

Impacts of grazing land-use on river ecological conditions

What we found

The Tasmanian River Condition Bayesian Network (River BN) has been developed to explore the potential effects of land-use on river ecological condition. River ecological condition was assessed by considering the condition of macroinvertebrate communities and algae and these were then used to derive an Aquatic Life condition score based on the Tasmanian River Condition Index (TRCI).

The ecological condition of rivers was predicted to decline in catchments with a high proportion of grazing in the upstream catchment (Figure 1). A threshold was observed around 40% of catchment area under grazing. When more than half of the catchment was classified as grazed by domestic live-stock, the average predicted condition score was moderate to poor and the chances of experiencing very poor conditions increased to 1–5%.

Reduction in ecological condition was caused by an increase in the biomass and cover of algae, loss of diversity and shift in community composition of macroinvertebrates. These changes were associated with an increase in the amount of fine sediments in the substrate and nutrients in the water, as well as a decrease in the amount of shading from riparian vegetation.

Implications for managers

Grazing can have negative impacts on the ecological condition of Tasmanian rivers, particularly when

greater than 40–50% of the catchment is classified as grazing. These changes may be caused by grazing *per se*, or by changes in riparian vegetation condition associated with grazing (e.g. type and extent of native vegetation).

In Tasmania, grazing is also associated with poor riparian vegetation condition (Figure 2) which can lead to bank erosion, high in-stream temperatures and high algal production. Poor quality riparian zones may also exacerbate the effects of grazing by providing a direct pathway for nutrients and sediments to the river via surface water run-off.

Methods for managing river condition in grazed landscapes need to focus on controlling the amount of



Black River – a north-west Tasmanian river with a catchment dominated by production forestry and good riparian vegetation condition.

fine sediment, nutrients and light entering the river. The River BN can be used to explore how varying these factors may improve river ecological condition.

Average Ecological Condition Score

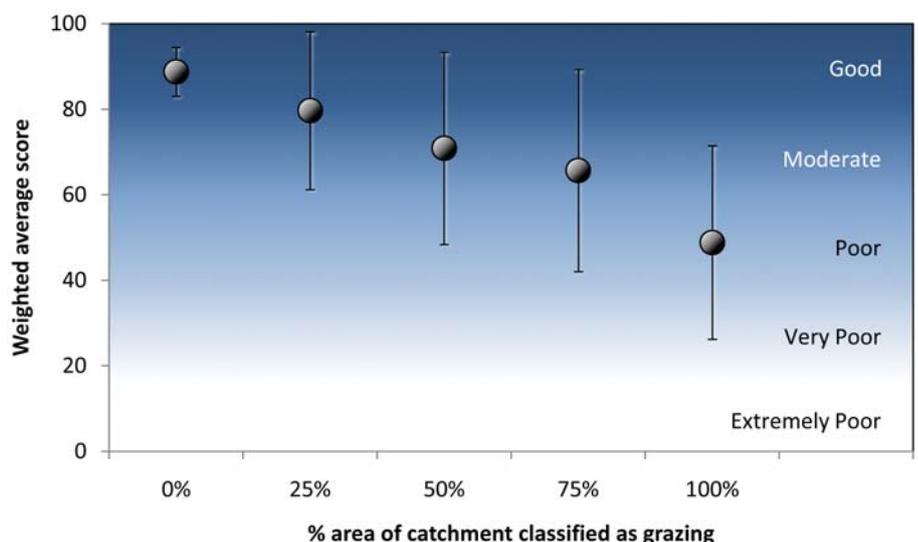


Figure 1 Changes in the TRCI river ecological condition score under different grazing scenarios for a typical catchment in northern Tasmania. Mean and standard deviation of scores are shown, along with impairment band labels, derived using the River BN.

The River BN – evidence and use

The River BN is a decision support tool that allows users to model changes in river ecological condition under different environmental management scenarios. The model is based on the strongest evidence available – a wide range of ecological and environmental data from Tasmanian rivers, supported by expert opinion.

A number of different land-use scenarios were entered into the River BN to examine the effects of land-use on the ecology of a typical Tasmanian lowland river. Managers can use it to further explore the combined effects in river health of changing the land use mix at catchment scale, changing riparian vegetation condition at catchment and reach scale, and also changing the relative loads of fine sediment and nutrients and the level of water use.

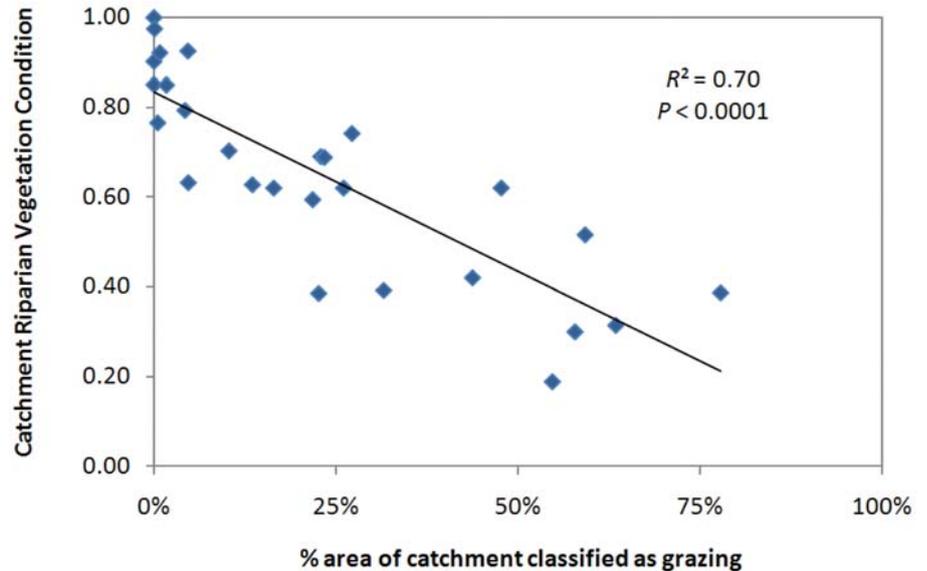


Figure 2. Relationship between the proportion of grazing land-use in a river catchment and riparian vegetation condition for 27 river catchments in northern Tasmania. Riparian vegetation condition is the proportion of native vegetation in the rivers riparian zone and was extracted from the CFEV database (DPIWE 2005).

These can be done singly or in combination, and for a variety of catchment and river site contexts within Tasmania.

The tool can be accessed via the Landscape Logic product library

(www.landscapellogicproducts.org.au).

For more information on scenario building and analysis in the River BN see The River BN Scenario Manual in the Landscape Logic Product Library (www.landscapellogicproducts.org.au) or contact the authors.



Edith Creek – a north-west Tasmanian river with a catchment dominated by grazing and very poor to moderate riparian vegetation condition.

The authors

Dr Regina Magierowski
reginam@utas.edu.au

Adj. Prof Peter Davies -
p.e.davies@utas.edu.au

Dr Steve Read
steve.read@forestrytas.com.au

For more information contact
Prof Ted Lefroy, Director, Landscape Logic
(03) 6226 2626 • 0408 180 567
ted.lefroy@utas.edu.au

Landscape Logic - www.landscapellogicproducts.org.au

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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.



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