it the effect of drying sediments or merely changes wrought in the food web? A number of tub experiments are being conducted which will look at the productivity of dry and wet treatments both with the introduction of predators and without.

A postgraduate project is also being conducted in parallel to the lakes work that looks at the community dynamics of invertebrates emerging from reflooded sediments of these dry lakes.

Weather conditions during the past year have played into the researchers hands; first providing a drought and then floods under which to study the Menindee Lakes system.

"Once the data is analysed we should be able to provide much more than a species list of fish in the lakes," Dr Gawne said. "We will be able to relate patterns of fish abundance to zooplankton and algal species composition and abundance.

"At the end of this project we'll be able to tell managers what sort of changes occur during a dry phase."

The real value of the work, however, will only be realised if the project is granted long-term funding so ecologists can track the changing population dynamics of these floodplain lakes.

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