Land-use Impacts on Rivers

Program Leader: Dr Peter Wallbrink (CSIRO Land and Water)

Project 2A: Reducing the impacts of irrigation and drainage on river water salinity

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This project focuses on predicting the impact of irrigation management on river water quality. It will link sub-catchment scale conditions (climatic variability, groundwater conditions) and management actions (irrigation practices, drainage design, land-use, water availability) to river networks at whole of catchment scale. The project findings will be demonstrated in the irrigation regions of the Murrumbidgee and Goulburn-Broken focus catchments. The project also aims to link with economic modelling activities being undertaken in Project 3A.

Duration: 3 years, starting January 2003. Total Budget: $1.12 million

Project 2B: Improved suspended sediment and nutrient modelling through river networks

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This project is strongly focused on the refinement and extension of the SedNet model, developed for the National Land and Water Resources Audit. It will permit prediction of erosion hotspots within focus catchments and the likelihood of sediment and nutrient delivery to particular reaches of river networks. The project is pitched at just the right spatial scale for our intended integrated modelling capability. New developments will allow the model to operate at a finer time step, improve predictions of river bank erosion, and improve the representation of sediment and nutrient delivery ratio (previously considered a constant).

This project is needed to underpin water quality predictions responsive to climate variability and land-use change. These predictions will have immediate value for the NAPSWQ target setting, the socio-economic models being built in Program 3, and the aquatic ecosystem response models we intend to build in Program 6.

Duration: 3 years, starting March 2003. Total Budget: $1.01 million

Project 2C: Predicting salt movement in catchments

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This project will deliver the capacity to identify salinity hot spots in focus catchments and to predict the effectiveness of revegetation in reducing salt loads into rivers. It builds upon a large body of modelling work and data capture undertaken by DLWC, DSE, QDNRM and CSIRO. Like Project 2B, this project forms a vital part of our water quality modelling approach.

A key part of the project will be integrating at least two salinity modelling approaches (BC2C and CATSALT) that have different strengths and weaknesses. The BC2C (Biophysical Capacity to Change) model focuses on groundwater flow systems and their water yield and salt load responses to changes in land-use. It is a promising screening tool for setting priorities on which catchments to revegetate, but has limited predictive capability for water quality target setting as it operates on an annual time scale. The CATSALT model operates on a daily time step and therefore offers this capability, though only at a reduced spatial scale and without due consideration to groundwater flow systems.

This project will formulate a hybrid modelling system to address both sets of needs. It will most likely also contain elements of other models.

Duration: 3 years, starting January 2003. Total Budget: $2.35 million

Project 2D: Modelling and managing nitrogen in riparian zones to improve water quality

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In many systems, nitrogen is the 'limiting' nutrient responsible for nuisance algae that threaten aquatic ecosystems. This project will deliver the ability to predict nitrogen influx into streams from shallow groundwater, and to estimate the ability of riparian and in-stream areas to 'consume' the nitrogen via the process of denitrification (microbial conversion of nitrate to nitrogen gas which is removed to the atmosphere).

The project addresses a key requirement in our modelling capability: the ability to estimate the fate of nutrients entering the river network and the efficacy of riparian management in different physio-climatic settings.

This project complements Project 2B (which focuses on nutrient delivery to streams) and two **research proposals submitted to Land and Water Australia by CRC researchers.**

Duration: 3 years, starting March 2003. Total Budget: $0.99 million

Project 2E: Modulating daily flow duration series to reflect the impact of land-use change

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Several components of the CRC's Catchment Modelling Toolkit require an ability to specify how daily flows will change when catchment land-use is changed. For instance, our water allocation, water quality and flow-biota relationship models will all require the ability to forecast how daily flow series will change if we modify land-use.

The purpose of this project is to develop a simple method that can quantify how the daily flow duration series for a catchment will vary in response to a major change in land-use (eg. from agriculture to plantation). The method to be developed will link to available conceptual rainfall/runoff models such as AWBM, SIMHYD, IHACRES and SACRAMENTO.

Duration: 1 year, starting January 2003. Total Budget: $0.20 million

COOPERATIVE RESEARCH CENTRE FOR

CATCHMENT HYDROLOGY