Sediment and nutrient loads

Regional scale sediment and nutrient budgets

A finely tuned balance

Changes in land-use associated with European settlement in Australia have resulted in increased sediment supply to rivers. Increasing the amounts of suspended sediment and associated nutrient (phosphorus and nitrogen) entering rivers has negative consequences for water quality and light penetration. Ecosystem functions such as photosynthesis are affected and the sediments can smother the habitat of fish and other animals.

Sediments and nutrients originate from a number of processes which include:

- Runoff on the land (hillslope erosion);
- Erosion of gullies;
- Erosion of the banks of streams and rivers.

To manage sediment and nutrient inputs to rivers we need to identify which of the erosion processes are most important in different parts of the catchment. This project aims to do this and so increase our understanding of how current land-uses impact the river systems in two north Australian river catchments.

How much sediment?

The Sediment River Network Model (SedNet) will be used to simulate, or represent how river sediments move through the catchments and provide a tool for making predictions about the potential impacts of land use change on sediment and nutrient levels in the rivers. To develop the SedNet model, budgets need to be constructed to account for the main sources and stores of sediment throughout the river system.

A range of information will need to be fed into SedNet to build the sediment and nutrient budgets for each catchment. This includes electronic maps of the catchment, current land use, river flow data, dimensions of river channels and estimates of erosion rates. This information will be sourced from existing data as well as new data collected in project field studies. For example, the team will take measurements

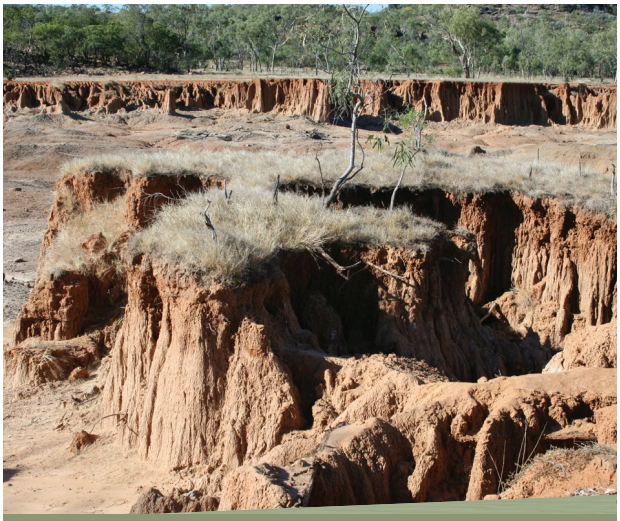

Photo: Ian Dixon

on floodplains to calculate the amount of sediment stored and the length of time it has been deposited.

The model's predictions will then be tested and fine-tuned for each focus catchment using field measurements. Actual suspended sediment loads will be calculated at gauging stations where flow and suspended sediment concentrations will be measured. The relative sediment contributions from each major tributary will be determined by sampling at river junctions and analysing sediments using sediment tracing techniques. Likewise, the key erosion processes responsible for delivering sediments will be determined by matching the chemical composition of river sediments and sources of sediment such as hillslopes and gullies.

Pin-pointing sources of sediment

Scientists will use a number of techniques to pin-point where sediment found in streams originated from and what erosion processes lead to its transport. Soils developed on different rock types often have unique chemical properties. When soil is eroded and becomes sediment in a stream, it carries its unique 'fingerprint' with it that can be used to trace its origins. Using this

Photo: Gary Caitcheon

technique, researchers will sample the deposited sediment at major river junctions to determine the relative sediment contributions from each major tributary to the main channel.

The low concentrations of radioactive elements (radionuclides) deposited from the atmosphere will also be used to differentiate between sediments derived from hillslope erosion versus river bank and gully erosion. Since sediments from hill slopes have higher concentrations of the radionuclides, samples will be collected from hillslopes and channels (e.g. gullies) and compared with samples collected from river sediments deposited downstream.

Who is on the team?

This project is led by scientists at CSIRO Land and Water in Canberra. They will be working with other scientists from Charles Darwin University in Darwin. There will also be strong links with other scientists doing related work in TRaCK (e.g. in the bedload transport project and the water budgets project).

Where is the research happening?

Models will be developed and tested for the Mitchell River(Qld) and the Daly (NT) River. Work in the Daly has commenced and field work in the Mitchell is planned to start in the 2008 dry season. The project will finish in 2010.

How will this research help?

In conjunction with other TRaCK research, the findings from this project will help predict the potential consequences of land use change on river and estuary health. This will assist water planners and natural resource managers make improved decisions when considering water allocation and development options in tropical river catchments.

A better understanding of the key sub-catchments that contribute sediment and nutrients to tropical river systems, as well as the erosion processes responsible, will help land holders and managers to more effectively plan and implement on-ground prevention and remedial works and adjust land management practices so that soil loss to streams is minimised.

Team contacts

For more information on this project contact:

Gary Caitcheon
CSIRO Land and Water, Canberra
gary.caitcheon@csiro.au
phone 02 6246 5752

Australian Government
Department of the Environment, Water, Heritage and the Arts
Land & Water Australia
Australian Government Water Fund
Raising National Water Standards

To find out more about TRaCK
visit **www.track.gov.au**
email **track@cdu.edu.au**
phone **08 8946 7444**

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