NEWSLETTER OF THE COOPERATIVE RESEARCH CENTRE FOR CATCHMENT HYDROLOGY

CATCHWORD

NO 93 APRIL 2001

A NOTE FROM THE DIRECTOR

Professor
Russell Mein

Inside...

ADAPTIVE TARGETING OF RESEARCH

Many readers of *Catchword* would be aware of how much planning went in to shaping of our research program. This started a couple of years before the award of our second seven-year term of funding, with a Future Issues Workshop to identify industry research needs. Subsequent workshops with CRC Parties were held to agree on the strategic directions for the CRC, and to develop program and project proposals to take us there.

In effect, we had to 'sell' the research/business plan to the funding Parties, and then present the package within a Business Plan to the Selection Committee for the CRC Program. Both groups emphasised that they wanted research that was 'relevant'.

Relevant research they have certainly got. The level of interest in catchment – scale water issues is at an all-time high level these days, with an urgent demand for scientific underpinning of management actions. Prominent among these has been the research on tree-water use, and the changes in catchment yield that can be expected to follow significant changes in catchment land-use (eg pasture to plantations). The possible impacts on stream salinity from a strategy of tree planting is a related issue attracting much attention.

The CRC and other research groups have some indicative answers to these, and related questions, but are some way from achieving the integrated capability we expect to have in five years time. [For instance, in the tree water-use area, we have the ability to predict average annual effects on water yield for plantations located at different sites on the catchment. Our research will bring in the seasonal effect due to climate variability, and extend our knowledge on the impacts of improved pastures]. However, far from staying out of the debate until we have reached our research targets, we consider it important to contribute what knowledge we can to assist managers make the right 'best-judgement' decisions.

We are now just over one year into our new set of core projects aimed at delivering predictive capability, at catchment scale, for the hydrologic effects of land-use change. Virtually all of these projects have now had at least one external review, and it is pleasing to record that these have been very positive. In some instances, suggestions for minor changes in research emphasis or approach have been made, perhaps to meet the opportunity to add value to other work, or better target a need. It is sensible that the CRC adopt such an approach to optimise the outcomes of its research investment.

Our aim at the project level is to have an adaptive strategy to allow minor changes in research direction to meet changing needs and opportunities. Such changes would be considered perhaps once or twice a year.

At the more strategic level, we'll shortly be re-visiting our Business Plan objectives. Here we want to see whether changes should be made to adjust to the fast changing environmental and research scene. In this exercise, the aim will be to optimise our work to get the best value for the research investment. We'll be re-examining the areas we planned to cover in our second round of core projects (to start in 2003), and research progress by other groups. There is no point in duplicating work which has been done elsewhere. In this vein, we'll look for further opportunities to collaborate with organisations 'outside' the CRC, to link their work and ours where there are benefits to both.

In May 2001, we'll be holding another Future Issues Workshop, at which representatives from a wide range of organisations outside the CRC will be invited. Participants will be asked to list the key catchment-scale hydrologic issues (as they see them), and the knowledge requirements and approaches that they believe have most promise in dealing with them. We'll collate these and use them in adapting the current research plan for the CRC. Obviously, if there are suitable opportunities to make our research outcomes useful to a wider range of applications, we'll do our best to make the changes required.

A report on the outcomes of our Future Issues Workshop will be given in *Catchword* later in the year.

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CRC PUBLICATIONS LIST

Reports, videos and software, available from the CRC, are listed in our Publications List included with this issue of Catchword.

Additional copies of the Publications List are available on request from the Centre Office on 03 9905 2704 or can be downloaded from the CRC website at

www.catchment.crc.org.au

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The Centre's products can be ordered through the Centre Office.

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PROGRAM 1
PREDICTING CATCHMENT BEHAVIOUR

Program Leader
ROB VERTESSY

Report by Tony Ladson, Rodger Grayson and Andrew Western

In search of the perfect profile…

Background

Back in October 2000, we began looking for research sites around Australia where there were measurements of root-zone soil moisture storage. This information is of general importance to many modelling studies and will help us specifically with the modelling being undertaken in CRC Project 2.3 (on predicting catchment water yield and salinity under different vegetation and climate scenarios), and CRC Project 5.2 (which aims to improve the land surface component in the Bureau of Meteorology's Numerical Weather Prediction model).

Finding the wettest and driest profile at any particular site gives an indication of the soil water storage for that soil and vegetation type - provided spatial and temporal scales of sampling are appropriate. We plan to compare measured soil profile information with the soil hydraulic characteristics from other work such as the commonly used "pedotransfer function" (PTF) approach. In PTF approaches, physical characteristics of soil, such as the percentage of sand, silt and clay, are used to estimate hydraulic characteristics, including soil water storage.

Soil moisture data

Tony Ladson and James Lander are now tracking down as much soil moisture information as possible by talking to researchers, reviewing the literature, and searching for technical reports. We have received excellent assistance from many CRC for Catchment Hydrology personnel, and others from within organisations party to the CRC. To date we have contacted over 100 individuals, collected 35 relevant papers and reports from which we can derive the information of interest, and received 10 data sets. We are expecting to receive several more data sets soon. Many others have been mentioned, but as yet their availability is unclear. While we will continue to chase more information, we have enough now to begin a pilot study to see whether the comparisons yield useful results. We hope to complete this pilot phase by the middle of the year.

Timing and issues

The search for information has taken a lot longer than we expected and has raised some interesting philosophical and practical issues that are of wider relevance to the CRC for Catchment Hydrology, its Parties and beyond. These issues largely relate to data archiving and management. The assistance we have had from all concerned to date has been terrific, but there are some broader issues that warrant discussion.

Data from individual research

Commonly, the data we use as hydrologists are measured and managed by organisations with a particular mandate, and the resources necessary, to archive and make available their information. Meteorological and streamflow data are two obvious examples. But information where there are no coordinated monitoring networks is difficult to track down. Much of the information we have been seeking has been collected as part of individual research projects or by a small group of researchers like ourselves. The motivations in these sorts of projects are to answer some specific questions and make the results available through publications. Indeed we have gained a lot of the information we need from published papers and reports. However, the basic data normally reside in field-books or computer media of different sorts, depending on the age of the study. These data have been used by the research team at the time, but, from the researcher (and likely the client's) point of view, once the appropriate analysis and publications have been completed, there is little need to do anything more with them. We have found this problem with our own work, especially where we never envisaged any further use for data, and usually the clients at the time were not funding us to archive it in any special way. It is also difficult to retrieve information from studies that are stored on out-of-date media like 'unexercised' magnetic tapes or even 5 1/4 inch discs. These problems must ring true for many of you.

Rescuing data

This is not a unique issue for CRC researchers. For example between 1965 and 1978 there was a vast deployment of seismometers in parts of the US to monitor Soviet nuclear tests. All data were stored on tapes but, given they had served their purpose, the custodian intended to dump them, until "rescued" by some USGS personnel (Anon., 2000). We need not look overseas to see disappointing losses of information. Many of the river cross-sections surveyed during the late 1930s in Victoria have been lost, including all those for the Mitchell River, along with the complete photo collection of the Mitchell that was held by the Rivers and Streams Section of the Rural Water Commission. In our own group, we would be hard pressed to locate the data from any postgraduate study that was undertaken more than 10 years ago, unless the original data ended up in a thesis appendix. Our experience from talking with individuals in other organisations is that the chances of locating data are very slim once those who did the collection or measurement move on. Even where specific databases have been established they can be lost because of changes in computer systems and personnel.

Resources for archiving data

From the point of view of individual researchers or research groups, it is difficult to justify the expense and time needed to archive and maintain data beyond the initial analysis and reporting. This is a task that must be tackled at a higher level. The obvious success in data management of groups such as the Bureau of Meteorology has come from major investments in the business of storing and maintaining data.

There has been a vast amount of information collected over the last century or more as part of graduate projects, university, agency and CSIRO studies. It is, however, largely inaccessible today – simply because it was never envisaged that the data might be useful later, and/or there were no resources available and/or the responsibility for archiving and maintenance activities was unclear.

'Data notes'

There are however some encouraging developments in archiving data. Leading international journals such as Water Resources Research, now have a form of publication called "data notes". These provide a vehicle for writing up and making generally available, data sets from field studies. These serve not only to maximise use of the results of (expensive) field studies, but also, being journal publications, provide motivation and 'brownie points' for researchers. There is a steady increase in the number of "data notes" which has to be a good sign. There are also World and National (US) Data Centres that are committed to:

1. Providing open access to scientists
2. Archiving data sets indefinitely (or to migrating the data to a permanent archive if the centre ceases operation) and
3. Providing services at reasonable cost

For more information see <http://www.agu.org/pubs/datacent.html>.

Managing data for future use

Do we need some archiving and data maintenance capability for research projects within the CRC for Catchment Hydrology? Should the CRC for Catchment Hydrology become a data centre for some of the key data that we measure and process? A consortium of researchers is ideally placed to develop storage protocols and procedures. The CRC for Coastal Zone, Estuary and Waterway Management is developing a centralised approach to data storage including development of protocols and rules for data access, and the CRC for Catchment Hydrology is currently exploring ways to be involved.

Alternatively, should we lobby for a Federal Government Data Centre dedicated to archiving data from government (and other) funded research projects. Depositing data (maybe with an appropriate quarantine period preventing access by competitors) could be a condition of funding and appropriate Meta Data requirements could ensure continued usefulness of the data.

In twenty year's time when someone wants data from a CRC for Catchment Hydrology project they'd read about in a journal or report, what chance would they have of getting a copy?

References

Anon. (2000) "Journey to the centre of the earth" American Scientist, Vol 88 No. 5: p 401-402.

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Rebecca Bartley is CRC Young Water Scientist of the Year

Congratulations to Rebecca Bartley, a PhD student in the CRC for Catchment Hydrology, who on 2 April won the competition for CRC Young Water Scientist of the Year. The award, sponsored by the 5 'water' CRCs and open to post-graduates in their respective programs, requires first a 4-page submission on their research work to an independent judging panel. The panel selects the finalists, one per CRC, who then present their work at a session at the AWA Conference. It was a very competitive field, and Rebecca did well to be selected for the award.

Rebecca has had another form of recognition this month. She has been selected as one of four postgraduates (from ALL CRCs) to be sponsored to attend and present at the CRC Association Conference in Perth next month. [CSIRO has offered the sponsorship to these four, and to another four to attend – a marvellous gesture to encourage young talent]. Well done Rebecca!

THE THIRD AUSTRALIAN STREAM MANAGEMENT CONFERENCE - THE VALUE OF HEALTHY STREAMS

27-29 August 2001

Hilton Hotel
Elizabeth Street
Brisbane

The Third Australian Stream Management Conference will be held during 27 - 29 August 2001 in conjunction with the 2001 River Symposium (29-31 August) and associated with the Third Australian Fishways Technical Workshop (30-31 August).

In support of the 'Value of Healthy Streams' theme, the Conference is centred on four key areas:

- Ecosystem services
- Hydrological connectivity
- Bio-physical integration
- Tools and techniques

DETAILS OF CONFERENCE ACCOMMODATION AND COSTS NOW ON-LINE at www.catchment.crc.org.au/streamconference

Book your accommodation early to ensure a room - please quote the conference name when booking.

SALINITY DISPOSAL BASIN REPORTS NOW AVAILABLE ON-LINE

The CRC Project S2, 'On-Farm and Community Scale Salt Disposal Basins on the Riverine Plain, was a collaborative project between the CRC for Catchment Hydrology, CSIRO Land and Water and the Murray-Darling Basin Commission.

The outputs of the project include fifteen technical reports covering key issues in the siting, design and management of salt disposal basins.

Reports in this series can be downloaded (free) as pdf files from the CRC website at the address - www.catchment.crc.org.au/disposalbasins

The reports are also available in printed form for $27.50 (inc. GST) from the CRC Centre Office

PROGRAM 2

LAND-USE IMPACTS ON RIVERS

Report by Heather Hunter

Issues for Water Quality Management in the Wet Tropics

Water quality is now well recognised as a priority issue for water management in the wet tropics of north-eastern Australia. Emphasis is placed on having healthy waterways and protecting aquatic ecosystems in streams, wetlands and estuaries, while at the same time meeting the water quality requirements for other purposes such as agriculture, aquaculture, domestic and recreational uses. A major priority is to protect downstream water quality in the Great Barrier Reef (GBR) lagoon, where there are concerns that ecosystems may be threatened by excessive loadings of nutrients, sediment and other contaminants discharged by coastal rivers.

Johnstone Basin study

This article reports the main conclusions from a recent study that assessed the key issues for water quality management in the Johnstone Basin, which lies within the wet tropics region. The assessment forms the first step towards developing and implementing a water quality management strategy for the basin, following the approach recommended in the National Water Quality Management Strategy (published by ANZECC & ARMCANZ). The assessment included both surface waters and groundwaters and took into account the impacts of catchment land use practices on the loadings of nutrients, suspended sediment and pesticides discharged to the GBR lagoon.

The Johnstone Basin covers an area of approximately 2,300km^2 and has an average annual rainfall ranging from 1800 mm to above 3500 mm. Rivers and streams within the basin drain to the GBR lagoon. Rainforest covers approximately half of the total land surface, much of it listed on the World Heritage register. The remainder is used principally for grazing (dairy and beef) and cropping (sugar cane, bananas and other horticultural crops). There are also relatively small areas of urban and rural residential development, with Innisfail the major town.

Water quality assessment

The water quality assessment was based on findings from recent research and monitoring studies carried out in the basin. These included a six-year water quality monitoring and modelling study (Hunter & Walton 1997), which had a focus on the impacts of land use on nutrient and sediment loads exported from the catchment; surveys of ambient surface water and groundwater quality; and monitoring of ecological health. In total, data from up to 41 surface water and 101 groundwater sites were evaluated. Water quality indicators examined included nitrogen, phosphorus, suspended sediment, pesticide residues, faecal coliforms and E. coli.

Land-use impacts

Several land uses, particularly sugar cane and banana growing, were found to contribute disproportionately high amounts of nitrogen, phosphorus and suspended sediment to annual average catchment exports, compared with rainforest areas. Relatively high loads of nitrogen were also found to come from residential areas relying on septic tanks, and from dairy farms.

Management practices to reduce sediment and nutrient exports

A number of land management practices may need to be addressed to reduce these nutrient and sediment loads (Table 1).

Table 1. Land management issues for reducing exports of suspended sediment and nutrients

LAND USE	KEY ISSUES
Sugar cane	• More efficient N fertiliser management • Reduced soil erosion
Bananas	• More efficient N fertiliser management • Reduced soil erosion
Dairy	• Improved effluent management and/or • More efficient N fertiliser use
Unsewered residential	• More effective disposal of domestic wastewater

Surface water quality

Under ambient conditions, surface waters within the basin were generally of good quality for most of the indicators examined. This assessment was based on comparisons with two rainforest reference sites in the basin, as well as the Australian water quality guidelines for tropical rivers and estuaries. Although there were some exceptions, median concentrations were generally within guideline levels for relevant environmental values, including protection of aquatic ecosystems. Consistent with this, the in-stream health of Johnstone Basin streams was found to be in a good to moderate (slightly impacted) condition at 85% of the 26 sites evaluated, based on monitoring of macro-invertebrates.

Nitrogen

Oxidised nitrogen levels were relatively high at a number of surface water and groundwater sites, particularly in sugar cane and banana growing areas on the coastal floodplain. Although exceeding recommended guidelines for protection of aquatic ecosystems, median concentrations did not exceed guidelines for nitrate in drinking water (NHMRC Australian Drinking Water Guidelines 1996). More efficient fertiliser use and

improvements to the design or location of septic systems may help reduce stream and groundwater oxidised nitrogen concentrations. Further water quality improvements may be gained by reducing the amount of nitrogen in effluent discharged from Innisfail's sewage treatment plant and by restricting stock access to streams.

Herbicides and pesticides

Although trace levels of several herbicide residues were detected in surface waters and groundwaters at a number of sites on one or more occasions (including one flood event), concentrations were very low and were unlikely to have posed a threat to ecosystem (or human) health. Nevertheless, continued periodic monitoring of pesticides may be prudent, particularly if there are changes in pesticide management practices.

Faecal contamination

Surface waters in the basin were significantly affected by faecal contamination at all 23 sites monitored during four surveys, using faecal (or thermotolerant) coliforms and E. coli as indicators. Although more regular monitoring is required to fully assess the risks, the findings have potential implications for human and livestock health. Sources of the contamination are not known, but possible issues for management include livestock access to streams, disposal of animal effluents, seepage or overflow from septic systems, stormwater overflows and control of feral pigs.

Stakeholder involvement

The active involvement of stakeholders is critical to successful development and implementation of the water quality management strategy. It is envisaged that the Johnstone River Catchment Management Association would provide leadership in this role, supported by key agency staff and other professionals. The information now available for the Johnstone Basin presents an ideal opportunity for testing and evaluating the process of strategy development and implementation.

(This article is a summary extract from a recently completed NHT project report, Hunter et al. (2001).)

References

Hunter HM, Sologinkin SJ, Choy SC, Hooper AR, Allen WS, Raymond MAA & Peeters J 2001. Water Management in the Johnstone Basin, final report for NHT project 952195, 105 pp., Department of Natural Resources and Mines, Brisbane (draft March 2001).

Hunter HM & Walton RS 1997. From Land to River to Reef Lagoon: Land Use Impacts on Water Quality in the Johnstone River Catchment, 12 pp., Queensland Department of Natural Resources, Brisbane.

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PROGRAM 3
SUSTAINABLE WATER ALLOCATION

Program Leader
JOHN TISDELL

Report by Gary Codner

Project 3.1: Water Trading and Sustainable Water Allocation

Water trading contributions to national benefits

One of the key outcomes from the COAG Strategic Water Reform Framework was the recognition that water trading is an important mechanism in maximising the contribution from water diversions to the national income and welfare.

Objectives for water trading

The Discussion Paper on "A National Approach to Water Trading" by the High Level Steering Group on Water (HLSGW) established by the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) has noted (January 2001) that "... water trading must be conducted within appropriate social, physical and ecological constraints of catchments." The HLSGW has developed emerging principles and a framework as a guide for water trading based on the following objectives and purpose:

- The development of efficient and equitable water trading arrangements should seek to promote economic well being subject to providing protection for other water users, river and wetland health and the broader environment and other third party interests.
- Water trading enables the transfer of water entitlements to higher value users ensuring the greatest return to water users and the wider community, and
- Water trading should provide incentives to consumptive water users, water businesses, water resource managers and system operators to improve the allocation and management of water.

Identifying costs and benefits

It is essential that the costs and benefits related to water trading be clearly identified. Cost benefit analysis is an approach commonly used for comparing different options. The resulting cost benefit ratio helps to clearly identify which option provides the most benefits per unit cost. However, in the case of water allocation there are difficulties with such an approach, particularly in attaching dollar signs to many of the costs and benefits. Benefits brought about by a project can include revenue generation, cost savings, environmental and other agricultural and/or community benefits. These may or may not be market priced and/or quantifiable and thus some can be hard to measure and use for direct comparison. For example, it is difficult to place a value on the benefits of increased biodiversity due

NEW WATER ALLOCATION RESEARCH REPORTS

Two new reports from the Sustainable Water Allocation Research Program will be available from the Centre Office in early May.

IRRIGATOR AND COMMUNITY ATTITUDES TO WATER ALLOCATION AND TRADING IN THE GOULBURN BROKEN CATCHMENT

by
John Tisdell
John Ward
Tony Grudzinski
Geoff Earl

Report 01/3

IRRIGATOR AND COMMUNITY ATTITUDES TO WATER ALLOCATION AND TRADING IN THE FITZROY CATCHMENT

by
John Tisdell
John Ward
Tony Grudzinski

Report 01/2

These reports describe the results and findings of a survey of irrigator's and community members attitudes to COAG reforms in the Goulburn Broken and Fitzroy catchments respectively.

Advanced orders of these reports can be made through the Centre Office now. The cost of $27.50 includes postage and handling and GST in Australia.

For further information contact Virginia Verrelli on 03 9905 2704 or email virginia.verrelli@eng.monash.edu.au

WATER ALLOCATION AND TRADING VIDEO

IRRIGATORS' ATTITUDES TO WATER ALLOCATION AND TRADING IN THE GOULBURN-MURRAY CATCHMENT

Dr John Tisdell
Program Leader - Water Allocation
CRC for Catchment Hydrology
Griffith University

November 2000

CRC Video 00/6

This presentation describes the results and findings of a survey of irrigators' attitudes to COAG reforms: temporary and permanent water trading; the role of the water authority in the market; and the environmental impact of trade. The survey also elicited irrigators' attitudes to breaking the nexus between land and water, points of blockage in current water markets and possible adjustments to trading rules and procedures.

COPIES ARE AVAILABLE FOR $27.50 (INC GST, POSTAGE AND HANDLING) THROUGH THE CENTRE OFFICE.

Contact Virginia Verrelli on 03 9905 2704 or by email virginia.verrelli@eng.monash.edu.au

to increased stream flow, and hence hard to compare those benefits to the effect flow changes may have on local irrigators.

External costs

External costs or 'externalities', both positive and negative, from water use must also be considered. When water allocations are increased beyond crop or plant requirements, irrigation induced salinity can occur. This is a common negative externality that should be included as a cost to add to the reliability of a cost benefit analysis.

Opportunity cost

Economics considers not just the market price of an activity but also the opportunity cost. An opportunity cost is measured as the value of water in its most valuable alternative use. The opportunity cost of water could be particularly relevant when considering allocation policy effects on different sectors of a region. In the case of an increased allocation of water for environmental flow, the opportunity cost could be considered to be the income forgone in the irrigation sector due to reduced flow allocations.

Welfare gains - consumer and producer surplus

Another approach used on a larger or macro scale to determine the benefits and costs of water use, is to look at the welfare derived from a market. Knowledge is required on the demand and supply curve for water and the produce it generates. Welfare is derived by evaluating gains to consumers and producers from participating in both the market for water and produce generated from its use – these gains are termed consumer and producer surplus..

Producer surplus in water allocation will be derived not only by the supply of water to irrigators, but also by the irrigators themselves in supplying the goods that they produce.

Similarly for consumers of a 'good' such as water, (for example, irrigators consuming water or buyers of their produce or even recreational users of a waterway) a surplus may exist, that is the total benefit they receive is beyond what they had to pay. If access to the good were reduced, they would be prepared to pay a higher price (that is, they value the good more highly). At the current use or consumption level, however, they pay a lower price. Hence they gain a surplus. Together this surplus adds to the measure of the welfare benefit. Identifying changes in this welfare is another way of comparing the benefits of various scenarios.

Future trends

In economics, the analysis of the outcomes of various scenarios also involves looking at shifts and trends.

Changes in cropping patterns and shifts in production due to changed water allocations can be interesting to observe. Knowing which industries and produce are on the rise, and which are on the decline, helps to establish future trends and can point to areas that should receive extra attention.

The effects on employment could also be considered by looking at the labour required before and after, this may point to likely social effects and the extent of their impact. These issues may help to determine the effects on a regional basis, assist with new policy directions and allow issues of equity to be considered.

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PROGRAM 4
URBAN STORMWATER QUALITY

Program Leader
TONY WONG

Report by Sara Lloyd

Impediments and Opportunities with Adoption of Water Sensitive Urban Design

Impacts of urban growth

Rapid urban growth over the last 30 years in Australian urban centres is resulting in an expanding footprint of urban-related impacts on receiving water values (ie environmental, economic, recreational, social, cultural, etc.). Additionally, urban consolidation is placing increasing pressure on existing drainage infrastructures and their receiving waters.

Support for change

Emphasis now placed on the importance of protecting receiving water values by both professionals within the water industry, and the broader community, is prompting a shift in what are considered appropriate land and water management practices for urban catchments. Consequently there is growing enthusiasm and support for a fundamental change in the way urban water resources are managed.

Water sensitive urban design

A recent national conference was held in Melbourne to highlight and explore the opportunities and impediments to the adoption of Water Sensitive Urban Design (WSUD). WSUD is the term used to describe a new approach to urban planning and design that offers sustainable solutions for the integration of land development and the natural water cycle. Integrated stormwater management systems are one component of WSUD, which aims to minimise the impact of urban development on values associated with the receiving waters. WSUD provides the planning and management practices required to achieve cost-effective solutions with enhanced human and environmental outcomes.

Integrated systems - Mawson Lakes

The vision for WSUD is to ultimately achieve integrated potable and non-potable supply systems by designing sustainable stormwater and wastewater management systems within urbanised catchments. Mawson Lakes, 12 km north of Adelaide's CBD, is the first attempt at achieving this vision by incorporating integrated sustainable environmental, economic and social outcomes. The design of the Mawson Lakes residential precinct features on-site stormwater and wastewater treatment, storage and reuse. All houses have a dual supply pipe system, one conveying potable water and the second supplying non-potable water from the groundwater aquifers for toilet flushing and outdoor use.

It is estimated that a 70% reduction in the annual volume of mains water supply can be achieved with these measures. *Figure 1* provides a schematic illustration of the Best Management Practices incorporated into the design of the Mawson Lakes development.

Getting WSUD into urban projects – some challenges

A summary of the challenges with integrating WSUD into urban development projects were identified at the conference and are shown in *Figure 2*. Issues associated with the current regulatory framework, assessment and costing, technology and design, and marketing and acceptance are included.

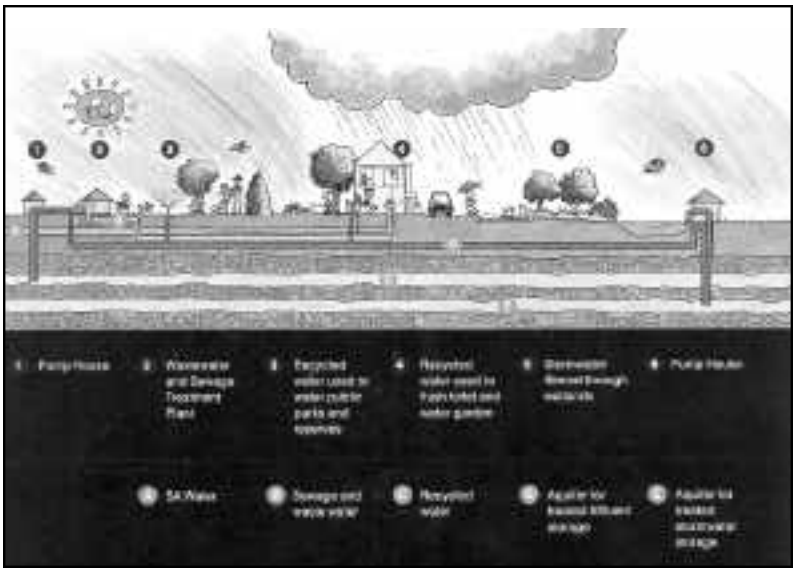

Figure 1. Best Management Practices incorporated into the Mawson Lakes ievelopment (Source: Salisbury Council, SA)

WATER SENSITIVE URBAN DESIGN

WATER SENSITIVE ROAD DESIGN - DESIGN OPTIONS FOR IMPROVING STORMWATER QUALITY OF ROAD RUNOFF

by

Tony Wong
Peter Breen
Sara Lloyd

Report 00/1

This joint publication with the CRC for Freshwater Ecology investigates opportunities for incorporating stormwater quality improvement measures into road design practices for protecting aquatic ecosystems.

Copies of the report are available from the Centre Office for $27.50 (includes postage and GST).

Please phone Virginia Verrelli on 03 9905 2704 or email virginia.verrelli@eng.monash.edu.au

URBAN STORMWATER QUALITY DECISION SUPPORT SYSTEM PROTOTYPE

One of the first key research outcomes to be delivered to our industry Parties for trialling is Program 4's Urban Stormwater Decision Support System (DSS).

A beta version of the DSS has been delivered to Melbourne Water and Brisbane City Council this month and training workshops are planned for April. In keeping with the Communication and Adoption Plan for the DSS, it will be field tested in these two organisations over the next 12 months as part of its development before a wider release.

For further information, please contact Tony Wong by email: tony.wong@eng.monash.edu.au.

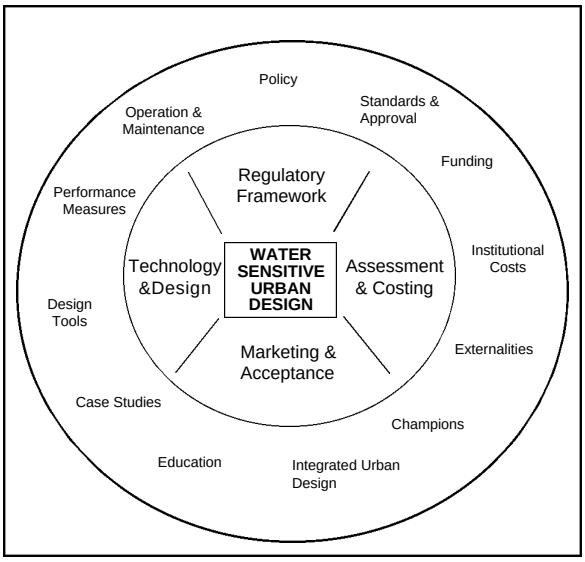

Figure 2. Key components to successfully integrating Water Sensitive Urban Design into urban development projects

Major impediments and opportunities

Some major impediments and opportunities with the widespread adoption of Water Sensitive Urban Design are:

– Regulatory Framework

- Effective operating environments for WSUD do not exist at the State and local government levels. Policy, codes and guidelines need to be amended so that consideration of WSUD is not precluded.
- Local government and water authorities' present skills and cultures appear to hinder their ability to keep abreast of the changes required for the assessment, approval, construction and maintenance of WSUD management schemes. For example, there is an apparent reluctance to accept the perceived risks involved in approving and implementing WSUD projects. Awareness and education of senior and middle management is required to promote WSUD within local government and water authorities. Training workshops are required to raise the workplace skills of employees to a level suitable to cope with assessment, approval, construction and maintenance needs.
- Fragmentation of responsibilities within institutions in the urban development and approval process creates difficulties in getting different organisations to work together in a positive manner across administrative boundaries.

– Technology and Design

- Local government is predominantly responsible for regulating the development industry. Poor construction site management can generate huge sediment loads potentially leading to adverse environmental impacts on receiving waters where there is a failure to use Best Management Practices. Local councils should require the development industry to submit strategies for sound construction-site practices when submitting development applications. Companies responsible for poor construction-site management should be appropriately reprimanded or penalised.
- A lack of information on the operation and maintenance of Best Management Practices leads to concerns within local governments regarding the long term viability and costs associated with water management schemes. Existing information which would be beneficial to the development of checklists, and standards to identify issues of inadequate system performance, need to be presented in a form to meet the needs of staff.

– Assessment and Costing

- There is limited quantitative data on the long-term performance of Best Planning Management and Practices. This makes the development of user-friendly models for key stakeholders to design cost and management effective water management schemes more difficult. Demonstration projects and the monitoring of water management schemes are necessary to help overcome the current lack of useful information.
- Achieving cost effective water management schemes requires an examination of the costs borne externally to schemes. No established procedures on how to undertake life cycle cost analyses, including external costs, currently exist.

– Marketing and Acceptance

- Market acceptance of WSUD is largely unknown. Demonstration projects and the progressive integration of WSUD practices into the streetscape and at the catchment scale, will help to allay community concerns over unfamiliar aspects of WSUD.

Urban design plays an important role in driving the changes required in the urban landscape by influencing community perceptions of the associated aesthetic, and social values.

(This article is a summary of a report prepared by Sara Lloyd for Melbourne Water Corporation following the 1st National Water Sensitive Urban Design Conference held in Melbourne in May 2000.)

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PROGRAM 5
CLIMATE VARIABILITY

Program Leader
TOM McMAHON

Report by Tom McMahon

Geoff Pegram's Visit to the CRC and The University of Melbourne

Background

Geoff Pegram, Professor of Civil Engineering at the University of Natal, Durban, spent twelve weeks in the Department of Civil and Environmental Engineering at the University of Melbourne, sponsored by the Miegunyah Fund, the CRC for Catchment Hydrology and the University of Melbourne. This brief note summarises some of the outcomes and activities that resulted from his visit, which was his third to Melbourne in three years.

Personal contributions

On a personal level, Geoff acted as a catalyst, helping to generate new ideas in research areas that ranged from stochastic hydrology through to hydraulic engineering. He contributed specifically in three areas: public presentations, scholastic interaction and adding value to the group's research activities.

Miegunyah Lecture

As readers may recall, Geoff Pegram presented the Miegunyah lecture in February. Upward of 120 people, mostly professionals from outside the University were attracted to the presentation. The lecture was well received and highlighted some of the research areas and problems that the CRC for Catchment Hydrology is engaged in.

Stochastic hydrology workshop

Geoff also participated in a Stochastic Hydrology Workshop which was held in February this year for middle/senior level managers in natural resources agencies and consultants. Geoff provided an international perspective on a mature field of research which tackles problems plaguing both Australia and South Africa - that is, reliability of water supply. The workshop was attended by 25 participants and was also well received.

Interactions with postgraduates and staff

On the scholastic side, Geoff interacted in an advisory way with several PhD students in the CRC for Catchment Hydrology research node of Melbourne University. He was able to inject alternative ideas into research discussions in the field of stochastic hydrology, which is his speciality.

In addition, Geoff had discussions on hydraulic routing problems and fluid dynamic problems with staff. The latter concerned stepped spillways (a spinoff of the Miegunyah lecture) where there is an intention to continue research collaboration.

Research contributions/collaborations

In the area of research, Geoff was drawn into and helped contribute to four different research endeavours with which the Cooperative Research Centre for Catchment Hydrology is involved:

- The exact distribution of runs of sequences of low flows in a record of finite length (with Roger Hughes).
- Multisite extension to daily stochastic rainfall model importing ideas from radar hydrology to improve parsimony and examine parameter uncertainty (with Sri Srikanthan, Bureau of Meteorology).
- Repairing/cleansing rainfall and streamflow data in a base data set (Senlin Zhou) - this technology was imported from South African experience.
- Infilling gaps in radar images of rainfall (Alan Seed, Bureau of Meteorology) - this is an ongoing research area started two years ago.

These projects are all expected to benefit from Geoff's continued involvement. We expect he will return to Melbourne on a regular basis.

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CLIMATE VARIABILITY PROGRAM TECHNICAL REPORT

STOCHASTIC GENERATION OF CLIMATE DATA: A REVIEW

by
Ratnasingham Srikanthan
Tom McMahon

Report 00/16

This report reviews the state of research and practice in the stochastic generation of annual, monthly and daily climate data.

Copies of the report are available from the Centre Office for $27.50 (includes postage and GST).

Please phone Virginia Verrelli on 03 9905 2704 or email virginia.verrelli@eng.monash.edu.au

THE THIRD AUSTRALIAN STREAM MANAGEMENT CONFERENCE - THE VALUE OF HEALTHY STREAMS

27-29 August 2001

Hilton Hotel
Elizabeth Street
Brisbane

The Third Australian Stream Management Conference will be held during 27 - 29 August 2001 in conjunction with the 2001 RiverSymposium (29-31 August) and associated with the Third Australian Fishways Technical Workshop (30-31 August).

In support of the 'Value of Healthy Streams' theme, the Conference is centred on four key areas:

· Ecosystem services
· Hydrological connectivity
· Bio-physical integration
· Tools and techniques

PLANNING TO ATTEND, SUBMIT A PAPER OR A POSTER?

To register your interest in attending the conference or submitting an abstract, please send an email with all your contact details to stream.conference@dnr.qld.gov.au

More details are available at www.catchment.crc.org.au/streamconference

PROGRAM 6
RIVER RESTORATION

Program Leader
IAN RUTHERFURD

Report by Ian Rutherfurd

Continuing riparian zone work in the River Restoration Program

National Riparian Zone Program

Many readers of *Catchword* will be familiar with the National Riparian Zone Program. This innovative research program was initiated by LWRRDC (now called Land & Water Australia, LAWA), and grew out of recognition that riparian zones were critical to the health of Australian streams, and required a special, integrated research program. LWRRDC, with strong collaboration from the States, established a large five-year contract research program with Griffith University's Centre for Instream Research (to do the ecology of riparian zones) and in conjunction with the CRC for Catchment Hydrology (to do the physical process work).

Under the leadership of Peter Hairsine and Cathy Wilson, the riparian program in the CRC for Catchment Hydrology developed. With considerable matching funding from States and our CRC the project investigated many physical processes associated with near-stream environments. Ian Prosser soon joined CSIRO as the leader of the riparian zone project, and great work was done on sediment and nutrient buffering, stream erosion, large woody debris, and catchment scale issues. To find the many products and outcomes of that research program, see http://www.rivers.aus.net/activities.htm.

Second round of riparian zone studies

State agencies and user groups have been directly involved in much of the National Riparian Zone Program, and the program has been assessed as one of LWRRDC's most successful. The LAWA Board has now decided to continue the work with a second round of the program and the CRC for Catchment Hydrology has been fortunate enough to win a further round of funding for riparian zone research.

In this article I will describe the riparian zone research that is to be completed under the direction of myself at The University of Melbourne, and Ian Prosser at CSIRO Land and Water, over the next four years. This large project is to become an associate project of the River Restoration Program (Program 6) of the CRC for Catchment Hydrology. We will be completing three main activities in the project.

Conceptual models of riparian functions

Riparian vegetation influences many functions in streams. What managers lack at present is a neat conceptualisation of the importance of these functions at different points in a catchment. Linkages between geomorphic and ecological riparian processes are also needed.

The first part of the project aims to develop a conceptual model that will provide these linkages, and reproduce them in a form that is useful for educators and managers. This model will be developed using:

• a literature review;

• development of a conceptual model;

• a wide review by Australian experts;

• development of targeted products with communication experts.

The impact of riparian vegetation on flooding

The second part of the project investigates some of the functions of riparian vegetation more closely; specifically, bank erosion processes and flood levels. The project will estimate the magnitude of vegetation effects so that stream managers will be able to predict the effect of planting riparian vegetation along Australian streams.

- Catchment-scale impact on flood lands

  An important topic is the catchment-scale effect of riparian vegetation on flood waves. Many restoration activities that are being carried-out in Australia include the reinstatement of large woody debris (LWD) and revegetation of riparian environments. Such measures tend to increase the hydraulic roughness of the channel network and should in practice act to slow the passage of runoff. However, at present, there is scant evidence that such attenuation occurs, let alone quantifying the extent of the impact or guiding where best to focus rehabilitative effort. Indeed, it is not known whether channel network roughness even plays a significant role in flood frequency and duration, or if catchment condition is the dominant factor.

- Roughness models for streams

  Brett Anderson (a PhD student at Melbourne Uni) will be heavily involved in this complex modeling exercise. One of his first steps will be to develop roughness models for Australian streams. This work will also contribute to another project funded by LAWA (through the Rivers Consortium) which is aimed at developing a method for estimating hydraulic roughness in Australian streams (but more on that in another edition of *Catchword*!).

The flooding project will follow the following steps:

1. Review literature on roughness estimation, and on catchment scale modelling approaches.
2. Develop a network model based initially on an idealised hydraulic geometry approach, then add complexity, building up to a real catchment network. Calibrate the model for known gauging stations.

3. Run the model with real catchment data, using numerous vegetation scenarios. Runs will be assessed against frequency of stage height and duration of inundation. We will collaborate with state agency staff in applying the models to important case studies.

Vegetation and bank erosion

Readers will recall the great work done by Bruce Abernethy in the initial CRC's riparian zone project on reducing mass failure in stream banks.

The aim of the third part of this second round project is to develop and complete this work so that managers will be able to predict whether vegetation will provide sufficient bank stabilisation in a given situation.

A typical question we will answer is: "will riparian vegetation alone stabilise this eroding bank?"

The project extends the earlier work on rotational failure of river banks to include:

- Assessment of root-area-ratios for other riparian tree species, aiming to develop relationships between easily estimated above-ground aspects of trees and their roots.
- Developing a generic set of predictive tools (eg. nomograms) that will allow managers to estimate the change in factor of safety for bank failure on any bank with and without vegetation.

The project will also consider the influence of riparian vegetation on other bank erosion mechanisms, particularly scour of the bank toe and face. Stages of this work are:

1 Characterisation of the hydraulic and mechanical effects of roots, and macrophytes in target streams.
2 Empirical assessment of the benefits provided by the vegetation using water jet field trials.

It may also be possible to include work on the hydraulic effect of undercutting. This specific work can then be incorporated into a numerical model of stream channel processes to predict the general effect of adding or removing vegetation.

Work on this research project is due to begin in mid-2001, and we will be recruiting postgraduate students and staff at this time!

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COMMUNICATION AND ADOPTION PROGRAM

Program Leader
DAVID PERRY

The Flow on Effect – April 2001

Here are some updates relevant to the Communication and Adoption Program.

Young Water Scientist of the Year

As noted on page 3, Rebecca Bartley was recently named 'Young Water Scientist of the Year' at the Australian Water Association Conference in Canberra. This award recognises young scientists with outstanding research ability, good communication skills and an understanding of industry needs. The award is made annually to a student in one of five water-related CRCs, collectively called the Water Forum. These CRCs have joined with the Australian Water Association (AWA) to present the award. Rebecca's win is the third for the CRC for Catchment Hydrology in the four years it has run.

Rebecca's research forms part of the CRC for Catchment Hydrology's Land-use Impacts on Rivers, and River Restoration Programs. Rebecca has developed a classification system that can help predict whether streams and creeks will recover from the damage caused by massive pulses of sediments and so help restore Australian waterways. According to Rebecca, increasing sediment loads are as significant as other, better-recognised environmental problems such as erosion and excessive land clearing. Rebecca measured various physical characteristics of a number of streams around south-east Australia, looking for a way of predicting how waterways would respond to restoration attempts.

For more information contact Rebecca Bartley on email: rebecca.bartley@tfrc.csiro.au

New Technical Report – Attitudes to Water Allocation and Trading

A new CRC report (Technical Report 01/3) entitled 'Irrigation and Community Attitudes to Water Allocation and Trading in the Goulburn Broken Catchment' by John Tisdell, John Ward, Tony Grudzinski (Griffith University) and Geoff Earl (Goulburn-Murray Water) will be available from the Centre Office in early May. The report describes work undertaken as part of the Sustainable Water Allocation Program.

The first phase of the CRC for Catchment Hydrology's Project 3.2 'Enhancement of the Water Market Reform Process' was to gather information on the nature of water markets and to provide input into water policy development to enhance water trading. This report documents the findings of a survey of irrigators and community members in the Goulburn Broken catchment.

CRC PROJECT SHEETS

Printed versions of the CRC project sheets (two page documents describing the key elements of research projects in CRC Programs except River Restoration and Communication and Adoption) are now available from the Centre Office.

There are 14 project sheets in total, and each gives details of research objectives, expected outcomes, target problems, key tasks, links, staff involved and contacts for that CRC project. They are an excellent way to quickly familiarise yourself with the nature and extent of our research program.

Copies are available by contacting Virginia Verrelli at the Centre Office on 03 9905 2704 or email virginia.verrelli@eng.monash.edu.au.

These sheets are also available for downloading from our website.

Look under Research 1999-2006 and follow the links for 'detailed information'

WHAT'S HAPPENING WHEN?

FIND OUT ABOUT CRC ACTIVITIES BY EMAIL

THE CRC WILL NOTIFY YOU OF AN UPCOMING CRC ACTIVITY IN YOUR AREA OF INTEREST

You can register to receive this information on line at www.catchment.crc.org.au/subscribe

or you can contact Virginia Verrelli at the Centre Office on 03 9905 2704.

The questionnaire elicited attitudes of irrigators and community members to the Council of Australian Governments (COAG) reforms, to temporary and permanent water trading, to the impact and future of water trading, to the role of the water authority in regulating the market, and to environmental issues. The survey was developed as part of a multiple catchment project exploring socio-economic issues in water trading. The work was undertaken in conjunction with staff from Goulburn-Murray Water.

A similar report for the Fitzroy catchment in Queensland will be available in the next few weeks.

To place an order for these reports contact Virginia at the CRC Centre Office:

CRC for Catchment Hydrology
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Coastal CRC 'citizen science toolbox' online

Environmental planners, decision-makers and researchers who want to build stronger links between science and communities now have a customised reference library at their fingertips thanks to a online bibliography launched recently by the CRC for Coastal Zone, Estuary and Waterway Management.

A reference list of published books, journal articles, websites and scientific papers has been published on the Coastal CRC's website:
(www.coastal.crc.org.au/citizen_science)
to provide help on a range of community-based science and environmental education issues.

More than 500 references are listed to help people search and retrieve social science information for coastal and marine issues.

CRC for Catchment Hydrology researcher Dana Thomson, a doctoral student investigating community-based research for community empowerment and environmental quality, has compiled the list to assist groups become more skilled in making decisions that promote sustainable alternatives.

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Report by Graham Rooney

The Yarra River Focus Catchment

Melbourne Water has been re-structured and it appears that my Focus Catchment Coordinator role will remain. This is a good outcome for the CRC, allowing continuity and a building of momentum for research in this catchment.

Recent developments in CRC-related activities include:

Urban Stormwater Quality Program

- Arranging training for Melbourne Water staff in the use of the stormwater-treatment Decision Support System - a pilot phase where users will provide feedback to model developers over 2001;
- Automatic water samplers purchased with the intention of collecting run-off data that represent land-use and geography for the Melbourne urban region. The data will improve parameter inputs to the stormwater-treatment Decision Support System;
- Funding provided for research into decay in concentration of nutrients in stormwater as it passes through large wetland systems;
- Supporting the cost of monitoring wetland systems –

(a) how the hydrology of the constructed system compares with the hydrology of the initial design and learning from the findings, and

(b) tracking vegetation growth and improving knowledge about planting sequences and timing;

River Restoration Program

- Discussions and debate with CRC for Catchment Hydrology Program Leaders about the nature of 'River Restoration' projects in the basin – Project 6.2 is now agreed and signed-off;
- As a technology adoption direction, facilitating a Masters degree with the CRC for a Melbourne Water staff member;
- Promoting successfully the allocation of capital expenditure funds to the modification of retarding basin outlets in order to explore hypotheses about factors that influence urban stream ecosystem health;

Other

- The Yarra Forum is firmly established, where researchers meet twice a year to share their work and findings about the Yarra River system.

  The Yarra Forum has met twice. University and agency researchers attend along with stream managers. A register of Yarra River research projects has been compiled and is updated at each meeting.

Yarra River network

I still need to establish a sensible network of people interested in Yarra River research. Several people contacted me after my first Focus Catchment Coordinator article and I can indicate that a newsletter containing information on CRC projects and other studies and research of interest in the Yarra basin will appear shortly.

If you would like to receive copies of the newsletter, drop me a line at my e-mail address below.

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EDUCATION & TRAINING PROGRAM

Program Leader
JOHN FIEN

Report by James Whelan

Catchment education in Japan

The CRC's education and training program is developing linkages with Japanese environmental educators and catchment managers.

James Whelan, Project researcher with the CRC's Education and Training Program, recently presented a keynote lecture at a conference for Japanese catchment educators, local government officials, engineers and academics. The lecture "Education for Sustainability: learning our way out", was based on a paper co-authored with Program Leader, Associate Prof John Fien.

James was accompanied by Peter Oliver, PhD student with the CRC for Coastal Zone, Estuary and Waterway Management. Peter recently received a state public service award for his leading work in natural resource management. He was one of the first Australian teachers to engage students in water quality monitoring work, inspired by mentor Bill Stapp. Peter is coordinator of the Pumicestone Passage Catchment Association with the Queensland Department of Natural Resources and Mines.

The two-day conference was hosted by the Tokyo-based Centre for Environmental Information and Science, Tokyo (CEIS).

On the second day of the conference, Peter and James facilitated a full-day workshop on catchment education based on resources from the "We All Use Water" resource kit developed by the Australian Water Association and the Sunshine Coast Environment Council. One of these exercises, "Sandbox 101", entails construction of a scale-model catchment in order to explain and explore management options and the spatial and temporal relationships between people and their catchments. Having modelled this process, James and Peter stepped back while participants enthusiastically constructed a model urban Japanese catchment using 200kg of builders loam, twigs and stones, lego, toy animals and other props. A rugged, vegetated landscape materialised. Streams led from terraced hillsides and plantations to massive dams and heavily populated river plains. Issues illustrated included discharge of untreated sewage, drought, dam impacts, land reclamation and habitat and species loss. Workshop discussions identified

CRC POSTGRADUATE SCHOLARSHIPS

The Cooperative Research Centre (CRC) for Catchment Hydrology has funding for postgraduate scholarships at Masters and PhD level with Griffith University, Monash University and The University of Melbourne.

Full scholarships and top-up scholarships are available.

For initial details and application forms, please contact
Virginia Verrelli on
tel: (03) 9905 2704
fax: (03) 9905 5033
email:
virginia.verrelli@eng.monash.edu.au

Please note positions are open to Australian or New Zealand citizens or Permanent Residents of Australia only.

issues and opportunities, resulting in plans to share educational materials between the Australian presenters and our hosts.

The professional translators commented on their difficulty finding a suitable word or phrase for "catchment". There is no equivalent. The catchment concept explored through lectures and workshops was considered important. Participants suggested suitable words to capture and convey the concept.

During the following three days, James and Peter toured the Kansai region including Kyoto, meeting environmental educators and visiting centres.

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POSTGRADUATES AND THEIR PROJECTS

Our postgraduate forApril is:

Tanja Mueller

Since moving to Australia from Germany in 1985, I fell in love with the ocean, lakes, rivers etc. Sure, we went to the beaches in Europe, but it was a long drive and never a one-day affair. Settling in Melbourne with my family, we would often drive some twenty minutes to the beach or a lake whenever we wanted. So after high school I packed my bags and moved to a beautiful coastal country town called Warrnambool (three hours drive west of Melbourne) to study Aquatic Science. After three years of enjoying living out of home and a stones throw away from the beach, getting my SCUBA licence and discovering the wonderful world of microbes, I attained by BSc (Aquatic Science) from Deakin University.

But all good things must come to an end. Well actually, I missed the city life style and decided to move back to the big smoke, Melbourne. I continued to study and obtained my Honours in Biological Sciences from Monash University, Clayton Campus. There I concentrated my research into looking at 'the potential role of microphytobenthos (microalgae) in influencing nutrient cycling across the sediment-water interface, within the Port Phillip Bay region'.

After attending Monash University I thought why not try another Uni. and began working as a Research Assistant in the Marine Natural Products research group at The University of Melbourne.

Throughout my year at Melbourne University I divided my time between scuba diving for sponge samples from around the south-east coast of Australia, and of course the tedious laboratory analyses to try and find the next "natural billion dollar super drug". But I never found this. So in November of 1999 I moved to Brisbane and seven months later enrolled as a PhD student within the Faculty of Environmental Science, School of Environmental Engineering at Griffith University, under the supervision of Dr. Margaret Greenway and Dr. Ian Phillips. My thesis is entitled: 'The Role of Biofilm in Water Quality Improvement in Stormwater Quality Improvement Devices'. This research forms part of the CRC for Catchment Hydrology Program 4: Urban Stormwater Quality.

A synopsis of the purpose of my research, research design, anticipated outcomes and significance to end-users follows.

Introduction

Urban stormwater management and treatment

In recent years there has been an increased interest in the management of urban stormwater and its impacts, in order to protect urban waterways and receiving waters. Stormwater, a by-product of urbanisation, contains a number of contaminants including suspended solids, nutrients, petroleum products, fertilisers/pesticides, hydrocarbons and heavy metals. Thus, the treatment of urban stormwater runoff is crucial.

So that urban stormwater runoff can be treated effectively and the variety of contaminants associated with runoff managed, a number of different types of stormwater quality improvement devices (SQIDS) are being developed and incorporated into urban infrastructure. Devices include Gross pollutant traps (GPTs), sediment basins, swales, wetlands and infiltration basins. The treatment of stormwater runoff within SQIDS is achieved through the exploitation of physical, chemical and biological processes.

Microbial activity and biofilms

Microbial activity and its ability to remove pollutants has been recognised as a major component in the treatment of wastewater (sewage, effluent, sludge, and stormwater). Within wastewater treatment facilities microbial activity is manipulated and exploited to achieve desired treatment processes.

One principal indicator of such microbial activity is the presence of biofilms. Biofilms are a community of microorganisms and organic matter that develop and perish at interfaces in aqueous environments. They are composed of microorganisms including bacteria (heterotrophic, nitrifying, denitrifying), protozoans, microalgae (diatoms, cyanobacteria) and aquatic fungi, embedded in a gelatinous matrix, a secretion of polysaccharides (glycocalyx), adhering to each other and/or to surfaces of an object.

The wastewater industry has relied heavily upon biofilms in a number of areas such as denitrification, mineralisation, xenobiotic detoxification, and heavy metal removal from waters. Much of the research conducted on biofilms has been undertaken with improved wastewater quality as the primary motivation.

Biofilms in stormwater treatment

Only a limited number of studies have investigated the presence of biofilms within the scope of stormwater treatment devices. These have concentrated mainly upon wetland systems and the characterisation of biofilms within the systems, thus emphasising the need for detailed studies within other stormwater treatment systems. Moreover, research needs to be conducted on the function of biofilms in improving stormwater quality.

An understanding of the particular properties and dynamics of biofilm development and processes could help to optimise the application of desired biofilms within stormwater quality improvement devices. Such knowledge could then be utilised as an integral part of engineering practices, leading to a low energy, low cost, and low maintenance system for the treatment of stormwater runoff pollution

Research aim and design

My research aims to investigate the role of Biofilms in Water Quality Improvement in Stormwater Treatment Devices.

Key aspects include:

1. The identification of key functional groups (microbial groups that have a common activity or association e.g. sulphate-reducing bacteria, nitrifying and denitrifying bacteria) present within the biofilm
2. The colonisation of biofilm on various substrates
3. The capacity and kinetics of nutrient (N & P) uptake by the biofilm
4. The effects of heavy metals and hydrocarbons representative of stormwater runoff pollution upon biofilm, and
5. The effects of wetting and drying cycles, representative of south-east Queensland rainfall conditions.

Anticipated outcomes:

To provide information on suitable substrates for optimal biofilm growth, and urban stormwater pollution removal efficiency of biofilms.

Significance to end-users:

The significance to end-users of the findings of this research is to provide a greater understanding of biofilm development and processes, in particular, in relation to urban stormwater runoff treatment. As noted above, this may help lead to a low energy, low cost and low maintenance system for the treatment of stormwater runoff pollution

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WANT TO KNOW WHAT'S GOING ON?

The CRC event calendar at www.catchment.crc.org.au allows you a 'sneak preview' of what is coming up month by month.

Details of CRC events (workshops, seminars, field tours etc.) are posted on the site as soon as they become available.

LOOK UNDER 'EVENTS' ON OUR WEBSITE.

CRC PROFILE

Report by Tony Weber

I've always wanted to be a scientist. When I was a little kid, everything fascinated me, so much so that I could usually be found pulling wings off things to look under a microscope or seeing how many different compounds you could add to a chemistry set test tube before something went bang.

Through high school, the first subject in senior that I topped the class in was Chemistry. So I thought, why not keep going and study chemistry at university. Several years and a scrape over the pass line (mostly due to sneaking off to Expo 88 instead of advanced complex mathematics lectures in my final year) saw me graduate from QUT with a Bachelor of Applied Science (Chemistry) degree.

My first job was at a private laboratory doing all sorts of water, wastewater, soil and sludge analyses while trying to learn as much as I could (I still maintain that I only used about 10% of the content of my degree, the rest of my technical expertise was gained by "on-the-job" training). After only twelve months at this job, a position became available in Brisbane City Council and I have been there ever since (nearly twelve years now).

My first role in the Council's organisation was in Scientific Services Branch out at the Mt Crosby Water Treatment Plants, affectionately known as "the Mountain" to those who worked there or "the retirement village" to those who wanted to. I must admit that it was a very pleasant place to work, surrounded by dry sclerophyll forest and the upper Brisbane River. Initially, tasks concerned perfecting methods for lime analysis, routine water quality testing, and supervising sampling staff, but this progressed to process development/improvement. This proved to be one of the highlights of my career, playing with a $58M treatment plant after only two years out of Uni. Most of the treatment research involved getting up to my armpits in sludge (optimising a dewatering centrifuge) playing with sand (trialing new filter media) and turning lots of valves on and off (learning just how much computer controlled operating systems didn't like thunderstorms).

After two and a half years the dreaded rotation program that we had in our branch summoned me back to the real lab where I soon got intimate with various organic analyses and instrumentation before moving on to a lab supervisor's role. After a couple of years, it became apparent that pushing paper and generating numbers for someone else to use didn't really appeal, so I went back to working with instrumentation in the lab again. For twelve months I nursed an old Labtam ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrophotometer) or "Ingrid ICP" as we use to call her, into producing reliable results before she was replaced with a young solid state upstart from Perkin Elmer. Within six months of delivery, I managed to get all methods converted, documented, validated and NATA accredited first time around, something that will always be a highlight in my career. The NATA assessor we had was impressed by our new instrument and the methods we were running, so I was soon co-opted into becoming a NATA assessor. I've done quite a few lab assessments now, and it is certainly a learning experience seeing NATA from the other side of the fence.

My life in the lab came to an end in 1998 when I secured a position in Council's Waterways Program where some of my first responsibilities were looking after the Stormwater Monitoring Project. It was actually quite ironic as I used to be the pleb who collected the samples out in the field and now I was in charge of the whole project. After a few changes in Waterways, I then inherited the Stormwater Quality Improvement Device Project amongst others and have been managing the $2M/year project for the last two years. During that time, the changes in technology and best management practices have been amazing. Through Council's linkage with the CRC for Catchment Hydrology, I believe that we will continue to radically change the way we manage stormwater over the next few years.

In order to balance the sometimes hectic work life, I have a hectic home life as well with a 18 month old boy and another baby on the way. I also seem to have more hobbies than any grown man should have with fly-fishing and model railways featuring high on the list. Just recently, I've also started to learn watercolour painting and in my rather large shed there is a 1/12th scale live steam locomotive that I constructed over a four-year period. So really there is no such thing as "spare time" in my life at the moment, but boy have I got a lot to do when I retire!

Finally, I've just become Focus Catchment Coordinator for the Brisbane River Catchment after André Taylor's departure, so I think there will be a few more challenges and opportunities in the near future. I'm really looking forward to continuing to build the CRC's profile in the catchment through more communication of research direction and outcomes and ensuring that the partnership between Brisbane City Council and the CRC continues to build.

After the recent Cobram workshop, I think I am most looking forward to working with Australia's (and the world's) leading researchers in Catchment Hydrology.

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WHERE ARE THEY NOW?

Report by Leanne Haupt

I am writing this article from a temporary site office in a remote area works camp in the headwaters of the Mitchell River in East Gippsland. The camp has been set up as part of a flood rehabilitation project and is a temporary home for a dozen employees of the East Gippsland Catchment Management Authority (EGCMA). It is located at the junction of the Wonnangatta and Wongungarra Rivers in East Gippsland and is 1.5 hours from Bairnsdale. This is where I am now.

In 1995, I graduated from Melbourne University with a B Eng Hons. (Chem). My chosen field took me into a research position with Comalco in Thomastown. After 18 months researching a wettable composite layer for carbon cathodes, I transferred to Boyne Island Aluminium Smelter in Central Queensland.

Whilst working for Comalco, I began studying for a MEngSc, majoring in water resources, at Monash University in Clayton. After working at the smelter for a further 18 months, I had completed eight coursework subjects, in river hydraulics, sediment transport, hydrology and environmental management. I decided to quit my job as a Process Engineer at the smelter and return to Monash full time to complete the thesis component of the degree.

At Monash, I worked with the CRC for Catchment Hydrology, under the Supervision of Bob Keller, to determine "the effect of rock ramp fishways on discharge measurement weirs". This project involved constructing a scale physical model and performing laboratory experiments. The outcome was a series of design recommendations for rockramp fishways. These fishways are often constructed to aid fish passage past discharge measurement weirs and the recommendations minimised the effect of the fishway on the stage-discharge curve of such weirs, while still providing effective fish passage.

Which leads me to my present position and location. After completing the bulk of my thesis, I began work as an engineer with the EGCMA. Initially, I was involved in designing some minor stream restoration / erosion control and bank protection works throughout the East Gippsland Catchment. My current position is Manager of Catchment Projects. In this position, my work has been primarily focused on designing and implementing a works program to address flood damage in the Upper Wonnangatta River catchment. The State Government identified this area as remote, and therefore provided funding for setting up a "camp" of portable buildings to service the works.

The primary focus of the works is to limit sediment supply from rivers in the upper catchment by stabilising bank erosion, and also to protect community assets such as roads and bridges. It has been necessary to balance broader geomorphic trends of stream migration and floodplain evolution with the short-term requirement to stem erosion. The issues are complicated by a lack of natural vegetation - right down to the waterline in some areas. Sometimes it is necessary to provide erosion protection for the bank until vegetation can be established and the rates of channel migration can become sustainable.

My work with the CMA is diverse. As well as flood related restoration works it includes longer-term management practices based on geomorphic considerations, willow control works, and aquatic habitat restoration trials involving large woody debris (LWD) in the estuarine reaches.

The position involves considerable field inspections and community liaison as well as technical design. The skills developed during my Masters frequently come in handy. Last year we even installed a rock ramp fishway.

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LINKS TO KEY HYDROLOGY WEBSITES

If you want information about catchment hydrology, start with our website.

Our links pages feature a wide range of addresses and descriptions of key hydrological websites relevant to the land and water management industry.

The CRC web links database is updated weekly.

www.catchment.crc.org.au

THIRD AUSTRALIAN STREAM MANAGEMENT CONFERENCE

The Value of Healthy Streams

The Third Australian Stream Management Conference will be held during 27-29 August 2001 in Brisbane, Australia.

WHO WILL ATTEND?

The conference is expected to attract people from catchment groups, academia, river-reliant industries and all levels of government across the country as well as internationally. Held every two years, the conference encourages scientists and practitioners to share their findings with a broad audience of researchers, educators, policy makers, regulators, advisors, community facilitators and stream users. The focus is on credible science and practical learnings in the fields of ecology, hydrology, geomorphology and socio-economics.

ABOUT THE PROGRAM

The theme of the conference is *The Value of Healthy Streams*, providing a focus on the technical aspects of the following major themes:

Ecosystem services – how do we quantify the values that healthy riverine ecosystems provide to humans (water quality, flood mitigation, sustainable fishery resources, stable bed and banks, etc) and to other ecosystems (on floodplains, in estuaries, etc)?;

Hydrological connectivity – how do we value the important linkages between the various hydrologic elements (streams, floodplains, estuaries and ground water) and what role do these connections play in regard to stream health?;

Bio-physical integration – how are the physical and biological aspects of stream systems inter-connected and how is the connection reflected in our planning and action?; and

Tools and techniques – what are the latest developments in science that will assist us to better plan and manage our stream systems in a cost effective way?

OTHER ASSOCIATED EVENTS

The conference will be held in conjunction with the **Brisbane River *Symposium*** (29 - 31 August), a popular annual event focused on social aspects of river management. The two events will be complementary, with the conference focused on the pure and applied science aspects of stream management and the symposium focused on institutional and investment aspects. A common day, Wednesday 29 August, will link the two events and form a bridge for the change in themes.

The conference will also be associated with the **Third Australian Fishways Technical Workshop** to be held on 30-31 August. The workshop will address issues related to the design and operation of fishways to provide fish passage over stream barriers such as weirs and barrages.

CONFERENCE TOURS

A range of pre-conference tours in Far North Queensland and post-conference tours around Brisbane will be offered.

THE VENUE AND ACCOMMODATION

The venue will be the Brisbane Hilton Hotel, located within the city's Queen Street Mall in the central business district.

There is a wide range of accommodation ranging from five star to budget (from $**74** per night) within easy walking distance of the venue. Details of accommodation options are given below. Please quote the conference name when booking.

HOTELS

GEORGE WILLIAMS 317 George Street

Reservations: Secure room 90 days in advance with 50% deposit, credit card number, or purchase order
Hotel Contact: Alan Keal
Bookings: Freecall: 1800 064 858 Fax: (07) 3308 0733 Email: hgw@brisbane.ymca.org.au
Rates: Single/ double - $74.00; Twin share - $74.00; Triple share - $86.00;
Quad share - $98.00

MERCURE 85 North Quay

Reservations: Secure room 60 days in advance with deposit equal to one night's accommodation
Hotel Contact: Tonia Krosch
Bookings: Tel: 1300 656 565 Fax: (07) 3236 1035 Email: res@mercurebrisbane.com.au
Rates: Standard single/ double / twin - $100.00 Standard – river view - $120.00
Studio suite – river view - $135.00 Executive suite – river view - $155.00

IBIS 27 Turbot Street

Reservations: Secure room 60 days in advance with deposit equal to one night's accommodation
Hotel Contact: Tonia Krosch
Bookings: Tel: 1300 656 565 Fax: (07) 3237 2444 Email: res@ibisbrisbane.com.au
Rates: Standard single/ double / twin - $100.00; Standard – balcony - $120.00

CARLTON CREST King George Square, Ann Street

Reservations: Secure room 60 days in advance with deposit equal to one night's accommodation
Hotel Contact: Rebecca Thomson
Bookings: Tel: 1800 777 123 Fax: 07 3229 9618 Email: res@carltoncrest-brisbane.com.au
Rates: Crest Tower - single/double/twin - $107.00
Carlton Tower - single/double/twin - $137.00

CHIFLEY ON GEORGE 103 George Street

Reservations: Secure room 20 days in advance with credit card number or order number
Hotel Contact: Amy Tyne
Bookings: Tel: 1800 065 064 Fax: 07 3221 7474 Email: BelFront@touraust.com.au
Rates: Deluxe (Queen size) - $104.00 Executive (King size) - $121.00
Spa suite (King size) - $137.00

HILTON 190 Elizabeth Street

Reservations: Secure room before 26 July with deposit equal to one night's accommodation
Hotel Contact: Wayne Garner
Bookings: Tel: 1800 222 255 Fax: 07 3231 3199 Email: fom_brisbane@hilton.com
Rates: Deluxe - $190.00 Executive (with breakfast) - $230.00

CONFERENCE REGISTRATION

The registration fee for the conference will not exceed $**520**, with discounts available for students and members of voluntary community groups. The bus tours, field trips and conference dinner will be optional and priced separately.

FOR FURTHER INFORMATION:

For any issues, queries, or suggestions, please contact the conference convenor.

Mr John Amprimo Department of Natural Resources GPO Box 2454, BRISBANE QLD 4001
Ph (07) 3224 7668 Fax: (07) 3224 8359 E-mail: stream.conference@dnr.qld.gov.au
Further details are published regularly on the Third Australian Stream Management Conference Website at
www.catchment.crc.org.au/streamconference

The CRC for Catchment Hydrology joins Natural Resources and Mines, Qld, Brisbane City Council, the Department of Agriculture, Fisheries and Forests, Australia and the Natural Heritage Trust as sponsors of the Third Australian Stream Management Conference.

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OUR MISSION

To deliver to resource managers the capability to assess the hydrologic impact of land-use and water-management decisions at whole-of-catchment scale.

OUR RESEARCH

To achieve our mission the CRC has six multi-disciplinary research programs:

- Predicting catchment behaviour
- Land-use impacts on rivers
- Sustainable water allocation
- Urban stormwater quality
- Climate variability
- River restoration

CRC AUSTRALIA

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 and Environment, Vic
Goulburn-Murray Water
Griffith University
Melbourne Water
Monash University
Murray-Darling Basin Commission
Natural Resources and Mines, Qld
Southern Rural Water
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