NEWSLETTER OF THE COOPERATIVE RESEARCH CENTRE FOR CATCHMENT HYDROLOGY

CATCHWORD

NO 80 FEBRUARY 2000

A NOTE FROM THE DIRECTOR

Professor
Russell Mein

Inside...

Research and focus catchments

In my *Catchword* column last November, I wrote of the need for integration of research to meet the needs of resource managers. I mentioned a number of ways in which such integration could be achieved in the research program of the CRC for Catchment Hydrology; these included thematic (rather than discipline-based) programs, multi-disciplinary projects, and linked models and databases.

Focus catchments

To demonstrate that we can achieve integration, we aim to 'test-bed' our research on important management issues. To this end, we have selected five 'focus catchments', selected to:

- cover a spectrum of spatial scales and catchment characteristics
- span the range of issue-based problems confronting catchment managers
- build upon existing catchment management initiatives at those sites
- link to research networks outside the bounds of the Centre
- satisfy the specific interests of each of the participating industry Parties.

The five focus catchments will be:

Brisbane River, Qld
The impact of urban stormwater quality on the river and Moreton Bay is a key concern. It is uncertain whether the primary source of pollutants is the urban or the outer-urban areas, so sediment sourcing and movement is a target issue. River and riparian restoration is a priority for this catchment.

Fitzroy River, Qld
This catchment has undergone rapid clearing; high sediment and nutrient loads are a major concern, both in the river and coastal waters. Water allocation for development, and for maintaining river health, is an important catchment issue.

Goulburn-Broken River, Vic
This area is the 'food-bowl' of Victoria, responsible for about $1.5 billion worth of food production each year. Salinity and nutrient management are key issues here, as are afforestation and water allocation under the tradeable water-rights system. System yield is affected by land use, losses from channels, and operation for irrigation supply.

Murrumbidgee River, NSW
Dryland salinity in the middle reaches is a major issue, with no sure means of forecasting/managing its impact. Afforestation of large areas of the upper and middle catchment is underway, with yet-to-be-determined consequences for salinity and water security.

Yarra River, Vic
The impact of urban stormwater quality on the river and Port Phillip Bay is a key concern. Rehabilitation of tributary streams to encourage aquatic life is a priority for this river.

Each of the six research programs of the CRC will target their research applications or effort on at least two of the five focus catchments, with Program 1 (Predicting Catchment Behaviour) being highly relevant to all five sites. Thus, the CRC is committed to integrated research across a variety of land uses and site conditions.

Focus Catchment Coordinators
The CRC has appointed a coordinator for each site, chosen from the relevant industry Party. The Focus Catchment Coordinators are André Taylor, Brisbane City Council (Brisbane River), Chris Carroll, Department of Natural Resources, Qld, (Fitzroy), Pat Feehan, Goulburn-Murray Water, (Goulburn-Broken), Carolyn Young, NSW Department of Land and Water Conservation, NSW,

cont'd over

PRESTIGOUS AWARD TO ROB VERTESSY

It is always pleasing when the scientific work of a CRC participant is given special recognition by an outside body. This time our congratulations go to Dr Rob Vertessy, whose research has been honoured by the International Union of Forestry Research Organisations (IUFRO) with its Scientific Achievement Award for 2000. He'll get a medallion, a citation and cash(!) at the next IUFRO World Congress, being held in Kuala Lumpur next August.

Long-term readers of Catchword will be aware that Rob Vertessy led the Forest Hydrology Program in the initial CRC, from 1992-1999, and that major advances in the understanding of the relationship between forest management and catchment yield were achieved during that time. These understandings are adding scientific underpinning to the current debate on the impact of forestry operations on streamflow.

Although the CRC does not now have a Forestry Program as such, the work on wood/water relationships is featuring strongly in the current research program, which has an emphasis on catchment-scale prediction of water, sediment, and solutes.

Russell Mein

PLEASE NOTE

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 ARE AVAILABLE FROM THE CENTRE OFFICE OR IT CAN BE DOWNLOADED FROM OUR WEBSITE.

COPIES OF VIDEOS, REPORTS AND WORKING DOCUMENTS ARE AVAILABLE 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

(Murrumbidgee), and Graham Rooney, Melbourne Water (Yarra). They have important roles to play in the CRC's research, particularly relating to the Communication and Adoption strategy for these catchments.Broadly speaking, these roles cover:

- intelligence gatherer (issues, related research, opportunities for the CRC)
- facilitator (of information, data, research integration)
- communicator (dialog with stakeholders and researchers)
- mediator (ensuring that the catchment context for our research is maintained)

The coordinators have met with Program Leaders and will continue to do so on a regular basis.

Generic research emphasis

The use of focus catchments should not be construed to mean that the CRC for Catchment Hydrology is only relevant for five catchments. The emphasis of the CRC is on generic research, applicable (or adaptable) to all catchments. The use of focus catchments is to 'test-bed' our research, and to address some important issues whilst doing so. A key element in success of the CRC is the level of take-up of our research; the communication and adoption strategy will be vital in this regard.

You'll be reading a lot more about focus catchment issues, and the related CRC research, in coming issues of *Catchword.*

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

PROGRAM 1

PREDICTING CATCHMENT BEHAVIOUR

Program Leader
ROB VERTESSY

Report by Rob Vertessy

Survey on model use and design

Team members in Project 1.1 (Development of a catchment modelling toolkit) are now in the process of running three different surveys on model adoption, use and design. Development work on our modelling toolkit will not begin until the results of these surveys have been analysed. One of our chief reasons for conducting these surveys is to build broad ownership of the modelling toolkit. We want a variety of stakeholders, ranging from customers of model outputs through to programmers, to have a say in the scope and design of the toolkit. Some brief detail on each of the surveys is given below.

The first survey, being managed by Rob Argent (Univ. Melbourne), will target senior managers across the land and water industry to ascertain their dependence on and attitudes to catchment prediction. The aim of the survey is to compile a priority list of catchment management questions that entail modelling, and to list the types of models currently in use. Apart from an information gathering exercise, we also view this survey as a benchmarking process. By the end of our new CRC in seven years time we will be able to compare rates of model adoption against that which we measure in this survey.

The second survey, being managed by Rob Vertessy (CSIRO), will target model users and aims to discover the range and nature of the hydrologic models in use by CRC for Catchment Hydrology Parties and their affiliates. It will list and classify these models and rate them in terms of their importance to the land and water industry. We will use this information to develop a short-list of models to be considered for inclusion in the modelling toolkit in the first three years. Our aim is to start working with models that our Parties currently rely heavily on.

The third survey, being managed by Sue Cuddy (CSIRO), will target model designers and programmers. This survey will determine what kind of new models CRC researchers are planning to build, and will ascertain the hardware platforms and programming languages being favoured by the model developers. It will also canvass attitudes of model developers to model training, packaging and dissemination .

All three surveys will be run during the first half of 2000 and will culminate in the release of three reports. Some of the survey groups may choose to run a workshop to clarify outstanding issues. Interested people can contact the Project Leader Rob Argent on (03) 9344 7115 for further information .

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

PROGRAM 2

LAND-USE IMPACTS ON RIVERS

Program Leader
PETER HAIRSINE

Report by Lu Zhang

Understanding Vegetation and Water in Catchments: New Ways Forward

Relations between vegetation and hydrology

H.L. Penman in 1963 surveyed a number of studies dealing with the relationship between vegetation and hydrology. From his introduction I quote: 'There was a great temptation to write a chapter, summarizing and explaining everything, but this task I leave to the reader, …'. Penman made the right decision in letting us explore the facts and myths of the role of vegetation in the hydrological cycle. This also reflects the complexity of the relationship, since if Penman could summarize it he would have. The various hydrological implications of extensive and long-term changes in vegetation are controversial. To what degree can water yield and recharge be manipulated by altering vegetation? How will afforestation affect seasonal stream flow patterns? To what extent is stream salinity altered by changing vegetation cover? These are some of the questions Project 2.3: "Predicting the effects of afforestation on catchment yield and stream salinity" is trying to answer.

Top-down approach

Our understanding of the relationship between vegetation and hydrology is often limited to small areas. However, management decisions usually involve large areas such as catchments and therefore require a catchment approach. Project 2.3 will use a so-called 'top-down' approach that links, in a hierarchy, the catchment responses to our understanding of processes at finer scales. Models of this type are practical, parsimonious (do an efficient job at low cost), and often very robust.

Examples of 'top-down' models – long term evapotranspiration and other models

For example, Budyko (1974) suggested that long-term average annual evapotranspiration from a catchment is determined by rainfall and net radiation, and the relationship he proposed showed good agreement with field measurements. Eagleson (1982) suggested the existence of equilibrium relationships between the hydrological and biological components of ecosystems. He hypothesised that under water-limited conditions, an ecosystem would develop a canopy density that produces minimum water stress for the given climate and soil

NEW INDUSTRY REPORT

MANAGING SEDIMENT SOURCES AND MOVEMENT IN FORESTS: THE FOREST INDUSTRY AND WATER QUALITY

by

Jacky Croke
Peter Wallbrink
Peter Fogarty
Peter Hairsine
Simon Mockler
Bob McCormack
Jim Brophy

Report 99/11

This report presents an overview of CRC research findings on the management of sediment sources and delivery pathways and the effectiveness of best management practices.

This report is relevant anyone involved in the forest industry, shire councils, road planning and catchment water quality management.

Copies available from the Centre Office for $25.

NEW INDUSTRY SEMINAR VIDEO

MANAGING SEDIMENT SOURCES AND MOVEMENT IN FORESTS: THE FOREST INDUSTRY AND WATER QUALITY.

Presented by

Dr Jacky Croke
CSIRO Land and Water

Dr Peter Wallbrink
CSIRO Land and Water

Mr Peter Fogarty
Soil and Land Conservation Consulting

CRC VIDEO 00/1

This video was recorded in Melbourne last year; the first of the three seminars held in Victoria and NSW during November.

It will be of interest to anyone involved in forest and catchment management.

moisture conditions. Under conditions of energy-limitation, the ecosystem would tend to maximize the biomass productivity for the given energy supply.

Soil, vegetation and climate relationships

The development of the equilibrium theory by Eagleson (1982) offered a promising approach for studying the relationships among soil, vegetation, and climate.To further exploit the idea of Budyko (1974) and Eagleson (1982), Milly (1994) developed a framework for mean annual evapotranspiration.

Based on the same philosophy, we proposed a two-parameter model for predicting the effect of vegetation changes on mean annual catchment water yield and the model showed good agreement with results from over 250 catchments worldwide (Copies of the report describing this work, Zhang et al., 1999, are available from Virginia Verelli on 03-9905 2704 or email: virginia.verelli@eng.monash.edu.au).

Project 2.3 will extend this work to consider how vegetation changes (e.g. afforestation, replacement of annual with perennial pastures) will affect seasonal stream flow patterns, groundwater recharge, and stream salinity.

The ultimate goal of the project is to provide predictive tools for managers who want to reliably forecast the water-related impacts of planned vegetation changes.

References

Budyko, M.I., 1974. *Climate and Life*, 508 pp., Academic, San Diego, California.

Eagleson, P.S., 1982. Ecological optimality in water-limited natural soil-vegetation systems. 1. Theory and hypothesis. Water Resour. Res., 18, 325-340.

Milly, P.C.D., 1994. Climate, soil water storage, and the average annual water balance. Water Resour. Res., 30, 2143-2156.

Penman, H.L., 1963. Vegetation and Hydrology, Technical Communication No.53, Commonwealth Bureau of Soils.

Zhang, L., Dawes, W.R., Walker, G.R., 1999. Predicting the effect of vegetation changes on catchment average water balance. Report 99/12, CRC for Catchment Hydrology

Lu Zhang
Tel.: (02) 6246 5802
Email: lu.zhang@cbr.clw.csiro.au

PROGRAM 3
SUSTAINABLE WATER ALLOCATION

Program Leader:
JOHN TISDELL

Report by John Tisdell

Project timings

Projects 3.1: "Integration of water balance, climatic and economic models" and 3.2: "Enhancement of the water market reform process" in the Sustainable water allocation program are expected to commence in March 2000 following the CRC Board meeting in February.

Project 3.1

The task for the next twelve months for those involved in Project 3.1 will be to assess the water system modelling requirements and develop a conceptual framework of the different components of an integrated model of water balance, climate and water allocation. This assessment will form the basis for consideration of the requirements of various model components and the linkages necessary. Two water balance models dominate water management in the eastern states of Australia, namely IQQM and REALM. IQQM will be reviewed by CRC researchers at the University of Melbourne. REALM and any other candidate models will be assessed by the CRC group at Monash University. The assessment of models will be related to the selected focus catchments, with close involvement of water authority parties in this process to help decide on the size and priority of tasks.

Project 3.2

Similarly, the task for the next twelve months for those involved in Project 3.2 will be to conduct a literature search of published papers and government reports on the current state of water trading in Australia. The literature survey will focus on synthesizing existing knowledge on water trading, exploring synergies between markets across Australia, and evaluating current water market activity and trading rules. Building on work by Geoff Syme of CSIRO and others, surveys of communities will be conducted to determine the impact of water markets on regional communities and towns, changes to agricultural farm practices, and perceptions of the future direction of agriculture as a result of trade in their catchment. The survey will also ask irrigators their attitude to breaking the nexus between land and water, points of blockage in current water markets and possible adjustments to trading rules and procedures.

Water market activities and opportunities

Water markets in Australia are at varying levels of development. Collating and exploring synergies between these markets will open opportunities for water authorities, government agencies and regional community groups to avoid any market constraints and externalities evolving in other markets. Within the focus catchments, the level of market activity ranges from initial development and introduction in the Fitzroy as part the WAMPS process; to expanding markets in the Murrumbidgee and Goulburn-Broken where there is active trade and evolving market knowledge.

The breath of market experience provides an excellent opportunity for water authorities, government departments and community groups to collaboratively develop possible operational trading rules and procedures for mature water markets in the focus sub-catchments.

The next twelve months of the program appear exciting and challenging, and hold great promise in establishing solid linkages between industry and researchers at universities and CSIRO, in this critical field of water management.

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

PROGRAM 4
URBAN STORMWATER QUALITY

Program Leader
TONY WONG

Report by Sara Lloyd

Water Sensitive Urban Design at the Lynbrook Estate, Melbourne

Impacts of urban stormwater on receiving waters

The frequent high discharge of polluted stormwater from urbanised catchments results in a number of negative impacts on receiving waters. Extensive channel erosion and a decline in ecological health are increasingly apparent in urban waterways, caused by a combination of physical impacts associated with increased runoff and degraded water quality from catchments with altered landuses.

Integrated approaches

Integrated drainage solutions using Water Sensitive Urban Design (WSUD) offer a means to protect receiving waters from stormwater discharged from urban development. WSUD views the aquatic environment as an asset and aims to minimise the impact of urbanisation on the natural water cycle in terms of changes to the quantity and quality of stormwater conveyed to receiving waters.

Need for further field-based information

Numerous publications conceptualise the WSUD philosophy, but only few on-ground developments exist which incorporate some aspect of WSUD. There is a general lack of field evidence on the performance, life-cycle cost and community acceptance of many of the elements of WSUD and this has hampered industry adoption of WSUD in catchments with urban development. The CRC for Catchment Hydrology is undertaking a number of research projects to determine field-based information on the performance of stormwater treatment measures to address current data inadequacies.

Melbourne Water initiative

An innovative sub-catchment-scale demonstration project incorporating WSUD-concepts was recently initiated by Melbourne Water to enable a better understanding of important design and construction issues related to WSUD. Melbourne Water considers ecologically-based urban drainage design as part of their long term goal to improve the health of Port Phillip Bay by major improvements to the quality of stormwater entering urban waterways. A residential subdivision, located at the Lynbrook Estate in Melbourne's south-eastern suburbs, will incorporate WSUD elements based on the recent Best Practice Environmental Guidelines for Urban Stormwater (Victorian

NEW INDUSTRY REPORT

THE REUSE POTENTIAL OF URBAN STORMWATER AND WASTEWATER

by
Grace Mitchell
Russell Mein
Tom McMahon

Report No. 99/14

This report deals with the feasibility of reusing storm-water and wastewater to reduce the demand on the potable water supplies in Australian cities. It also describe 'Aquacycle' - a model developed by the CRC to assist in this process.

Copies available for $25 from the Centre Office.

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

NEW TECHNICAL REPORT

BLACKBURN LAKE DISCHARGE AND WATER QUALITY MONITORING PROGRAM: DATA SUMMARY AND INTERPRETATION

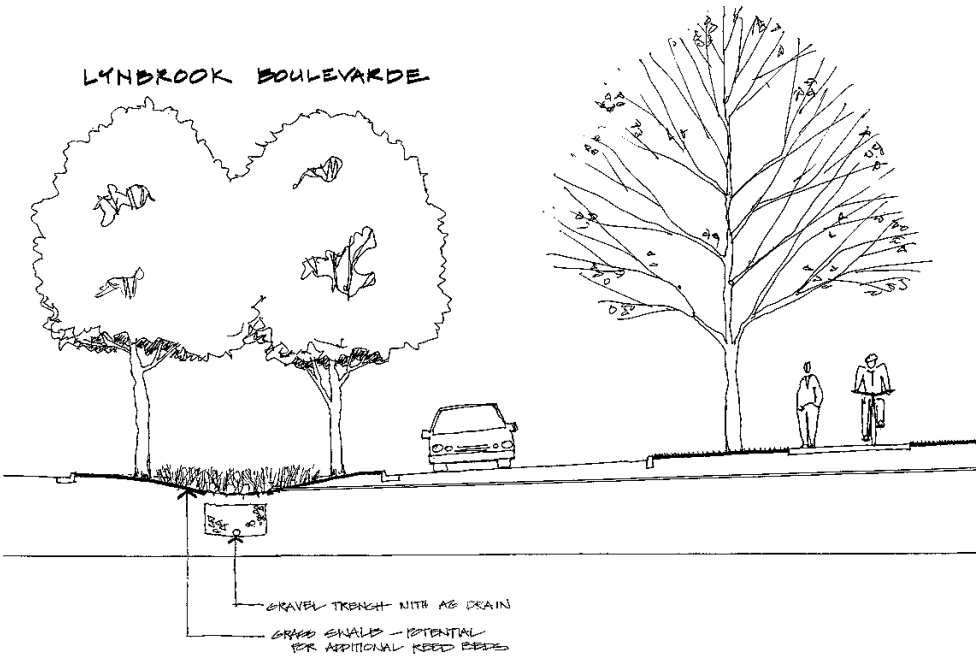
by

Sharyn RossRakesh
Chris Gippel
Francis Chiew
Peter Breen

Report 99/13

The 100 page report documents work undertaken by the CRC for Catchment Hydrology and the CRC for Freshwater Ecology on the performance of an urban pollution control pond in Melbourne.

Copies of this report are available from the Centre Office for $25.



Water sensitive urban design at the Lynbrook Estate, Melbourne

Stormwater Committee, 1999). A collaborative approach has been adopted between Melbourne Water, the Urban Land Corporation (ULC), KLM Development Consultants, Murphy Design Group, and the CRC for Catchment Hydrology to design, implement and monitor the WSUD project.

Design approach at Lynbrook Estate

The design of the Lynbrook Estate drainage system adopts an approach which aims to delay and attenuate the discharge of stormwater from the site by detaining stormwater at the source and in-transit. Grass swales underlain by gravel trenches and bio-retention systems (vegetated swales which promote infiltration into the underlying gravel-filled trench) are the 'primary' stormwater treatment measures. (*Please see diagram*) Secondary treatment will be provided by a series of wetland systems. The cumulative effect of peak discharge attenuation and water quality improvements is expected to minimise the impact of urbanisation on the receiving waters. The unique feature of this drainage system at Lynbrook is not as much the design of the individual WSUD infrastructure, but rather the integrated and complementary layout of multiple WSUD elements constructed within the one catchment.

Feasibility of aquatic ecosystem protection

My research aims to assess the feasibility for aquatic ecosystem protection provided by the alternative stormwater drainage scheme at the Lynbrook development. A paired-catchment monitoring study, comparing WSUD infrastructure to conventional drainage design within the same residential estate, will be undertaken. The monitoring program proposed at Lynbrook is extensive. Components of the monitoring are directed at gaining a greater understanding of the effect on catchment hydrology, as well as hydraulic aspects of the individual stormwater quality improvement measures.

Economic benefits and constraints

Another aspect of my work will focus on the economic benefits and constraints of WSUD. These could include issues of construction methods, maintenance, and community acceptance. Developers, councils and the community are unlikely to adopt WSUD as common residential planning practice unless the associated life-cycle costs are comparable to conventional drainage systems. Investigation of the economic benefits will include some analysis of the potential impact of WSUD on future land values. This is expected to be influenced by market approval and community understanding of and response to WSUD.

Timing of work and monitoring

Construction of the WSUD scheme is scheduled for February 2000 and is expected to be completed by April 2000. Monitoring of the construction activities will be undertaken as part of my project to ascertain and document issues related to those construction methods which differ from the construction of conventional systems. Field experiments will be conducted on the bio-retention systems to determine the hydraulic conductivity of the infiltration media. The pathways of water being treated by these systems will be tracked using a tracer. Paired-catchment monitoring is planned for later this year.

Sara Lloyd
Tel: (03) 9905 3837
Email: sara.lloyd@eng.monash.edu.au

PROGRAM 5
CLIMATE VARIABILITY

Program Leader
TOM McMAHON

Report by Tom McMahon

Since our last communication, Francis Chiew and I as Project Leaders of Climate Variability Projects 5.1 "Modelling and forecasting hydroclimate variables in space and time" and 5.2 "National data bank of stochastic climate and streamflow models" respectively, have been finalising the two project agreements.

We are hopeful that the projects are given the green light at the forthcoming CRC Board meeting on 25 February.

We invite you to watch this space for our planned activities. The research areas in the two projects were outlined in the November and December 1999 *Catchword*.

Tom McMahon
Tel.: (03) 9344 6641
t.mcmahon@civag.unimelb.edu.au

PROGRAM 6
RIVER RESTORATION

Program Leader
IAN RUTHERFURD

Report by Bob Keller

Project 6.2: Improved design of tools for stream restoration

Project Aim – fishways a major component

The aim of this project is to improve the confidence with which people design and apply tools for stream restoration in Australian streams. A major component of the project is the rational design and evaluation of fishways. Many millions of dollars are being spent on fishways across Australia. A great deal of research and development is being directed at fishway design in Australia by biologists, but there is an acknowledged lack of hydraulic and engineering expertise to turn that good work into consistent engineering designs.

Opportunity for further research across various disciplines

Additional funding of $360,000 has recently been secured through a successful application to the Murray-Darling 2001 Fish Rehabilitation Program. In particular, an integrated interdisciplinary research program will be carried out that will draw on engineering, operations and biological expertise to produce information that will significantly contribute optimising fish passage in rivers. The project combines well established and innovative techniques in the field and in the laboratory to generate information on hydraulic and biological parameters relevant to fishway design. The information produced will allow more predictive capability when designing fishways, and in turn, potential for a more explicit trading-off of factors such as the number of fish passing the fishway, water use, and capital cost.

Fishway research package

Elements of the integrated package include:

- *t*ests of swimming ability for a range of fish species, size classes and test durations within existing fishways using established methods (eg. paired experiments using cone traps within fishways, varying slot widths;
- use of video technology to measure swimming ability and record the behaviour of fish in fishways;
- physical and numerical modelling of the depth, velocity and turbulence distributions within different types of fishways; and
- varying hydraulic conditions near the entrances to fishways, and characterising which conditions attract *fish.*

TECHNICAL REPORT

GUIDELINES FOR STABILISING STREAMBANKS WITH RIPARIAN VEGETATION

by
Bruce Abernethy and Ian Rutherfurd

Report 99/10

The Queensland Department of Natural Resources contracted the CRC for Catchment Hydrology to write technical guidelines to help specify the width and composition of vegetated riparian zones, for bank erosion control.

This report will guide and focus the practitioner's approach to planning riverbank stability works using vegetation.

The report is available from the Centre Office for $25.

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

NEW TECHNICAL REPORT

PREDICTING THE EFFECT OF VEGETATION CHANGES ON CATCHMENT AVERAGE WATER BALANCE

by

Lu Zhang
Warwick Dawes
Glen Walker

Report 99/12

This project's aim was to estimate the effects of afforestation or deforestation on run-off that leads to recharge to some of the alluvial catchments in the upland areas of the Murray-Darling Basin. The method proved to be very successful and can be more widely used by providing a basis for making estimates of the water yield impacts of wide-scale afforestation in Murray-Darling Basin

Copies of this report are available from the Centre Office for $25.

Project outcomes

Expected outcomes are a Technical Report, and a Manual of Practice. The aim is for these to be key references in the future design of fishways, providing:

- Charts of swimming ability for Murray-Darling Basin fish (native and exotic) as a function of length and other variables (e.g. temperature).
- Information on conditions needed to attract fish into fishways.
- Accurate rating curves (flow vs. water level relationships) for some fishways.
- Information on how sensitive selected fishway designs are to variability in construction, and blockages by instream debris.
- Information on how to optimise water use within fishways by considering the minimum flow conditions at which fish will migrate, and the part of the day at which fish migrate.
- A numerical model of the velocity and turbulence distribution within vertical slot fishways, for a range of flows.

An increased pool of expertise on fishway design and management will also be an outcome.

Postgraduate studies

Lindsay White is undertaking his PhD studies within this project. Two further postgraduate students are to be appointed in the areas of hydraulic engineering and fish biology.

Work recently completed includes a study of the influence of rock ramp fishways on weir rating curves. This work forms the minor thesis component of Leanne Haupt's M.Eng.Sc.

Further information on the various aspects of this project can be obtained from:

Bob Keller
Tel: (03) 9905 4946
Email: bob.keller@eng.monash.edu.au

COMMUNICATION AND ADOPTION PROGRAM

Program Leader
DAVID PERRY

Report by André Taylor

Introducing the Brisbane River Catchment

The Brisbane River Catchment in South East Queensland is one of the CRC's five focus catchments. The information given below is intended to give readers a feel for the physical nature of the catchment, the key issues facing catchment managers in the region, and key stakeholder groups involved in catchment management and waterway-related research.

The Catchment at a Glance

The Brisbane River Catchment has a sub-tropical climate, with 1.5m of rainfall a year, mostly as intense summer storms. The catchment area is 13,500km^2 and extends from Moreton Bay to the Great Dividing Range. This catchment includes the sub-catchments of the Upper Brisbane, Stanley, Lockyer and Bremer Rivers. It has 850kms of river and lake banks as well as 50 major creeks.

The Brisbane River is the largest river in the catchment. Eighty kms of the river's lower reaches are tidal and flood prone with 11 'major floods' recorded in Brisbane since 1840.

Only 14% of the catchment is currently uncleared. Land use is varied, including significant areas of urban, grazing, cropping and forested lands. The upper catchment is mainly rural, while the lower catchment is urbanised. The Brisbane River catchment supports the largest population of any catchment in Queensland (in excess of 1 million), and being part of SE Queensland, is currently experiencing rapid population growth. For example, from 1991 to 2031 it has been estimated that there will be a 78% increase in the population of Brisbane City. As a consequence of this population, there are 40 sewage treatment plants (STPs) in the catchment. In Brisbane City alone, there are over 2,100km of enclosed urban stormwater drains and 8,200km of 'kerb and channel' stormwater drainage.

The Brisbane River Catchment drains to Moreton Bay (1,523km^2 in area), a shallow bay sheltered from the Pacific Ocean by the islands of Moreton and North Stradbroke to the east. The Bay plays a major role in the economy of the region and the lifestyle of its people. Brisbane is the only place in the world where 700-900

dugong graze on seagrasses within sight of a major City. The Bay also hosts internationally recognised sites for migratory birds and supports a significant fishing industry. The Bay's recreational fishing industry alone is worth over $400M per year.

Key Waterway-Related Issues

The following issues are nominated by the Author as currently being the most significant waterway-related issues facing the catchment (in no particular order):

- Flooding (regional and local).
- Sediment loads/turbidity in creeks, the River and Bay (from urban stormwater and rural land uses).
- Nutrient loads in creeks, the River and Bay (e.g. algal blooms in the Western Bay are principally linked to nitrogen discharges from STPs).
- Weeds (aquatic and riparian).
- Degradation and discontinuity of riparian vegetation.
- High concentrations of nutrients, bacteria and phytoplankton in creeks within the upper catchment.
- Sewer overflows and urban stormwater impacting upon urban creeks.
- Water supply and environmental flows.
- Litter and toxicants (e.g. pesticides and heavy metals) in creeks, the River and Bay.
- Bank erosion (particularly creeks in the upper catchment).

Largely because of the widely recognised work of the SE Qld Regional Water Quality Management Strategy (SEQRWQMS or 'The Moreton Bay Study'), catchment managers now have a good understanding of cause-effect relationships in tidal waterways, and are implementing suitable actions. However, scientific investigations are still in their infancy in freshwater areas via the SEQRWQMS (with help from CRCs and others). There is still much to learn about the health of these systems, the key threats, sources of pollutants and importantly, necessary management actions.

Key Stakeholders Involved with Catchment Management and Research

Local stakeholder groups that are actively involved in catchment management and research include:

- Local governments and their various reference groups.
- Numerous community/catchment groups (e.g. in Brisbane City Council alone there are currently 16 formally recognised catchment groups).
- Commonwealth Government (e.g. through NHT funded projects).
- State Government (e.g. the Environmental Protection Agency, Department of Natural Resources, Department of Primary Industries, Queensland Transport).
- Port of Brisbane Corporation.
- SEQ Water Board.
- CRCs (i.e. Catchment Hydrology, Coastal Zone, Freshwater Ecology).
- Local universities (University of Qld, Griffith, Qld University of Technology).
- Industry associations (SIA, IEAust, HIA, QMBA, UDIA, etc.) and local groups such as the Urban Stormwater Information Group which represents key urban stormwater managers from across SE Qld.
- The SEQRWQMS (the Strategy will continue until 2001).

Want More Information?

- The Crew Member's Guide to the Health of Our Waterways (SEQRWQMS, 1998) is an excellent layperson's summary of the SEQRWQMS's scientific findings involving the lower catchment (contact the SEQRWQMS on 07 3403 4206).
- The Moreton Bay Study – A Scientific Basis for the Healthy Waterways Campaign (SEQRWQMS, 1999) is a companion document to the above, but aimed at the scientific community (contact the SEQRWQMS on 07 3403 4206).
- The Moreton Bay Catchment Water Quality Management Strategy (SEQRWQMS, 1998) summarises those actions being taken by stakeholders in the region to address the findings of the SEQRWQMS for tidal waters (contact the SEQRWQMS on 07 3403 4206). This Strategy is being updated as scientific investigations now involve the catchment's freshwater areas.
- The Urban Stormwater Management Strategy (BCC, 1999) summarises those actions being taken by Brisbane City Council to manage urban waterways within its jurisdiction (contact Council on 07 3403 9402).

André Taylor
Focus Catchment Coordinator (Brisbane)
Tel: (07) 3403 9402
Email: pwpoq@brisbane.qld.gov.au

NEW VIDEO

EROSION IN FORESTS FIELD TOUR WARBURTON, VICTORIA MAY 1999

CRC VIDEO 99/3

This new CRC video presents the field tour in the Noojee State Forest undertaken as part of the recent 'Second Erosion in Forests Workshop'.

The video includes presentations by forest managers and researchers as well as questions from participants and group discussion.

Copies are available for $20 from the Centre Office.

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

SECOND EDITION OF INDUSTRY REPORT PUBLISHED

MANAGING URBAN STORMWATER USING CONSTRUCTED WETLANDS

by

Tony Wong
Peter Breen
Nicholas Somes
Sara Lloyd

Report 98/7

Over 900 copies of this successful Industry Report have been sold resulting in a Second Edition. This new edition includes a new section, Appendix A, which answers a number of common questions on the use of constructed wetlands in stormwater management.

Copies available from the Centre Office.

CRC PROFILE

John Langford

John Langford is Board Chairman of the Cooperative Research Centre for Catchment Hydrology. He also chairs the Cooperative Research Centre Freshwater Ecology and the Murray Darling Freshwater Research Centre. As Executive Director of the Water Services Association of Australia (WSAA), he leads the peak body of the Australian urban water industry.

John's career in the water industry spans three decades of commitment and enthusiasm. Its impetus springs from a deep affection for the natural environment and a desire to achieve sustainable use of it. He chose water as a field in which it was possible to make a strategic contribution.

Graduating from the University of Melbourne in 1966 as an agricultural engineer, he followed in the footsteps of Russell Mein, current Director of the CRC for Catchment Hydrology, who was a year ahead of him. Those university days were also shared with Peter Cullen, now Director of the CRC for Freshwater Ecology.

John began postgraduate work in 1967, setting out to measure run off. That year delivered one of the worst droughts in Victoria's history. 'By the time it was over,' he recalls wryly, 'I'd done a lot of work, but had no data!' He then turned his efforts to building a rainfall simulator, which led to a doctorate on the hydraulics of overland flow, awarded in 1971.

Water resource and catchment management, urban and irrigation water supply and research management, are warp and weft of John's working life. He started at the Melbourne and Metropolitan Board of Works in 1971. In 1973 John was awarded a Churchill Fellowship that took him to work with Heggie Holton at the Hydrographic Laboratory of the US Department of Agriculture where he researched the hydrological cycle, using one of the early mathematical models. Subsequently he worked for the Department of Water Resources (Victoria) and the Rural Water Corporation. As Chief Executive, he directed programs that substantially improved the performance of the Corporation, reducing the annual shortfall of revenue against business costs by 80% from $70 million to $13 million.

In addition to his managerial work, John has served on numerous boards and committees, including: the Murray-Darling Basin Commission; Goulburn-Murray Water; and the Land Conservation Council. He chairs the CSIRO Land and Water Sector Advisory Committee, and the Sydney University-based Advisory Committee of the Special Research Centre for the Ecological Impact of Coastal Cities. He actively contributes to the wider debate by presenting papers at forums sponsored by organisations including the World Bank, the UN Environmental Program (UNEP), the OECD, and the Rosenberg Forum on International Water Policy

Three guiding motivations fuel John's commitment to sustainable use of the natural environment. The first is the need to find the appropriate balance between using natural resources and preserving them so that future generations can enjoy them. The second is a passion for getting people working cooperatively together - hence his work with the CRCs and WSAA.

The third is a conviction about the importance of finding the points of strategic leverage if work is to endure and have impact. 'If you can identify the point of strategic leverage,' John comments, 'and if you can focus your energies on that, your chances of actually making a real difference are much greater – even if it takes a long time. In this game we're talking about a natural environment that's been around for millions of years, so you have to be patient.'

One point of strategic leverage in the early seventies, was his pioneering work on the effect of bushfires and logging on reducing streamflow yields in the mountain ash forests of Melbourne's water catchments. Research showed a decrease in streamflow that went against expectation. In the context of a team effort, John established the scientific credibility of these findings. 'The research program, including the contribution of the CRC for Catchment Hydrology, is one of the prime reasons why those catchments aren't logged today,' he remarks.

Another point of strategic leverage was work at MMBW on water supply strategy which led to the demand management strategy that ultimately resulted in a range of reforms including dual flush toilets.

As Chief Executive of the Rural Water Corporation, John was instrumental in setting up a further strategic leverage point – water trading. Water trading brought about a significant and positive restructuring of the irrigation industry moving water to more economically profitable and productive enterprises.

And today's leverage points? John plays a lead role in facilitating collaboration between health regulators and water authorities to achieve positive public health results, not just to meet numerical standards. He was instrumental in initiating major research into public health and water supplies, bringing together health and water agencies to

implement a double blind clinical trial designed to answer the question, "Are people getting gastroenteritis from drinking water?" This trial has involved 600 volunteer families.

Cryptosporidium in water supplies is central issue for his attention. As WSAA's Executive Director, John Langford is the catalyst to critical research into Cryptosporidium in water supplies. He reports that the National Cryptosporidium Research Steering Committee of the United Kingdom, of which he is a member, was impressed with WSAA's highly focussed Cryptosporidium research strategy. 'I see considerable potential for harnessing the research effort in the UK and US to help complete the research in a more timely fashion,' he says.

John's career includes numerous external acknowledgements starting with the Churchill Fellowship. He is a Fellow of the Institution of Engineers, Australia, and in 1998 his peers elected him as a Fellow of the Academy of Technological Sciences and Engineering. In 1999 the World Bank published "Towards a Financially Sustainable Irrigation System: Lessons from the State of Victoria, Australia, 1984 – 1994", a book which John Langford co-authored with Christine Forster and Duncan Malcolm. In his Foreword to the book, Senior Water Advisor to the World Bank, John Briscoe observes, 'The [Australian] water reform process has had remarkable leadership from a cadre of "thinker-practitioners" who have constantly sought the holy grail of theoretical soundness and technical and political practicality.'

'The World Bank published the book in recognition of the value of our experience to others contemplating similar reforms,' John comments. 'Having been Jeffed, and forced to breakup the Rural Water Corporation, writing the book was a much needed therapeutic exercise!'

In April 2000 John Langford will be presented with the Peter Hughes Water Award, which recognises a world class contribution to water affairs. The judging panel selected him for his work on improvements to national urban water management for both efficiency and health outcomes.

Asked about his aspirations as Board Chairman, John replies, 'I want to stand in a river valley and see real improvement as a result of our research. Not just kilograms of research papers, but a real improvement!'

John Langford
Tel.: (03) 9606 0678
Email: john.langford@wsaa.asn.au

WHERE ARE THEY NOW?

Report by Fiona Dyer

Where is Fiona Dyer now?

….. not very far from where I was then! But I guess I have been round the world once, moved offices and changed funding sources in the meantime.

I finished my PhD in June 1998 and after taking a little time off to relearn some social skills (like having conversations that didn't revolve around sediment!) I took up a CRC 'writing-up' award to polish off a couple of manuscripts.

Following on from this I began work for the Facilities and Services Department of the ANU (but still physically based at CSIRO Land and Water) on the nutrients in Sullivan's Creek - yes, that's right playing in an urban stormwater drain! This has been a great experience - its allowed me to be a real chemist again (and hone my swearing skills - has anyone ever told you about low level nutrient analyses???) and dabble in the area of water quality. The project was designed to identify the forms (eg dissolved, particulate, organic or inorganic) of nitrogen and phosphorus in Sullivan's Creek and to see if I could identify any major sources of the nutrients. It's been interesting to discover that the greatest source of nutrients during low flow conditions is actually a gross pollutant trap festering away under low oxygen conditions. This project is currently drawing to a close and by the time you read this months *Catchword*, my story will be a little out of date as I move on to unknown territory at the start of February.

On the lighter side of life, I took a five month break in the middle of last year for a culinary tour of the world - missing a Canberra winter, visiting the odd researcher, catching up with some old friends and performing background research for an application for funding to study cake shops and wineries of the world. Any takers to join my project????

Fiona Dyer
Tel: (02) 6246 5746
Email: fiona.dyer@cbr.clw.csiro.au

STREAM CONFERENCE PROCEEDINGS

The Proceedings of the Second Australian Stream Management Conference held in Adelaide earlier this year 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.

The Table of Contents from the proceedings have been posted on the CRC for Catchment Hydrology website in pdf (Adobe) format. This allows you to browse the contents pages to get an idea of the range of papers.

Look under PRODUCTS

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

If undelivered return to:

Department of Civil Engineering
PO Box 60
Monash University
Vic 3800

Surface Mail

Postage Paid Australia

Print Post Approved
PP338685/00026

COOPERATIVE RESEARCH CENTRE FOR **CATCHMENT HYDROLOGY**

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 • SA Water • State Forests of NSW •

CENTRE OFFICE:
CRC for Catchment Hydrology
Department of Civil Engineering
PO Box 60
Monash University, Vic 3800
Telephone: +61 3 9905 2704
Facsimile +61 3 9905 5033

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