

Reserves are not enough to conserve biodiversity

Rapid urbanisation in the Perth and Peel region of Western Australia is fragmenting the natural landscape causing significant habitat loss, endangering the area's unique biodiversity. To sustain biodiversity, native species need to be able to move between remaining sources of food and shelter to maintain healthy populations. The distance wildlife or plant seeds can travel through an urban matrix differs between species. Urban infrastructure can be hostile, exposing species to hazards such as traffic and predation. However urban design can enhance support of biodiversity through urban greening and especially, by creating linkages between habitats.

Aims

1. To estimate the current degree of connectivity between protected areas (wetlands and bushlands) in the Perth and Peel region; and
2. To investigate the most effective placement of ecological linkages to create a connectivity network within the Perth and Peel region.



At 50m

Connectivity between habitats is poor



At 500m

Rivers and estuaries play an important role in connecting the landscape

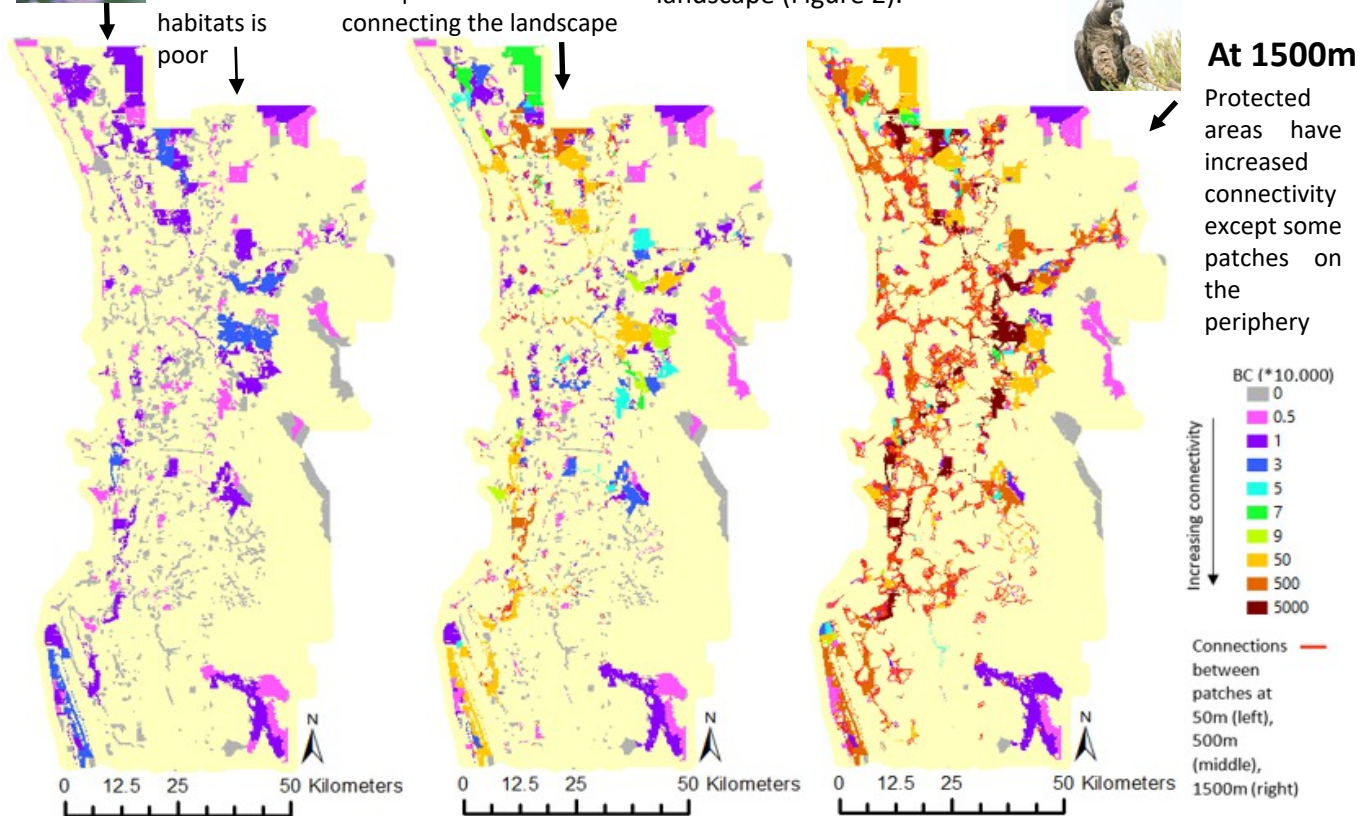


Figure 1: The individual role of each protected area in enabling species movement from one protected area to another based on the number of shortest paths that pass through an individual protected area (Betweenness Centrality, BC). This is shown at the different ecological distance thresholds species (as illustrated by images) can travel including 50m (left), 500m (centre) and 1500m (right). The grey, pink and purple protected areas have the least number of paths connecting them to other protected areas, while the orange and red protected areas have the most.

Methods

The degree of connectivity was assessed for a range of distances that encompassed those that different species are able to traverse. (50, 100, 300, 500, 1000 and 1500 metres) (Figure 1). The placement of ecological linkages considered the opportunities and constraints of the current land use and ecological characteristics such as distance and direction of species dispersal. A computer model based on least-cost principles was used to identify paths between protected areas that pose the least risk to species during movement. Results of the least-cost path modelling were compared with the findings of previous studies on ecological linkages in the Perth and Peel region, showing that improving connectivity between protected areas is still feasible in the urbanised landscape (Figure 2).

Key results

- Literature review demonstrated the significant differences in the dispersal abilities of Australian plants and animals, with a reported average distance of 100m.
- Connectivity for most local plant and animal species is poor (Figure 1).
- Without intervention, biodiversity in the Perth and Peel will be reduced in favour of species that can move greater distances
- Bush Forever sites play a pivotal role in connecting protected areas, by improving the number of protected areas connected to another by 25% at 50m, and by 60% at 1000m.
- Least-cost path (LCP) modelling indicates places to break barriers such as roads, enhance green spaces and protect native vegetation.
- The least-cost paths in residential and industrial areas rely heavily on small parks, bike routes, vegetated gardens, and verges (Figure 2).
- Paths between protected areas in less urbanised regions rely on natural areas, vegetated gardens and roadsides (Figure 2).
- Marinas form barriers for species movement along the coast.
- Paths between protected areas identified by the least-cost modelling follow a similar trend or directions to ecological linkages identified in previous studies but identify more specific routes or alternative routes where the landscape has changed due to urban development, and opportunities still exist.

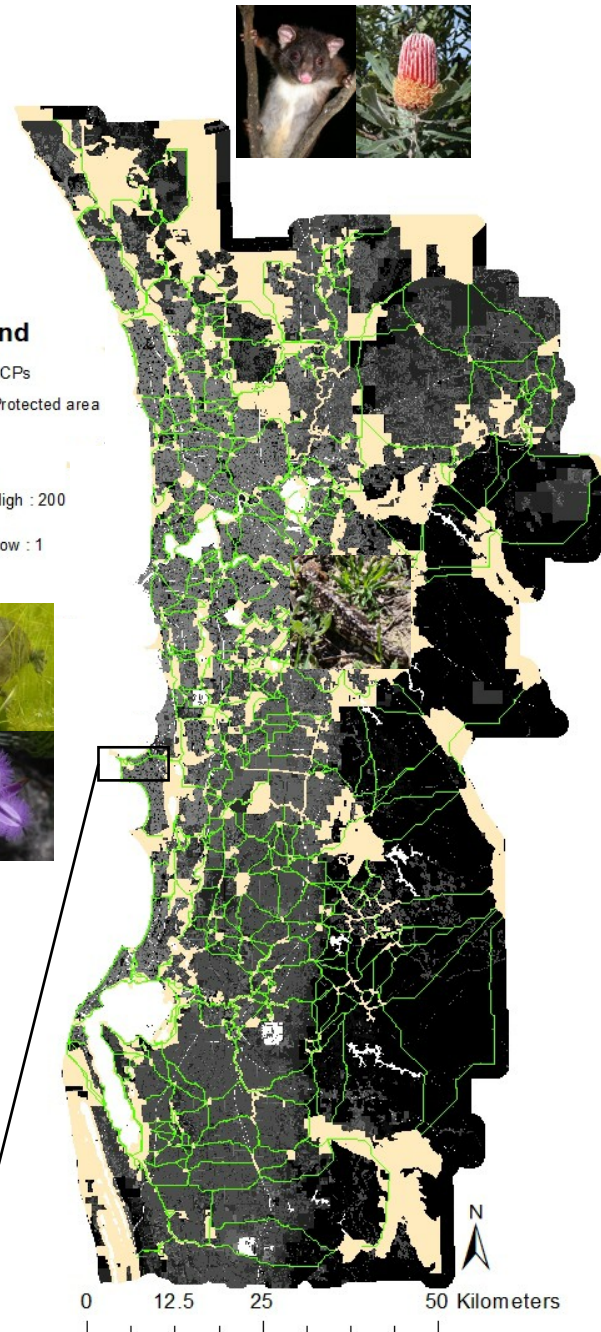
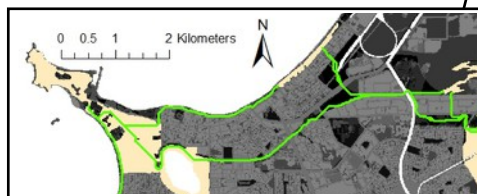


Figure 2. The least-cost path results between all protected areas, with 1269 LCP linkages. The surrounding images showing some of the fauna and flora that will benefit from these linkages. The insert shows the least-cost paths using vegetated small parks and roads to connect protected areas in Rockingham.

Discussion

To conserve biodiversity in urban environments, land use planners and managers need to not only protect areas of habitat, but provide opportunities for species to move between them. The study demonstrated the need for greater protection of natural protected areas in the Perth and Peel to retain biodiversity, and the urban greening of verges, gardens, underpasses and other infrastructure to facilitate fauna and flora movement. For more information see the full report at <https://researchrepository.murdoch.edu.au/id/eprint/59474/>.

Photo credits

Bee – Museum of Western Australia
Peacock spider – Paul Irvine
Tuart- Renata Zelinova
Quenda – Simon Cherriman
Chuditch- Perth Zoo

Carnaby- Sam Rycken
Possum- Adrian Wayne/ DBCA
Banksia- Joe Fontaine
Turtle- Christina Myktyuik
Fringe lily– Joe Fontaine

Acknowledgements

Supervisors: Dr Margaret Andrew,
Dr Jane Chambers, Renata
Zelinova

Data: Department of Planning
Lands and Heritage, and Publicly
accessible spatial data resources