NEWSLETTER OF THE COOPERATIVE RESEARCH CENTRE FOR CATCHMENT HYDROLOGY

CATCHWORD

NO 74 JULY 1999

A NOTE FROM THE DIRECTOR

Professor
Russell Mein

Inside...

New CRC – New Projects

The new CRC for Catchment Hydrology commenced its second seven years of activities on 1 July. Shortly, each Party to the CRC, and the Commonwealth Government (under its CRC Program), will have signed the extensive contract documents that bind them together in the unincorporated joint venture that is the CRC. Given that all organisations these days are dollar-focussed, and require regular reviews of what they are getting for each item of their expenditure, the commitment by the CRC Parties over the seven-year period is impressive indeed.

Clearly, Parties are participating in the CRC because they want research done that will help them achieve their goals as part of improved land and water management. At any given time during the life of the CRC, Parties need to be able to justify to their own Boards that what the CRC is doing deserves their continued involvement and support. Participating in the development and choice of the research projects to be tackled by the CRC was pretty important in this process, particularly for our industry Parties.

It is not as though we are 'starting from scratch' in selection of research projects to be funded.

Regular readers of *Catchword* will know that the CRC followed a collaborative and comprehensive process to put our new funding bid together. A critical early step was a workshop of potential Parties to set some strategic research directions, ie. areas that they saw as needing research. This was followed by a three-day workshop of senior technical staff, who nominated some 40 possible projects, before reducing this number by half in a priority setting exercise. Two-page abstracts were prepared for each selected project proposal, outlining the aims, target issues, expected outcomes, involvement of Parties, and the like. These abstracts were important to give a picture of the research fields that tackled the issues facing our Parties.

With Party approval, we went to the next stage, ie. putting the bid for funding together. A key component of the application was a Business Plan for the Centre, outlining the research programs and areas of activity. As previously mentioned in *Catchword*, we are undertaking integrated research, under Programs entitled:

- Predicting Catchment Behaviour
- Land-use Impacts on Rivers
- Sustainable Water Allocation
- Urban Stormwater Quality
- Climate Variability
- River Restoration
- Communication and Adoption
- Education and Training

We are now in the process of identifying the initial group of core projects for the Centre.

The planning process we are following is similar to that used in the initial CRC for Catchment Hydrology. Thus, Technical Advisory Groups (TAGs) are being convened for each program. Members of the TAGs generally come from the CRC Parties with special interest in the Program, although several external participants (selected for their expertise in the area) have also been invited. Project ideas will be discussed (including those already put forward from the planning workshops), and a new/revised set of project abstracts prepared. Before these revised abstracts are presented to the Governing Board of the CRC, Program Leaders will meet to ensure that linkages between Programs and focus catchments, and consistency of projects with the Business Plan for the bid, are maintained. The Board will then decide which project proposals should be 'worked up' for final approval.

'Working up' means fully scoped projects, with Project Agreements setting out objectives, methodology, expected outcomes, linkages to other projects, timetable and milestones, and resources required. The Agreements describe who is to do what and when, and are thus important planning documents for the CRC. When our Board gives final funding approval to a project, each Party involved in the project signs off on their project commitment.

The planning and selection of core projects is an important and major activity for the CRC. It is how we will achieve a research program which is both focussed and relevant.

Russell Mein
Tel.: (03) 9905 2704
Email: russell.mein@eng.monash.edu.au

Please note...

CRC publications and videos are listed in a separate document "CRC Publications"

The latest update has been included with this months *Catchword.*

Additional copies of the July to September Publications List are available from the Centre Office.

COPIES ARE AVAILABLE OF VIDEOS, REPORTS AND WORKING DOCUMENTS FROM: THE CENTRE OFFICE AT $20 PER COPY UNLESS OTHERWISE NOTED AND CAN BE ORDERED BY CONTACTING: VIRGINIA VERRELLI ON TEL (03) 9905 2704 or FAX (03) 9905 5033 EMAIL virginia.verrelli@eng.monash.edu.au

PROGRAM ROUNDUP

PROGRAM 1

PREDICTING CATCHMENT BEHAVIOUR

Program Leader
ROB VERTESSY

Report by Rob Vertessy

Many *Catchword* readers will be aware that the new CRC for Catchment Hydrology is aspiring to develop a new capability to predict the holistic function of catchments. By this we mean an ability to forecast how the water, solute, sediment and nutrient balances of landscapes mutually respond to land management and how these interact with the climatic variability and the ecologic, social and economic fabric of catchments. To make matters more difficult, we are proposing to focus our efforts across multiple scales. We are looking beyond the comfort zone of hillslopes and small catchments and aiming also at regions. We have chosen to direct our efforts on five focus catchments, these being the Brisbane, Yarra, Goulburn-Broken, Murrumbidgee and Fitzroy basins. The last of these has an area of over 130,000 km^2, so we are certainly ambitious.

We have set ourselves an immense scientific challenge, but the pay-offs are huge if we can succeed. If we do, catchment managers and the community stand to save millions of dollars per year by better targetting catchment management works, by reducing land and water degradation, and by more efficiently using catchment resources. Several breakthroughs will be needed to deliver on this challenge.

Some scientific challenges

First, we will need to find ways of scaling our biophysical understanding of catchment function to large spatial scales. Parsimonious representation of such understanding in regional hydrologic models is troubling many groups around the world. Luckily, we have a very strong skill base from which to work and great collaborative networks.

Second, we need to develop methods to exploit the new types of environmental data being captured through remote sensing. High resolution digital elevation data offer unprecedented definition of the shape of the land, and thus the flowpaths for water and materials. Gamma radio-metrics are providing new insights into soil and geologic properties. Hyperspectral imagery is telling us new things about plant canopy processes such as evapotranspiration and photosynthesis. Finally, rainfall radar gives us a much needed handle on the space-time distribution of rainfall. Most of this data is now being gathered from aircraft, allowing us to test ways of using the data in our models. In a few years time, much of it will be gathered routinely across the globe from satellites.

Third, we have to recognise that the input data to our models, and the models themselves, will be less than perfect. Because modelling is set to become a serious activity in natural resource management, we must be equipped to specify the uncertainty in all of our predictions. There have been many new advances in uncertainty analysis, but incorporating it into complex models will be very difficult.

Finally, we need to build bridges between the disciplines. Socio-economists, ecologists, geomorphologists, meteorologists and hydrologists need to first understand one another, then collectively build a framework that can integrate our knowledge. As catchment management becomes more complicated there is a growing need to forecast the trade-offs that might result from a particular land use option. For instance, broadscale afforestation might be great for salinity control and carbon sequestration, but may have some adverse impacts on water yield and water allocations. Fairly comprehensive models are needed to capture such trade-offs. The challenge here is both intellectual and practical. Building software which can link different sub-models that may operate on a variety of spatial and temporal scales will be quite hard.

The Technical Advisory Group (TAG) process

The above issues are concerning the TAG for this Program, which was convened in late May. Some 30 people, spanning all of the CRC for Catchment Hydrology Parties, are involved in this particular TAG. There has been active debate thus far and certainly no shortage of bright ideas. We will be meeting on July 15 to discuss these further and develop project proposals for consideration by the CRC Board on August 19. I am confident that we have the depth of talent and enthusiasm in our CRC and amongst our collaborators to give large scale, holistic prediction of catchment function a very good shot.

At this formative stage in the new CRC for Catchment Hydrology, I am particularly keen to receive advice from people who have ideas about how we might realise our vision. I can be reached on 02 6246 5790 or at rob.vertessy@cbr.clw.csiro.au.

Rob Vertessy
Tel: (02) 6246 5790
Email: rob.vertessy@cbr.clw.csiro.au

PROGRAM 2

LAND-USE IMPACTS ON RIVERS

Program Leader

PETER HAIRSINE

Report by Chris Carroll
Queensland Department of Natural Resources,
and
Peter Hairsine CSIRO Land and Water

Land use impacts on the Fitzroy River, Central Queensland

Introduction

In this article we introduce some of the problems and research issues relating to the catchment of the Fitzroy River in Central Queensland. This catchment is one of the CRC's focus catchments. Though the details of our research program are still to be finalised, this program will conduct part of its work in this catchment.

Location and size

The catchment of the Fitzroy River stretches from the Carnarvon Gorge National Park in the West to Rockhampton on the central Queensland coast. The Fitzroy catchment is the second largest in Australia, nearly 150,000km^2, and is dominated by agriculture (grazing, dryland cropping, irrigated cotton and horticulture) and by mining (coal production of 100 million tonnes/year, magnesite, nickel and historically gold and silver).

Hydrologic aspects

The river flow is highly episodic with a seasonal bias to higher flows in summer. Limited data indicates annual sediment delivery to the estuary is 5 million tonnes with high levels of nutrients and some pesticides. The catchment has recognised land degradation problems including all forms of soil erosion by water, and soil fertility decline. Several existing industries and communities are barely viable in the current economic environment.

Land use in Fitzroy catchment

Grazing

Grazing is the largest contributor (over 50 %) to rural income into Queensland's Central West Region. The grazing industry manages vast areas of the Fitzroy region (more than 13 million ha). Productivity is low by world standards, and in some cases poor management has led to resource degradation and possibly off-site impacts. Soil erosion and related problems of sediment and nutrient delivery are perceived to be major problems. It is likely that off-site impacts are small on a per hectare basis, but due to its massive area, grazing is possibly the largest contributor to the Fitzroy Catchment water quality problems.

Dryland cropping

The second largest area managed is dryland cropping, roughly 0.8 to 1 million hectares. Dryland cropping productivity in the region is low (grain production is about 700,000 tonnes/year), but recent estimates suggest there is potential to produce 2,000,000 tonnes/year. Again, soil erosion is perceived to be a dominant natural resource problem for this land use. Local practice, plus the unreliable rainfall, result in long periods with cropping land lying fallow and thus vulnerable to soil erosion. Other land resource degradation issues include soil compaction and fertility decline. It is widely recognised by catchment groups that the decline in these natural resources is linked to reduced farm productivity. There has been slow uptake of previous research, so careful consideration of the socio-economics of this sector is vital to uptake of any future research results.

Irrigated cropping

Irrigated cropping, although small in area, may have an impact on water quality; the major concerns are pesticides and nutrients. Although irrigation accounts for a small percentage of the total catchment area (45,000 ha), the rapid expansion and high inputs required by the industry have a significant effect on resources and downstream water quality. There is considerable potential for the adoption of best management practices in this sector. Note that the Fitzroy River is currently subject to a Water Allocation Management Plan (WAMP). Aspects of this issue will be covered in the CRC's Sustainable Water Allocation program.

Mining

Mining, although small in area, may have impacts on acidity and salinity of surface water. In central Queensland the area disturbed by open-cut coal mining exceeds 50,000 ha. The area subjected to underground long-wall mining is less, but increasing. The primary aim with open-cut rehabilitation is to produce a post-mining landform that is resistant to geo-technical failure and with minimal off-site impact on water quality.

In-stream problems

The Fitzroy River has periodically high levels of sediment (turbidity), pesticide and nutrient levels, toxic algal blooms and widespread occurrence of exotic weeds and threatened habitats, in particular flood plains and riparian areas.

Soil erosion and related sediment movement appear to be having a major impact on the Fitzroy Catchment. In two isolated events, QDNR staff estimated that approximately 20 million tonnes of topsoil was eroded from the surface of

NEW TECHNICAL REPORT

IMPLICATIONS OF IRRIGATION BAY MANAGEMENT FOR SALT EXPORT - A Study of Irrigation Bay Processes in the Barr Creek Catchment

by

M. Gilfedder
L.D. Connell
R.G. Mein

Report 99/4

This report presents details of the CRC irrigation bay experimental monitoring program aimed at determining the processes for the flow of water and transport of salt to surface drainage from an irrigation bay.

How these irrigation bay flows related to soil properties and irrigation practices is linked to improved understanding of the wider issue of salt export processes.

Copies available from the Centre Office.

NEW INDUSTRY REPORT

IRRIGATION BAY SALT EXPORT AND SALINITY MANAGEMENT

by

M. Gilfedder
L. Connell
J. Knight

Report 99/5

This new Industry Report presents the results of a CRC study of salt export from the Barr Creek catchment in northern Victoria; a large net exporter of salt to the Murray River.

The study focused on the measurement of salt export from an irrigation bay and the results have allowed assessment of the impacts of possible changes to improve farm irrigation management. In particular the report identifies the effects of reducing total irrigation volumes, and the impacts of the irrigation runoff reuse to reduce farm salt export.

In keeping with the Industry Report format and style, the report features clear and concise details of the research and outcomes with numerous illustrations and explanations.

It is available from the Centre Office for $20 by contacting Virginia Verrelli on tel: 03 9905 2704 or by email: virginia.verrelli@eng.monash.edu.au

the catchment, predominantly from agricultural land. An unknown portion of this eroded sediment reaches the river network. Further, an unknown portion of this material is transported through the complex river/floodplain environment and its associated sediment storages. It is not clear what the trends are in measures of river health. There is a need to quantify the source, amount, and quality of sediment generated across the catchment, the pollutants carried with it, and the effects of the practical management options.

Riverine, riparian, estuarine and marine health

Riverine and riparian areas in the Fitzroy have been disturbed by agricultural and mining activities. The estuary hinterlands have been generally cleared for grazing and urban development except for a considerable area of near pristine marine wetlands near the southern mouth. Based on limited water quality data, the downstream end of the estuary is in good condition but with high turbidity. Near Rockhampton, the estuary has high nutrient levels probably associated with upstream inputs, reduced tidal mixing due to the barrage, and local sewage outfalls. Keppel Bay supports a major scallop, prawn and fish industry.

The way forward

There is considerable existing knowledge about the functioning of this and similar catchments. The Queensland Department of Natural Resources has had a long-term presence in the catchment. The Fitzroy is also a focus catchment of the CRC for Coastal Zone, Estuary, and Waterway Management, LWRRDC's National Eutrophication Management program and a site for investigations by several Universities including Central Queensland University and the University of Melbourne.

The challenge for the CRC for Catchment Hydrology is to consider this vast, diverse catchment in a holistic way taking into consideration the existing knowledge and the parallel research of other organisations.

Chris Carroll
Tel: (07) 4938 4243
Email: Chris.Carroll@dnr.qld.gov.au

Peter Hairsine
Tel: (02) 6246 5924
Email: peter.hairsine@cbr.clw.csiro.au

PROGRAM 3

SUSTAINABLE WATER ALLOCATION

Program Leader
JOHN TISDELL (acting)

Report by John Tisdell

Objectives

The overall aim of the program is to develop principles, guidelines, procedures and practical management tools for policy makers and water managers that will provide a sound basis for managing water use in an efficient and environmentally sustainable manner under the new national property rights framework.

Justification

(a) Importance of issues being addressed

Resolution of the fundamental issues of:

- Assessment and management of system supply performance
- Establishing water trading frameworks
- Maximising water use efficiency

is critical to water resource management agencies, as property rights frameworks are currently being implemented, and need to be refined before substantial water trading occurs.

(b) Potential of CRC research to make a significant contribution

The CRC and its Parties are well placed to make significant progress in these areas, with clear expertise in hydrological and catchment modelling, uncertainty analysis, streamflow data generation, and climate analysis. Important economic expertise is also available through one of the Parties. Existing water supply systems and models in Victoria, NSW and Queensland will be used to explore these issues under a range of conditions.

Proposed Research Projects

Three integrated research projects are proposed to deal with the identified issues.

1. Managing water allocation and trading for sustainable use

Objectives

- to identify and characterise the key factors which can lead to uncertainty or change in water available for use by entitlement holders and the environment
- to characterise the nature of the impacts of the various sources of uncertainty on the performance of surface and groundwater supply systems

- to identify appropriate management techniques to reduce the risk of change and or to manage the change
- to develop procedures for determining appropriate 'exchange rates' for water trades and guidelines for determining appropriate constraints on trading to ensure that supply to other users is not affected by trading and that water use is environmentally sustainable
- to develop a methodology for quantifying groundwater allocations in terms of both volume and reliability

The project will use existing water resource models to test the sensitivity of supply system performance to modelling assumptions and to changes in physical system 'factors'. The risk of each factor changing will be assessed, and options to reduce and/or manage the risks developed. These options could include water allocation mechanisms, regulatory controls and economic instruments.

2. Improved river flow management (replaces 'Environmental flow modelling for operations' previously in River Restoration Program)

Objectives

- To improve the ability of water supply system managers to better deliver available flows to meet increasingly complex environmental flow targets and consumptive water use needs. This will maximise the environmental outcomes in the river systems.

The project will develop computer based management tools to assist in day-to-day reservoir release and diversion decision making. Key elements would include incorporation of real time monitoring, flow routing, stream flow prediction, environmental flow need prediction, and water use need prediction. An important output will be tracking time and condition varying environmental flow requirements, and assessing the probability of their future occurrence.

3. Improved rural water use efficiency

Objectives

- To develop procedures for identifying and quantifying the sources of losses in water delivery and on-farm systems and identify opportunities for improving the efficiency of existing water use.

This project aims to identify opportunities to increase the efficiency of water delivery and use in rural water supply systems. As most systems operate by open channel gravity supply, substantial water is lost by seepage, evaporation, outfalls from the channels, and runoff from farms.

John Tisdell
Tel: (07) 3875 5291
Email: j.tisdell@mailbox.gu.edu.au

PROGRAM 4
URBAN STORMWATER QUALITY

Program Leader
TONY WONG

Report by Tony Wong

The transition from the 'old' Urban Hydrology Program to the Urban Stormwater Quality Program of the 'new' CRC has been seamless and most of us in the program hardly noticed this transition. Planning for the next round of research activities is now well underway with the (new) Technical Advisory Group for this program meeting for the first time in Brisbane on 5 July. Many thanks to the members of the TAG for their invaluable input to the project development process.

Focus and Projects

The focus of the research activities of this program is directed at the development of a Stormwater Management Decision Support System. Projects identified at the TAG meeting have included a combination of the following activities:-

(i) theoretical development of stormwater treatment processes;

(ii) field experiments to aid the theoretical understanding of the processes identified in (i)

(iii) targetted monitoring and evaluation of existing stormwater best management practices (structural and non-structural),

(iv) characterisation of non-point urban pollutants in terms of their sources, pathways and impacts.

The projects identified at the TAG meeting of 5 July are currently being scoped and priorities will be ultimately set by the TAG for submission to the CRC Board.

Associated Projects

Targetted field monitoring of existing stormwater quality management facilities is an integral part of the research strategy of the this program. Planning for CRC Associated Projects has also commenced with a number of projects, on field monitoring and evaluation of stormwater treatment facilities, identified for CRC involvement. These projects have direct relevance to the aims and objectives of the Urban Stormwater Quality research program of the CRC. These associated projects are largely funded separately by industry, with CRC providing in-kind staff resources and intellectual inputs. Melbourne Water's funding commitment to the project on monitoring of the Hallam Wetlands will probably see this site as the first of a number of Melbourne and Brisbane-based associated projects.

Tony Wong
Tel: (03) 9903 2557
Email: tony.wong@eng.monash.edu.au

TECHNICAL REPORTS

REMOVAL OF SUSPENDED SOLIDS AND ASSOCIATED POLLUTANTS BY A CDS GROSS POLLUTANT TRAP

by
T. A. Walker
R. A. Allison
T. H. F. Wong
R. M. Wootton

Report 99/2

This report describes an extensive monitoring program to assess the efficiency of a CDS gross pollutant trap in removing suspended solids and nutrients.

URBAN STORMWATER QUALITY: A STATISTICAL REVIEW

by
Hugh P. Duncan

Report 99/3

This report describes the analysis of stormwater quality data from over 500 Australian and overseas studies. The report summarises stormwater concentrations of 21 water quality parameters, and examines the relationships between contaminant concentrations and physical and climatic characteristics.

Copies of these Reports are available for $20 from the Centre Office.

STREAM CONFERENCE PROCEEDINGS

The Proceedings of the Second Australian Stream Management Conference held in Adelaide recently are available through the CRC Centre Office for $95.

The two volumes (750+pp) consist of over 150 papers covering all aspects of stream management.

Please contact Virginia Verrelli on 03 9905 2704 to order your copy.

PROGRAM 5 CLIMATE VARIABILITY | Program Leader TOM MCMAHON

Report by Francis Chiew

Climate change and variablility

Rainfall and runoff can vary considerably from year to year. Managing of land and water resources involves designing and operating systems to cope with the variability in the climate. The design considerations are further exacerbated by the threat of climate change resulting from increased concentration of greenhouse gases. In Australia, problems arising from climate variability and climate change are further compounded by the higher inter-annual variability of river flows compared to elsewhere in the world.

Program goal

The goal of this program is to improve our ability to quantify climate variability. This will lead to a reduction in hydrologic risk for a wide range of water-related issues. It is not surprising then that the climate variability program is strongly linked to many other CRC for Catchment Hydrology research programs, in particular Program 1 (Predicting catchment behaviour), Program 3 (Sustainable water allocation) and Program 4 (Urban stormwater quality).

TAG meeting

The technical advisory group (TAG) meeting for the climate variability program will be held on July 21 in Melbourne, and will involve researchers, industry partners and stakeholders from across Australia. The objective of the TAG meeting is to discuss program directions and propose potential projects.

Research areas

The potential research areas include developing algorithms to stochastically generate climate and related hydrologic data sequences for any point in Australia, improving numerical weather and hydrologic prediction (as part of the international Global Energy and Water Cycle Experiment - GEWEX program), modelling space-time characteristics of rainfall, forecasting seasonal streamflow and evaluating the benefits and risks of using the forecasts for water resources management.

The research projects will be finalised in late August after a meeting of program leaders and the CRC Board.

Francis Chiew
Tel: (03) 9344 6644
Email: f.chiew@civag.unimelb.edu.au

PROGRAM 6 RIVER RESTORATION | Program Leader IAN RUTHERFURD

Report by Ian Rutherfurd

Changing attitudes

Nearly fifteen years ago, I had my first real job, working for the Lands Department in NE Victoria. I had some responsibilities for rivers and streams. Although we talked about environmental values, the core business of stream management then was to reduce the threat that the streams posed to economic and social assets – productive lands, bridges, roads etc. Streams will always threaten human use of floodplains, and this threat will always have to be managed. However, there has been a creeping change in the way we look at streams over the decades.

Today we consider the threat that humans pose to the environment of the stream, but more importantly, we are even considering improving their environmental condition. This is what stream rehabilitation is about – returning some of the natural values that streams enjoyed at first settlement. At least $50 million per year is being directed to rehabilitating Australian streams each year, and this amount is steadily growing. Most of the agency Parties in the CRC are responsible in some way for stream health, and have a strong commitment to improving the environmental condition of their streams. (Please note that I will use the terms rehabilitation and restoration interchangeably even though I appreciate that there is a real difference between the terms).

Stream condition

Stream condition reflects the compounding damage done to streams by humans throughout a catchment. As a result, attempts to restore streams can be seen as ambitious, risky, and inherently multi-disciplinary. At the end of the day, the success of stream rehabilitation will usually be measured in terms of the organisms that streams support. Our research centre has limited expertise in biology, so what can we bring to the problem of river and stream restoration? The CRC for Catchment Hydrology has expertise in physical processes operating in streams: hydrology, hydraulics, and geomorphology. These processes often underpin the health of organisms in streams. These are our core business. In most cases we will be relying on other parties (particularly the Cooperative Research Centre for Freshwater Ecology) to investigate the biological consequences of these processes.

Initial CRC work

The initial CRC for Catchment Hydrology had a stream rehabilitation project within the Waterways Program. This

modest project considered some physical processes in streams, and developed a Stream Rehabilitation Manual in partnership with LWRRDC. Interest in stream or river rehabilitation amongst our CRC Parties (expressed at the Woodend planning workshop) has meant that river restoration has become a program in its own right in the new research centre.

Future vision

The vision that underpins the program is improving and protecting the natural environment of Australian streams for future generations. We will contribute to this vision by providing information, tools, and intellectual leadership required to rehabilitate the physical condition of our streams. The premise is that the flow and geomorphology of the stream is a pre-requisite for a healthy stream.

Project proposals

The exact projects that will be carried out over the first three years of the program are still to be reviewed by the Technical Advisory Group, and ratified by the CRC Board. However it is likely that they will fall into three overlapping themes (I don't say projects because they are so interrelated!). Here are the groups with some potential activities.

1. Stream restoration procedures and approaches (this involves reviewing existing stream rehabilitation projects, and developing procedures for setting priorities)

2. Evaluation and execution of some major stream rehabilitation projects (this trials the procedures developed above, and evaluates the projects)

3. Physical processes in stream channels related to stream rehabilitation (these processes involve the interactions between flow, sediment, and channel morphology. Some projects may include recovery of disturbed stream geomorphology, hydraulic geometry approaches to rehabilitation and many more).

Support to the Program

The river restoration program is entirely dependent upon support from others. We are dependent upon other programs in the CRC for Catchment Hydrology to provide predictive models of inputs to our rehabilitated rivers and streams. We are also dependent on our agency partners to build things in streams that we can evaluate. And we are dependent on our biology colleagues to monitor the ecological impacts of works. I look forward to an exciting and challenging program of research in river restoration, and would welcome any discussion of the program.

Ian Rutherfurd
Tel: (03) 9344 7123
Fax: (03) 9344 4972
Email: i.rutherfurd@geography.unimelb.edu.au

COMMUNICATION AND ADOPTION PROGRAM

Program Leader
DAVID PERRY

Report by David Perry

The Flow on Effect - July 1999

A vision for successful adoption of our technology

Begin with the End in Mind

Imagine a copy of the May/June edition of the Australian Water and Wastewater Association Journal 'Water' from the year 2004. In the same way that the most recent edition of 'Water' had a feature on the CRC for Catchment Hydrology, this future edition might have a feature on a number of CRCs and include an interview with our Centre's Director. Let's say this interview is about the success of the CRC in fulfilling its objectives for the communication and adoption of its research findings and technology. What does it say about the CRC and our adoption activities? Perhaps it can help us describe a vision for our success.

After a quick read it is clear that the Director describes our six new research programs and the Communication and Adoption Program as having improved land and water management and practice by delivering world class research outcomes and communicating them to industry – But is that enough to be considered successful?

The Plan

The CRC for Catchment Hydrology Business Plan 1999 – 2006 formed the basis of our application to the Commonwealth Government for continued funding over the next seven years. By being successful in obtaining funding we now have a responsibility to carry out each aspect of the plan. Of the Communication and Adoption Program, it says two critical things:

- The effectiveness of our communication activities will be measured by independent consultants at the end of years one, three and five';
- 'The major performance indicator for the CRC for Catchment Hydrology will be the level of adoption of research outcomes.'

Quite clearly, the Business Plan declares the new CRC's intent with respect to its interaction with industry and the community. It will not be enough to undertake leading edge research into an issue, develop a model and communicate its relevance to industry. In the new CRC we also have a responsibility to develop that model with end-

INDUSTRY SEMINAR VIDEO

REHABILITATING STREAMS IN YOUR CATCHMENT - PRIORITIES AND POSSIBILITIES

Dr Ian Rutherfurd
(CRC for Catchment Hydrology, Monash)

Prof. Sam Lake
(CRC for Freshwater Ecology, Monash)

and
Dr Peter Breen
(CRC for Freshwater Ecology, Melbourne Water)

present a seminar designed to provide practical information for those involved in urban and rural stream management.

A video of this popular seminar is available. Orders can be made by contacting Virginia Verrelli at the Centre Office on tel: 03 9905 2704

users to create a product that can be readily applied by the land and water management industry. How can this be done effectively given the limited resources of the CRC?

Taking the right approach

Generally speaking there are four broad avenues to communicate our research outcomes:

- general promotion activities that create awareness of the research and the issues - most importantly in the land and water management industry but also by the public.
- the project teams and their links with other researchers and industry staff
- links in the focus catchments. (Five focus catchments - the Yarra and Goulburn-Broken in Victoria, the Murrumbidgee in NSW and the Fitzroy and Brisbane catchments in Qld, have been chosen to provide a platform for the integration of our research results.)
- The communication and technology transfer pathways of our industry Parties and other similar agencies, national research and development corporations, other CRC's and professional associations.

The CRC for Catchment Hydrology has built a reputation for effective technology transfer and there are many excellent examples. We have emphasised to date the promotion of our activities, project links and a strong commitment of resources.

The role of our researchers and industry staff

For the seven year life of the next CRC however, the 'technology transfer gauntlet' has been thrown down in no uncertain terms. Clearly the researchers in the CRC do not have the resources alone to develop the technology from each project to point where industry can simply pick it up and use it.

To ensure effective development and ultimately successful adoption, the key communication activities undertaken by the researchers (promoting the CRC and establishing links through the project teams) will rely on support from industry. Industry will have key roles to further develop and implement the research outcomes using the five focus catchments and their communication and technology transfer networks (the last two points). For this reason a close relationship between research and industry Parties will be essential for the life of each project – from formulation to adoption.

This is a substantial and exciting challenge for all of us. As I flick, in my mind's eye, through this imaginary article, I see a quote from our Centre's Director about halfway down the page…

"The land and water management industry as part of its active involvement in the CRC, enjoys such a thirst for our CRC's research outcomes that scarcely is our research completed, before it is enthusiastically interpreted, developed and integrated into common industry practice."

Now that's a vision of success…

David Perry
Tel: 03 9905 9600
Facs: 03 9905 5033
Email: david.perry@eng.monash.edu.au

TECHNICAL REPORT

THE HYDROLOGIC IMPACTS OF FORESTRY ON THE MAROONDAH CATCHMENTS

by
F.G.R. Watson
R.A. Vertessy
T.A. McMahon
B.G. Rhodes
I.S. Watson

Report 99/1

This report documents the analysis of 30 years of hydrographic data from the high-rainfall, ash forest areas, which comprise much of water supply catchments for Melbourne.

Fred Watson and Rob Vertessy (Project Leader), with strong input from the other named authors, have produced a report which has important ramifications for the management of forested catchments generally, but particularly for ash species.

Copies available for $20 from the Centre Office.

POSTGRADUATES AND THEIR PROJECTS

Our postgraduate for July is:

Nick Marsh

A Murray Cod swims up and down the same reach of turgid stream, unable to find the twisted old redgum snag that it uses as refuge from the turbulent irrigation releases. As we address the impacts of flow regulation on instream biota, we are also faced with the legacy of other river improvement activities. We have spent so much time tinkering with our streams that the tough old Murray Cod which has survived our best attempts to improve streams for our own use cannot find suitable refuge habitat. The fine grained sediments in most of our lowland streams offer a pretty restricted habitat for native fish. The key elements found in the few remaining high quality lowland streams are snags. Oddly enough the Murray Cod, and just about every other native fish species, recognises the habitat value of snags (as do most good anglers for that matter). Stream managers are convinced of the habitat value of snags, and the removal of snags has largely ceased. Some stream managers have now moved on to the task of reintroducing snags to our waterways. The snag reintroduction process is achieved through a combination of physically placing snags in streams coupled with riparian revegetation programs aimed at producing a sustainable yield of snags to the stream for generations to come.

Nick's PhD studies are focused on being able to predict the hydraulic and depth diversity that can be gained through the reintroduction of snags. So far Nick has completed a census of snags and the associated scour and depositional features of snags in a number of different streams in eastern Australia. The loading and distribution of snags, and scour at snags varies considerably from stream to stream depending on riparian vegetation characteristics, rate of decay of the snags, and the ability of the stream to transport the snags. From a stream rehabilitation perspective, it is valuable to understand what the pre-disturbance loading and distribution characteristics of the snags were. These pre-disturbance levels act as an ultimate goal in rehabilitation, however in most cases it is only possible to reintroduce a few pieces of timber to the stream. In this case the question is, "What is the best location for snags?"

The scour hole created at a snag is a beneficial habitat feature because it creates depth and hydraulic diversity as well as providing cover for aquatic organisms. Nick is currently developing a model to predict the extent of scour around snags. The outcome from the model is that for a given stream we will be able to determine if conditions are suitable for scour at snags and if so, also give the expected depth of scour for a range of alternative single log and log jam configurations. By applying the results of Nick's work we will be able to gain an appreciation of the natural snag loading rates, as well as a guide to the best placement of snags in stream rehabilitation projects so our homeless Murray Cod and other aquatic fauna can thrive.

Nick Marsh
Tel: (07) 3875 7101
Email: nick.marsh@mailbox.gu.edu.au

INDUSTRY REPORT

MANAGING URBAN STORMWATER USING CONSTRUCTED WETLANDS

by

Tony Wong
Peter Breen
Nicholas Somes
Sara Lloyd

Report 98/7

The importance and relevance of the CRC's research in stormwater management using constructed wetlands is reflected in the registration of over 240 people at the recent CRC Industry Seminar 'Constructed Stormwater Wetlands: From Design to Construction'.

'Managing Urban Stormwater using Constructed Wetlands' provides a clear and concise overview of the hydrological and ecological principles required for effective design of stormwater wetlands.

This report is the seventh in the successful CRC Industry Report Series - over 2000 have been sold.

Copies of the Report are available for $20 from the Centre Office.

WATER VICTORIA EMAIL (WAVE) LIST

The WaVE list (formerly known as VicWater) has been set up to facilitate the discussion of water related issues.

The list is free and can be used to advertise seminars, workshops, job vacancies, to solicit information on any range of water related topics or any other appropriate use. Posters should keep matters relevant to the state of Victoria, Australia. The list is closed, which means that only those on the list can post a message, but it is open for anyone to subscribe or unsubscribe as desired.

To subscribe, send subscribe to: wave-request@eng.monash.edu.au

To send a messages, send an email to: wave@eng.monash.edu.au

The list is maintained by Peter Hill at Sinclair Knight Merz. Any queries should be directed to: phill@skm.com.au.

WaVE is supported by the Victorian Water Engineering Branch of the Institution of Engineers and the CRC for Catchment Hydrology.

CRC PROFILE

Our profile for July is

James Margules

I am one of the few people that can proudly state I am Canberra born and bred, and have been here for the last 34 years. My education prior to CSIRO (an education in itself) was at Yarralumla Primary, Telopea Park High School and Narrabundah College. (For those of you who know Canberra)

A long time ago, in a division far far away…… well, in 1984, I began my career with CSIRO at the tender young age of 19 years. The division was then named Water and Land Resources and the program was called Physical Hydrology, headed by Program Leader Dr. Emmett O'Loughlin. I became, by default, an associate member of the 'Irish Mafia' as the group was then known. The employment was part-time, 20 hours per week, and was funded on an annual tenure basis by the then Forestry Commission of NSW. My original job was to transform (Digitise) NSW Forestry Commission water-level charts from their analogue trace to a digital format. This position was soon transferred to full-time under Emmett's desire for fair and equitable employment for all and my duties became more experimentally oriented as the years passed. Projects ranged from studies into the effects of forest harvesting and fire on water yield in Yambulla forest, southwest of Eden, NSW; to surface water and soil water balance studies in land under pasture (livestock farming) near Goulburn, NSW.

In 1989 the Australian Centre for Catchment Hydrology (ACCH) was initiated. A couple of young PhD graduates were employed for the ACCH, Dr. Tom Hatton and Dr. Rob Vertessy. Look at them now! CSIRO invested in Hydsys, a software package for hydrological data archiving and management. Hydsys became my 'baby' and for a few years I was considered the divisional authority on Hydsys.

In 1992, with the emergence of the first CRC for Catchment Hydrology, work began in the Melbourne water catchments and my direction of employment moved toward technical direction. I have also provided assistance to a number of PhD students under the CRC scholarship program. Through all my fieldwork I have learnt the importance of doing thorough research - checking out the pub at Benalla, checking out the pub at Noojee, checking out the pub at Eden, checking out the pub at Horseshoe Bay, which chocolate biscuits last the longest when you suck port through them…… It's been a learning experience.

Over the last few years I have also undertaken formal tertiary education at the Australian National University, working towards a Degree in Resource and Environmental Management, which I, along with a few colleagues, can now thankfully say is complete.

That's my employed life to current in a nutshell. Let's hope the new CRC for Catchment Hydrology brings with it many opportunities.

James Margules
Tel: (02) 6246 5801
Email: james.margules@cbr.clw.csiro..au

WHERE ARE THEY NOW?

Report by Robin Allison

After four years of grovelling down drains I finally left Melbourne University with PhD in hand. After some outback travel and fruitless navel gazing, I headed off to the public sector to see how things were tackled there.

A six month contract was spent with Water and Catchment Policy at the Victorian EPA where I officially became a 'policy wanker'. While the one handed typing proved difficult at first, I did manage to nut out some "Best practice environmental management guidelines for urban stormwater" while working closely with Melbourne Water and local government. This stint in the public sector opened my eyes to many different ways of looking at environmental issues and some of the challenges that these type of agencies face.

From the EPA I floated about for a while then found myself back at Melbourne University for a short while as a research fellow. From there I lined up a trip to the USA to explain the details of drain grovelling, Australian style. This involved dodgy hotel rooms, regular presentations, Starbucks and lots of "there-you-go" wherever I went.

I spent a month travelling around the US spreading the good word of the CRC for Catchment Hydrology and finding out the way environmental problems are tackled in the US. I was lucky to meet such helpful and interesting people who took me around. It was heartening to find out that some of the research we had been doing in the Urban Hydrology Program over the last five years had not been tried in the USA. The timing of my trip was also lucky as now people in the USA are looking at some of these issues (particularly in gross pollutant management).

Stemming from that trip I now find myself looking out a sunny office window in Mission Valley, San Diego, California. I have been employed here with "URS Greiner Woodward Clyde" as an environmental engineer. The company is very large consultancy (ie. global) and is one of the leading water research consultants in western USA. I arrived here in mid-June so am still finding my feet and honing my "there-you-go" and "super" so I can fit in.

I plan to be involved in some large and interesting research projects while here, mainly in the urban water quality area. Particularly some monitoring projects, helping Los Angeles regulators with some regulations for pollutant discharges, and may also have the opportunity to introduce some Australian treatment technology to the USA. I'm also looking forward to discovering more of the US.

Where will I be next? No idea.

Dr Robin Allison
Email: robin_allison@urscorp.com

TECHNICAL REPORT

A TECHNIQUE TO INPERPOLATE FREQUENCY CURVES BETWEEN FREQUENT EVENTS AND PROBABLE MAXIMUM EVENTS

by

L. Siriwardena
P.E. Weinmann

Report 98/9

A key research outcome from the CRC Project D3 'Probability and Risk of Extreme Floods' has been methodology to extract more information from daily rainfall data. With this methodology (CRC-FORGE), more reliable estimates of long duration rainfalls for rare design events are now possible.

This report deals with the interpolation range for even rarer events.

Here the authors address the issue of a consistent and acceptable way to construct frequency curves where no data are available.

Copies of these Reports are available from the Centre Office.

If undelivered return to:

Monash University
Department of Civil Engineering
Clayton Victoria 3168

Surface Mail

Postage Paid Australia

Print Post Approved
PP338685/00026

The Cooperative Research Centre for Catchment Hydrology is a cooperative venture formed under the Commonwealth CRC Program between:

Brisbane City Council
Bureau of Meteorology
CSIRO Land and Water
Department of Land and Water Conservation, NSW
Department of Natural Resources, Qld
Department of Natural Resources and Environment, Vic
Goulburn-Murray Water
Griffith University
Melbourne Water
Monash University
Murray-Darling Basin Commission
Southern Rural Water
The University of Melbourne
Wimmera Mallee Water

Associates: Hydro-Electric Corporation, Tas • State Forests of NSW

CENTRE OFFICE:
Department of Civil Engineering
Monash University, Clayton
Victoria 3168 Australia
Telephone: +61 3 9905 2704
Facsimile +61 3 9905 5033

http://www.catchment.crc.org.au