LANDSCAPE LOGIC
LINKING LAND AND WATER MANAGEMENT TO RESOURCE CONDITION TARGETS

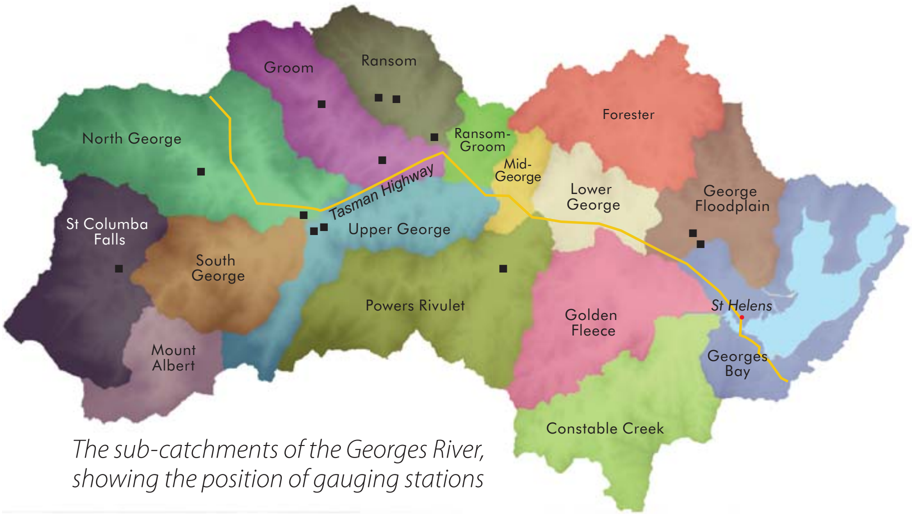
Fact sheet for managers and policy-makers #1
February 2010

Identifying sources of sediment and nutrients in the Georges River catchment, north-east Tasmania

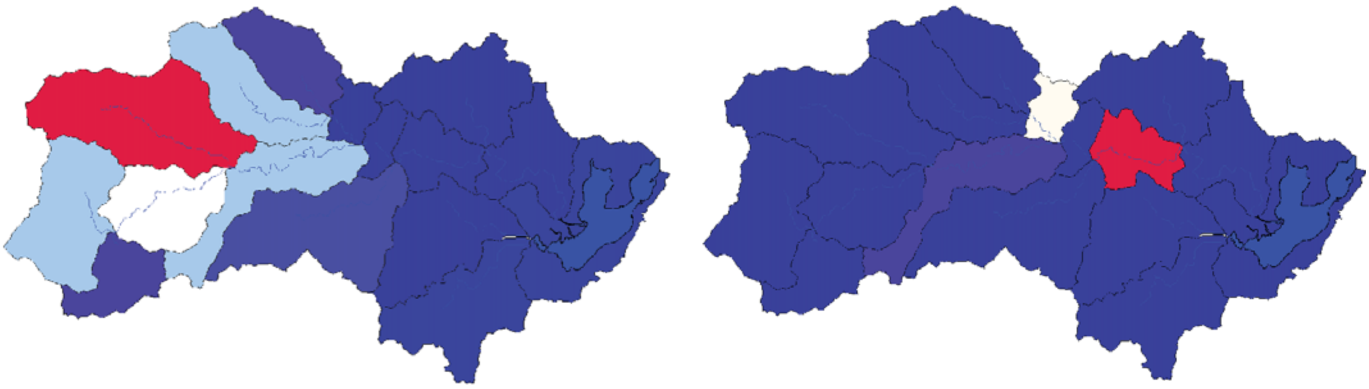
What we found

The model *CatchMODS* was used to identify the most likely sources of sediment and nutrient loads into the Georges River, and compare the effectiveness of different management options to reduce delivery to the Georges Bay estuary. Of the 15 sub-catchments contributing to the flow into Georges Bay, four were found to be the major contributors of sediment and nutrients based on slope, soil type, land use and rainfall. The North and South George sub-catchments were identified as the major sources of hill-slope erosion, contributing 23% and 11% respectively of total sediment load into Georges Bay. The Upper George sub-catchment contributed 12% of total sediment load from a combination of hill-slope and stream-bank erosion, while the Lower George sub-catchment contributed the highest levels of stream-bank erosion, amounting to 7% of total sediment load to the estuary. Overall it was estimated that hill-slope erosion contributes 83% of sediment load compared to 17% from stream-bank erosion.

Georges River near Binalong Road



The sub-catchments of the Georges River, showing the position of gauging stations



Left: Predicted sediment loads from hill slope erosion (t/yr) (red > 1,500 t/yr, white & blue < 1,000 t/yr).
Right: Predicted sediment loads from stream-bank erosion (t/yr), (red > 530 t/yr, white & blue < 500 t/yr).

Implications for managers

These findings suggest that the most cost-effective strategies to reduce the delivery of nutrient and sediment loadings to Georges Bay would be management of hill-slope erosion through changed land management or land use in the western parts of the catchment, and fencing and revegetation to reduce streambank erosion in the middle of the catchment.

For instance, if 5km of revegetation was carried out along riparian areas in poor condition across the whole catchment, the model suggests this would result in a 9.5% reduction in total phosphorus load to Georges Bay (from 5.50 to 4.98 tonnes per year). However, if the same 5km of riparian zone planting was more strategically divided amongst the North, South, Upper and Lower George and Ransom-Groom sub-catchments, the model suggests a 15% reduction in total phosphorus load into Bay could be achieved (from 5.50 to 4.72 tonnes per year).

How we did it

CatchMODS (The Catchment Scale Management of Diffuse Sources) is a spatially semi-distributed model that simulates the effects of different management actions on the delivery of sediment and nutrients to rivers, lakes and estuaries using a series of sub-models.

The hydrologic sub-model simulates daily stream flow using rainfall, temperature and topography. The sediment sub-model identifies critical sources of hill-slope, gully and stream-bank erosion using topography, soil and land-use mapping to produce an estimate of mean annual suspended sediment (SS). Nutrient sub-models estimate loads of particulate and dissolved nitrogen and phosphorous based on observed relationships between suspended sediment, nutrient concentrations and stream characteristics.

The model combines daily rainfall and evaporation data with flow and transport of sediments and nutrients simulated at stream reach and sub-catchment scales to give an estimate of the annual average nutrient and sediment loads at the end of the catchment. The economic sub-model uses the costs of intervention as fixed costs (riparian and gully zone revegetation, stream bank engineering and point source abatement), annual maintenance costs, and land use or land management change (change in gross margin in $/ha) to estimate return on investment in terms of reduced loads per dollar invested.

The model was run over a 49-year period to estimate steady state average flow and sediment and nutrient concentration in each sub-catchment to identify the most important sources of sediment and nutrients.

Observed and predicted flow, suspended sediment, nitrogen and phosphorous loads for the whole catchment and one sub-catchment.

Sub-catchment outlet	Variable	Observed	Predicted
Ransom River at Sweets Hill	Mean annual flow (ML/yr)	11,712	10,391
	Suspended sediment (t/yr)	na	344
	Total Nitrogen (t/yr)	4.77	5.46
	Total Phosphorus (t/yr)	0.16	0.24
George River at St Helens	Mean annual flow (ML/yr)	195,530	191,209
	Suspended sediment (t/yr)	na	7,356
	Total Nitrogen (t/yr)	101	108
	Total Phosphorus (t/yr)	5.76	5.50

Further information

A technical report describing this work can be found on the Landscape Logic website at: www.landscapelogic.org.au/publications/Technical_Reports/No_16_George_Water_Quality_model.pdf

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Landscape Logic is a research hub under the Commonwealth Environmental Research Facilities scheme, managed by the Department of Environment, Water Heritage and the Arts. It is a partnership between:
six regional organisations – the North Central, North East and Goulburn–Broken Catchment Management Authorities in Victoria and the North, South and Cradle Coast Natural Resource Management organisations in Tasmania;
five research institutions – University of Tasmania, Australian National University, RMIT University, Charles Sturt University and CSIRO; and
state land management agencies in Tasmania and Victoria – the Tasmanian Department of Primary Industries, Parks, Water & Environment, Forestry Tasmania and the Victorian Department of Sustainability & Environment.

Australian Government
Department of the Environment, Water, Heritage and the Arts