

# The Future



Brown Treecreeper  
Photo: Helen Fallow



Tasmanian Bettong and her joey  
Photo: Dave Watts

- In 2009, Brown Treecreepers (*Climacteris picumnus*) were reintroduced into the two Nature reserves, and are being studied by a PhD researcher.
- There will be ongoing monitoring of the effects of restoration treatments on biodiversity with results used to inform adaptive management of woodlands in the ACT and beyond.
- Major Australian Research Council grant has recently been secured to support research on the reintroduction of the Tasmanian Bettong (*Bettongia gaimardi*) to Mulligans Flat Woodland Sanctuary. Tasmanian Bettongs are thought to be 'ecosystem engineers' and are known to create up to 3000 diggings per ha, this is expected to have profound effects on the soil, water infiltration, seed germination and litter accumulation in the reserve. Using our experimental framework, we will examine the value of reintroducing this important species as a restoration tool in box-gum grassy woodlands.
- Future experimental reintroductions could also include species, such as the New Holland Mouse (*Pseudomys novaehollandiae*) and the Bush-stone Curlew (*Burhinus grallarius*).
- A key outcome from this ongoing experiment is expected to be improved understanding of the techniques that can be used by public and private land managers to manage woodlands to enhance their conservation value.

## Find out more .....

Manning, A. D., Wood, J. T., Cunningham, R. B., McIntyre, S., Shorthouse, D. J., Gordon, I. J. and Lindenmayer, D. B. (2011) Integrating research and restoration: the establishment of a long-term woodland experiment in south-eastern Australia. *Australian Zoologist* 35(3) 633-648.

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[http://people.anu.edu.au/adrian.manning/Mulligans\\_Flat\\_Goorooyarroo.html](http://people.anu.edu.au/adrian.manning/Mulligans_Flat_Goorooyarroo.html)

The Mulligans Flat - Goorooyarroo Woodland Experiment is a partnership between The Australian National University, the ACT Government and CSIRO. It provides a rare opportunity to restore the whole box-gum grassy woodland ecosystem within a rigorous experimental framework. PhD students from the Fenner School of Environment and Society, ANU and researchers from other research organisations are collaborating with us to help build a better understanding of box-gum grassy woodlands.



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## Mulligans Flat - Goorooyarroo Woodland Experiment

Integrating Research & Restoration



## Integrating research and ecosystem restoration for woodland conservation.

This project aims to understand ways of restoring the structure and function of temperate woodlands to increase biodiversity. In establishing a designed restoration experiment, our intention is to support the managers in their work to conserve woodlands and for it to become a long-term ecological research site and an 'outdoor laboratory' for ecological restoration research, and community and student learning.



Photo: Adrian Manning

## Why was the Mulligans Flat - Goorooyarroo Woodland Experiment established?

Restoration experiments that manipulate ecosystems can inform us about cause and effect, and guide adaptive management.

Long-term ecological research is recognised globally as critical for understanding environmental change. However, in Australia, there has been a lack of long-term ecological studies, with few running more than 25 years and none of those having replicated plots from different experimental treatments.

There is a critical need for long-term experiments in ecological restoration to inform conservation decision making, particularly in highly modified or endangered ecological communities.

## Yellow Box-Blakely's Red Gum Grassy Woodlands

Yellow box-Blakely's red gum (box-gum) grassy woodland is an ecological community dominated by mixtures of yellow box, *Eucalyptus melliodora*, and Blakely's red gum, *Eucalyptus blakelyi*. In combination with white box (*Eucalyptus albens*), this community once occurred over an extensive area of south-eastern Australia, including the western slopes and tablelands of the Great Dividing Range, southern Queensland, western New South Wales, the Australian Capital Territory (ACT) and Victoria.

National Conservation Status: Critically Endangered

Since European settlement, 92% of box-gum grassy woodland has been cleared (over 5 million hectares) and consequently, it is recognised as a critically endangered ecological community.



## A Highly Modified, Endangered Ecosystem

Box-gum woodlands are a type of temperate woodland and are a highly modified endangered ecosystem. A range of human-induced disturbances have lead to a drastic reduction in the extent and condition of temperate woodland ecosystems.

### Threatening Processes

- direct vegetation clearing
- vegetation modification and fragmentation
- changes in grazing intensity
- removal of fallen timber and dead trees (often for firewood)
- inappropriate revegetation activities
- physical disturbance (tidying up, cultivation, development)
- human-induced climate change
- addition of fertilisers
- introduction of invasive exotic pest animals and plants

### Outcomes

- changed soil health and nutrient cycling
- changes in levels of tree regeneration
- loss of understorey vegetation
- weed invasion
- declining tree health
- changed hydrology
- elevated salinity
- changed ground flora composition
- decline or extinction of native fauna, including critically important 'ecosystem engineers'

## What is the Mulligans Flat - Goorooyarroo Woodland Experiment?

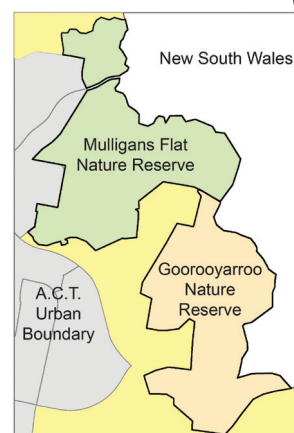


Photo: Nicki Munro

Established in 2004, the Mulligans Flat - Goorooyarroo Woodland Experiment is located in two adjacent nature reserves in north-east ACT. The experiment covers an area totalling 1494ha, of this 1210ha is yellow box - Blakely's red gum grassy woodland. This is the largest and most intact example of this type of woodland in the ACT.

The partnership between The Australian National University and ACT Government provides a unique opportunity for researchers to work together, to work towards a whole-ecosystem understanding of box-gum grassy woodland. Since the experiment started many more collaborators, including CSIRO, have joined the research program, both from Australia and overseas.

In 2008, the ACT Government built a 11.5km feral animal-proof fence around Mulligans Flat to allow removal and control of feral cats, foxes, rabbits and hares and the reintroduction of locally extinct species.

The 'Mulligans Flat Woodland Sanctuary' provides a valuable opportunity to experimentally reintroduce lost species, observe effects of the experimental management in the absence of feral animals and understand the effects of the reintroduction of lost ecosystem engineers.

### What makes Mulligans Flat - Goorooyarroo Nature Reserves suitable for research?

The Mulligans Flat - Goorooyarroo Nature Reserves have several unique features that make them suited for research:

- they support one of the most extensive remaining areas of publicly managed box-gum grassy woodlands in Australia
- there is one long-term owner and land manager - the ACT Government
- the reserves are situated near a large centre of population (Canberra), and universities, schools and research institutions, which means they are especially suitable as an 'outdoor laboratory' for research, teaching and learning at all levels
- there is a well-educated local community and special interest groups that actively support woodland conservation and restoration activities

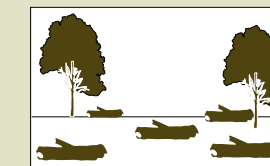
## Experimental Design

- The experiment consists of 96 experimental plots (1ha each) with 24 polygons in Mulligans Flat and Goorooyarroo Nature Reserves (12 each) based on four different vegetation types.
- A set of key ecosystem manipulations or 'treatments' have been chosen to investigate how to reverse the decline in the biodiversity of these woodlands. These include the addition of logs, prescribed burning and exclusion of kangaroos and feral predators.
- In 2007, a total of 2000 tonnes of logs was added to 72 experimental plots. The diagrams to the right shows the different treatments applied to the sites.
- A range of response organisms (eg. birds, small mammals, reptiles, invertebrates and plants) are to be monitored to examine the effects of the ecosystem manipulations on the structure, composition, ecological processes and biodiversity in the reserve.
- The figure below shows some of the woodland elements that are currently underway to examine the effects of the ecosystem manipulations, these are:

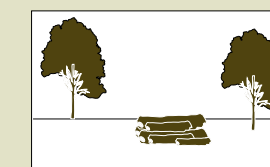
- |                  |  |
|------------------|--|
| 1. Dead wood     | 7. Bettong reintroduction                        |
| 2. Birds         | 8. Brown tree creeper reintroduction             |
| 3. Invertebrates | 9. Kangaroos                                     |
| 4. Vegetation    | 10. Small mammals                                |
| 5. Reptiles      | 11. Leaf litter, soils and soil microbes         |
| 6. Fungi         | 12. Exclusion of foxes, feral cats and wild dogs |



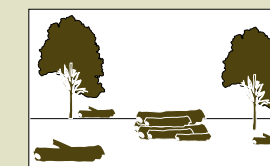
No Added Logs - Control



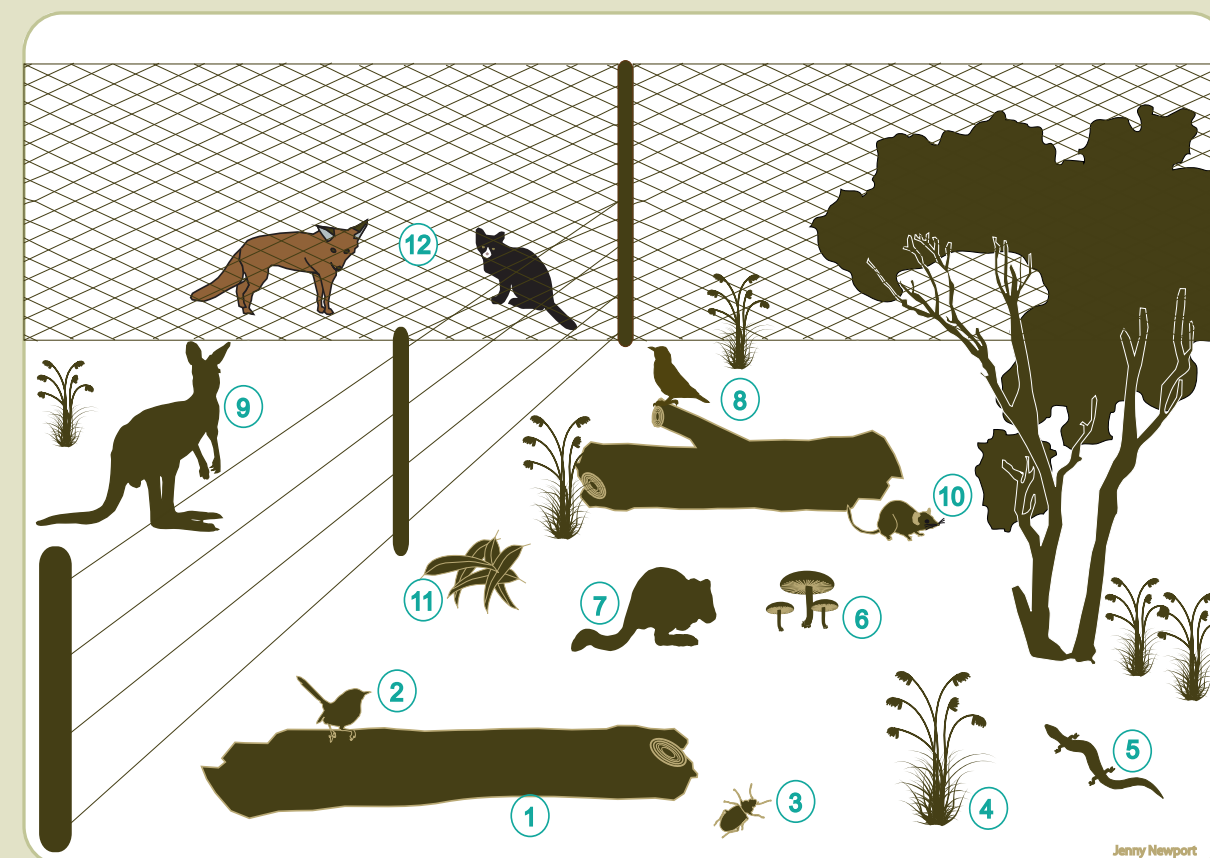
Dispersed Logs



Clumped Logs



Dispersed and Clumped Logs



Jenny Newport