



## New Research

# Large-scale restoration experiment pioneers management of grazing impact on insect diversity

### This research is important

- Box-gum grassy woodlands once covered several million hectares in eastern Australia. Today only 8% of this type of woodland remain, making it one of the most endangered ecological communities in Australia.
- A key threatening process in these box-gum grassy woodlands is overgrazing by herbivores, including kangaroos, which can impact negatively on the grass layer, and therefore affect their plant and animal species.
- No previous research has been undertaken that experimentally tests the effect of kangaroo grazing on insect diversity in box-gum grassy woodlands. Insects are an important part of the ecosystem providing many important functions, such as a food source for other animals.

### Restoration experiment examines the effects of kangaroo grazing on the insect community

- The Mulligans Flat - Goorooyaroo Woodland Experiment, near Canberra, has been designed to investigate ways of restoring biodiversity in box-gum grassy woodlands.
- This is the first research in Australia to experimentally manipulate kangaroo grazing with large-scale enclosure fences in conjunction with the addition of logs to increase ground-layer structure at small scales.
- New research has shown that high levels of kangaroo grazing can have negative effects on beetle abundance and species richness. Conversely, the addition of logs can have positive effects on beetle diversity by acting as refuges for the insects in grasslands with high grazing levels (from our research, recently published in *Journal of Applied Ecology*).
- Beetles are an excellent indicator of broader insect species richness in the ecosystem. The results of this experiment suggest that fencing and the addition of logs is important for managing the impact of kangaroo grazing on insect diversity in box-gum grassy woodlands.



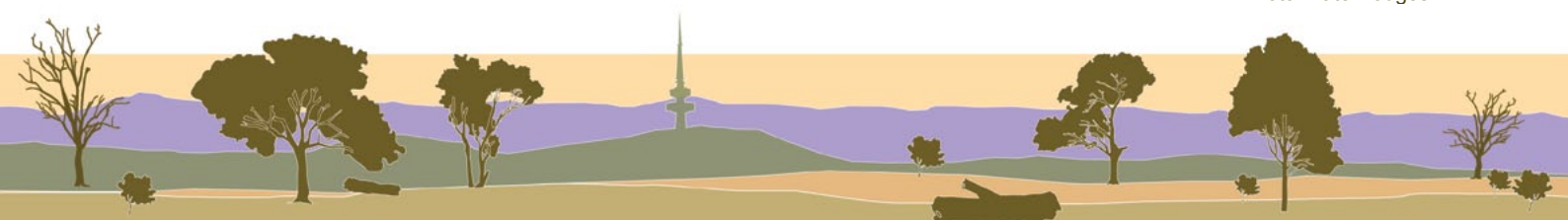
Eastern grey kangaroos (*Macropus giganteus*) can reach high densities in box-gum grassy woodlands and impact on grassland biomass and animals.

Photo: Jenny Newport



Tall fences were used to exclude kangaroos and decrease grazing levels.

Photo: Kate Hodges



## Added logs contribute to the increase in diversity and abundance of beetles.

- Beetles were sampled across 48 one-hectare sites in 2008 and 2009 to look at how they changed in diversity after the fences and logs were added in the reserve in 2007.
- Across the one-hectare sites, significant negative effects of grazing and positive effects of logs on beetle abundance and species richness were detected (top right figure).
- Beetles adjacent to experimental logs showed an increase in abundance and species richness compared with beetles sampled from open ground, indicating logs are acting as microhabitat buffers from grazing (bottom right figure).
- These results show that fencing and log addition can help mitigate against the impact of kangaroo overgrazing on insect diversity in grassy woodlands, at different spatial scales.



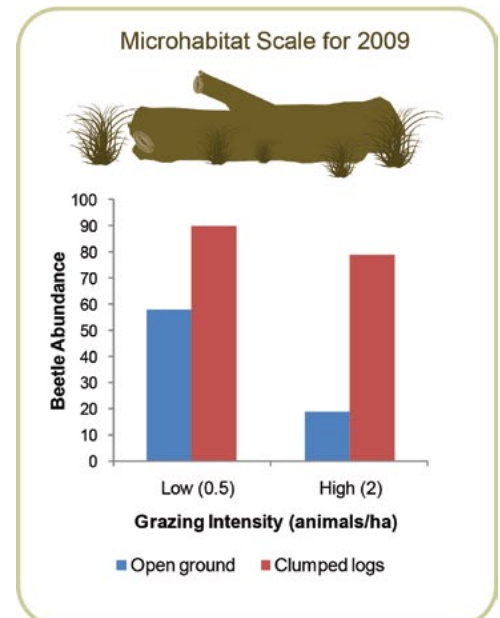
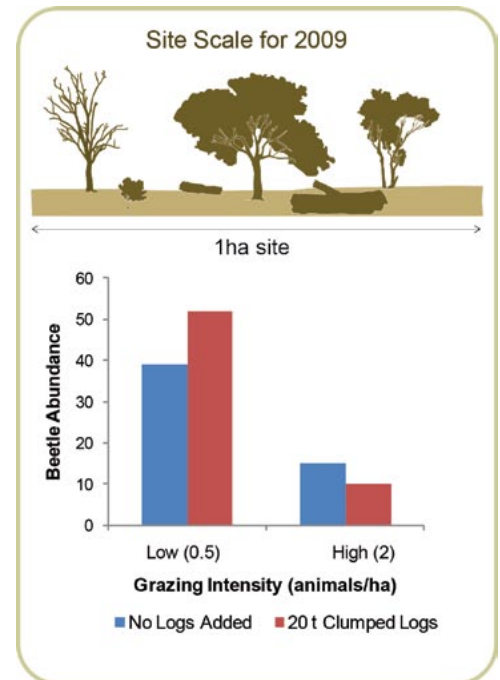
## Conservation Implications

This research has demonstrated how grazing when at high levels can have a negative effect on insect diversity, but that reducing grazing levels and adding logs can have positive effects on insect diversity.

Practical implications include:

- Lowering the density of kangaroos to 0.5 animals/ha in an area promotes an increase in grass biomass and plant habitat structure.
- Logs can help reduce the negative effects of overgrazing by kangaroos in box-gum grassy woodlands.
- Logs in clumped arrangements had the largest positive effect on beetles when combined with lowered grazing levels
- Logs, including fallen trees and branches, increase habitat structure and can provide shelter for beetles.

The combination of reduced grazing by kangaroos and increased habitat diversity through the addition of logs - can assist restoration and structure of the grassy layer of woodlands which also benefits insect diversity.



## Where to from here?

Research will continue on the effects of grazing and addition of logs on other insect groups, small mammals and reptiles. Future research will also look at the interactions between grazing and fire.

## Published Research

Barton, P.S., Manning, A.D., Gibb, H., Wood, J.T., Lindenmayer, D.B. & Cunningham, S.A. (2011) Experimental reduction of native vertebrate grazing and addition of logs benefits beetle diversity at multiple scales. *Journal of Applied Ecology*. doi: 10.1111/j.1365-2664.2011.01994.x

The Mulligans Flat–Goorooyarroo Woodland Experiment is a joint partnership between The Australian National University, the ACT Government and CSIRO.



The Mulligans Flat - Goorooyarroo Woodland Experiment

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