National Environmental Research Program

LANDSCAPES & POLICY *hub*

Fragments of native vegetation in the Tasmanian Midlands. As habitats become increasingly fragmented, the importance of fine-scale landscape features, such as paddock trees and strips of roadside vegetation, are becoming more apparent.

Photo: Suze Gaynor

Planning wildlife corridors at the regional scale: a tool for conservation planners

Using the GAP CLoSR decision-support tool, conservation planners throughout Australia can:

- plan connectivity of fragmented landscapes at the regional scale while taking into account small, but potentially important, landscape features such as paddock trees and strips of roadside vegetation,
- include property/site-scale connectivity implications in regional-scale biodiversity assessments,
- compare the connectivity implications of multiple regional-scale plans and strategies.

Research summary

As habitats become increasingly fragmented, the importance of fine-scale landscape features, such as paddock trees and strips of roadside vegetation, are becoming more apparent. These features can act as stepping stones for birds and animals. Importantly, models for planning regional-scale connectivity do not represent fine-scale landscape features.

We developed the GAP CLoSR decision-support tool to overcome this limitation. Conservation planners can use it to plan connectivity of fragmented landscapes at the regional scale while taking into account the connectivity implications of fine-scale landscape features. They can also use the tool to compare the connectivity implications of multiple regional-scale plans and strategies.

Animals and plants need room to move

Whether to disperse their seed or to travel to a breeding site, all species need room to move in the landscape.

As natural landscapes become more fragmented due to land clearing, the populations of native plants and animals that the remaining patches of habitat can support become smaller and more isolated. Small, isolated populations are less viable, which increases the risk of the species becoming locally extinct.

Small features are important for connectivity

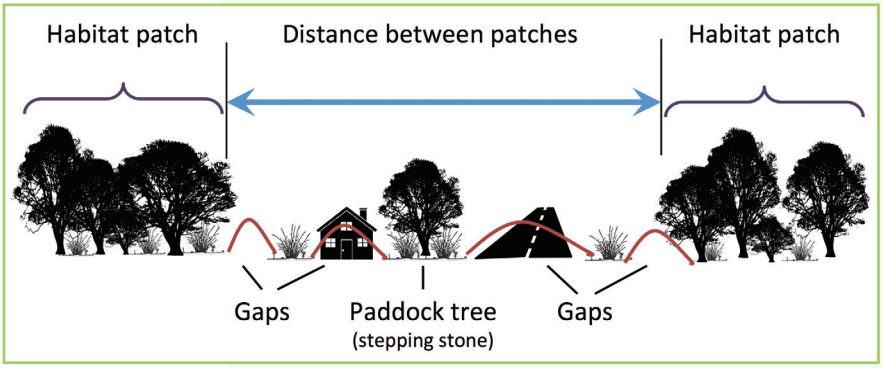
To give plants and animals more room to move in a fragmented landscape, conservation managers often focus on identifying, conserving and restoring patches of habitat that increase connectivity.

Yet, even with wildlife corridors in place, a species may be unable to travel across a gap in the vegetation. Some woodland birds, for example, will readily fly up to 100 metres from one group of scattered trees to another on farmland, but no further. Increasingly, we are observing that very small strips of roadside vegetation and small, isolated features such as scattered paddock trees, shrubs and rocky outcrops, or small clusters of these features, can function as stepping stones for some species.

The limitations of current connectivity models

The models available to conservation planners for planning connectivity over large geographic areas have three limitations:

- Models are unable to represent fine-scale features such as paddock trees which, apart from being valuable in their own right, are the necessary stepping stones that allow some species to cross gaps within and between patches of habitat.
- Often, models do not represent movement thresholds for species.
- Current methods are too complex and practically impossible to implement within a reasonable time frame and at a reasonable cost for land use planning.



Movement dynamics. Every species has a distance threshold beyond which it will not move. For example, some woodland birds will fly over open ground for a maximum of 100 metres. A feature such as a paddock tree can act as a stepping stone for a species to reach a patch of habitat within its threshold, while gaps in the vegetation caused by roads, intensive agriculture, cities and towns, for example, may prevent a species from reaching its threshold.

What can GAP CLoSR do?

We designed GAP CLoSR (General Approach to Planning Connectivity from Local Scales to Regional) to overcome the limitations of current connectivity models. The GIS-based framework and tool allow conservation planners across Australia to plan wildlife corridors at the regional scale while taking into account the movement characteristics of species, such as the greatest distance of open ground animals will cross and the longest distance they will move in a connected landscape.

GAP CLoSR can:

- identify the most important patches and appropriate locations for wildlife corridors,
- assess, quantitatively, the impact of land-use change, such as urbanisation, on connectivity at the local and regional scale for a range of planning scenarios,
- identify the optimal pathway between habitat patches based on the location of fine-scale connectivity elements (for example, scattered trees) and barriers such as cities and towns,
- characterise how species move between patches and identify pinch points where they have few options for moving between patches.

How GAP CLoSR works

We designed GAP CLoSR to be readily applied by natural resource managers, consultants, and conservation planners in both government and non-government agencies. It runs on a standard desktop computer using readily available GIS software and spatial data (Graphab and Circuitscape).

The tool comes with a six-step framework to guide planners through the modelling process.

Planners first populate the model with data about the region's species, including their movement thresholds, and data about the fine-scale connectivity features of the landscape which can be derived from satellite data.

The tool rescales the fine-scale data to a coarser resolution, preserving the species' movement dynamics and thresholds, and then builds regional- and local-scale connectivity models.

The outputs support regional decision-making about where to focus efforts to manage and restore connectivity, as well as local decision-making about how best to support and improve connectivity in priority areas.

Lower Hunter and Tasmanian Midlands case studies

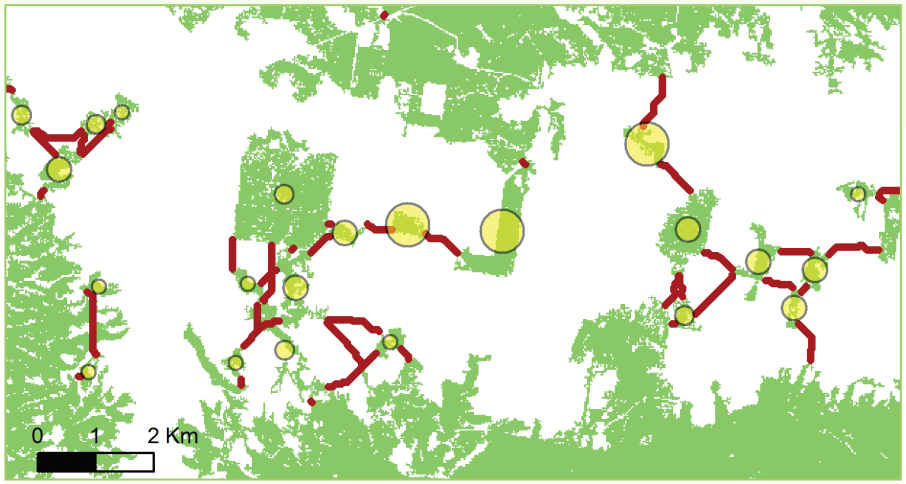
We trialled GAP CLoSR in the Lower Hunter region of New South Wales and in the Tasmanian Midlands.

In the Lower Hunter, we mapped connectivity between patches of woody vegetation. Our analysis showed that most of the region's native vegetation is confined to two large groups of patches, which are isolated from each other.

In the Tasmanian Midlands, we identified groups of species with similar dispersal and habitat characteristics and identified which of these groups had high or low connectivity across the region according to these characteristics.

For both regions, we identified areas where protecting patches of vegetation, managing scattered trees and restoring connectivity will best contribute to the overall connectivity of the region. We also produced a series of maps identifying habitat patches that are important as stepping stones and critical for preserving connectivity across the region.

Planners can use these results to guide them in selecting the most promising locations to restore connectivity and which species to target in order to build resilience to changes in land use and climate.



GAP CLoSR map output example. The red lines indicate the optimal pathways between habitat patches (green). The relative size of the circles at the centre of the patches represents the importance of those patches for connectivity.

Where to from here?

The GAP CLoSR tool and its open-source code are free to download from: http://www.nerplandscapes.edu.au/GAP_CLoSR

In December 2014, we are training land-use planners from the Tasmanian Government Department of Primary Industries, Parks, Water and Environment and from non-government agencies such as the Tasmanian Land Conservancy and Bush Heritage Australia in how to use GAP CLoSR.

Who are the researchers?

Dr Alex Lechner

Alex is a multidisciplinary researcher at the University of Tasmania, with skills and experience in applying spatial analyses to ecological problems.

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Further reading

Lechner AM, Brown G & Raymond C (2015) Modelling the impact of future development and public conservation on landscape connectivity for conservation planning. *Landscape Ecology*. April 2015, Volume 30, Issue 4, pp 699-713. doi: 10.1007/s10980-015-0153-0

Lechner AM, Doerr V, Harris RMB, Doerr E & Lefroy T (in press) A framework for multi-scale connectivity modelling incorporating fine-scale dispersal behaviour. *Landscape and Urban Planning*.

Lechner AM & Lefroy EC (2014) General Approach to Planning Connectivity from Local Scales to Regional (GAP CLoSR): combining multi-criteria analysis and connectivity science to enhance conservation outcomes at regional scale in the Lower Hunter. University of Tasmania, Hobart, Tasmania.

About the NERP Landscapes and Policy Hub

The Landscapes and Policy Hub is one of five research hubs funded by the National Environmental Research Program (NERP) for four years (2011–2014) to study biodiversity conservation.

We integrate ecology and social science to provide guidance for policymakers on planning and managing biodiversity at a regional scale. We develop tools, techniques and policy options to integrate biodiversity into regional-scale planning.

The University of Tasmania hosts the hub.

www.nerplandscapes.edu.au

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