

COOPERATIVE RESEARCH CENTRE FOR



CATCHMENT HYDROLOGY

Project 2.1 Sediment Movement, Physical Habitat and Water Quality in Large River Systems

Project Objectives

To predict the effects of future land use change and catchment remediation on the condition of large rivers requires large-scale physically-based process models.

Our aim is to build on our detailed understanding of sediment and associated nutrient transport at the small scale in order to construct models for river behaviour on a large scale, and then to acquire the data to calibrate such models. This will help guide the efforts of managers to improve river health.

Expected Outcomes

- A more holistic approach to catchment and river management for sediment control with increased understanding of the complex patterns of sediment transport and habitat in river systems
- An improved technical basis for river management policy
- An increased ability of management agencies to undertake regional catchment planning and better allocate limited resources
- Flexible design principles for riparian management and river restoration that reflect local conditions and history

Target problems

The focus of the CRC for Catchment Hydrology is on large-scale regional catchments, the scale relevant to regional planning. At such large scales the questions posed for sediment, nutrient transport and river restoration centre around the large-scale spatial and temporal patterns of processes. Appropriate questions include:

- From where in a catchment are sediment and nutrients sourced?
- Where downstream do they impact on the physical habitat?
- What changes are occurring to the channel morphology and bed substrate?
- What are the rates of adjustment of rivers to land use change?
- Are rivers approaching a new ecologically acceptable state without intervention?


Research Plan

The challenge is to build our current process understanding into predictions at a larger scale. Inevitably, there will be less emphasis given to the more traditional reductionist approaches of detailed process studies at small scales. The project is structured around a conceptual framework predicting sediment transport and channel morphology on the basis of stream power and sediment loading.

A significant gap is data on large-scale patterns of river behaviour and morphology upon which to calibrate such models. Aspects such as sediment residence times, patterns of channel morphology, channel substrates and patterns of sediment and nutrient yield are poorly understood in all catchments, but are tractable using recently developed techniques and by targeted field measurement. We wish to:

- Identify those areas where land use practice has the greatest impact
- Identify which river reaches bear the bulk of that impact
- Identify which river reaches have the greatest potential for recovery
- Develop techniques to assist that recovery

www.catchment.crc.org.au/landuseimpacts



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

Key Research Tasks - 2000-2003

- Using a relatively simple physically-based model, predict the spatial and temporal patterns of erosion and sediment transport in large catchments, raising testable hypotheses on the controls over these patterns
- Assess the dominant sources of sediment and associated nutrients and the processes of erosion using tracing techniques
- Determine and explain the patterns of channel form, and investigate their significance for sediment transport and in-stream habitat
- Relate local in-stream habitat structure and diversity to broader patterns of sediment transport and hydrological regime
- Develop conceptual models for the recovery trajectory of disturbed streams

Linkages

CRC Projects 6.1 and 6.2 will develop appropriate management aimed at increased ecological viability of rivers. We will contribute by identifying the physical constraints of sediment regime, flow regime and channel form, and there will be a strong emphasis on ecological viability. Strong linkages will be made with the CRC for Freshwater Ecology to maximise the ecological relevance of the work.

End users and Stakeholders

Potential end users for a better understanding of large-scale patterns of downstream impact of land use and riverine health are Commonwealth, State and regional agencies responsible for catchment and river management and policy development. Local catchment and Rivercare groups are other potential users of the knowledge.

Staff Involved

Project Leader

Ian Prosser (CSIRO Land and Water)

Researchers

Ian Rutherford (The University of Melbourne)

Rebecca Bartley (Monash University)

Scott Wilkinson (Monash University)

Bill Young (CSIRO Land and Water)

Jon Olley (CSIRO Land and Water)

Peter Wallbrink (CSIRO Land and Water)

Gary Caitcheon (CSIRO Land and Water)

Anthony Scott (CSIRO Land and Water)

Andrew Hughes (CSIRO Land and Water)

Guy Geeves (Department of Land and Water Conservation, NSW)

Christoph Zierholz (Department of Land and Water Conservation, NSW)

Carolyn Young (Department of Land and Water Conservation, NSW)

Participating Organisations

CSIRO Land and Water • Department of Land and Water Conservation, NSW • Monash University
• The University of Melbourne

For Further Information: Dr. Ian Prosser Cooperative Research Centre for Catchment Hydrology

CSIRO Land and Water, GPO Box 1666 Canberra, ACT 2601

Tel: 02 6246 5830 • Fax: 02 6246 5845 • Email: ian.prosser@cbr.cw.csiro.au

www.catchment.crc.org.au/landuseimpacts