

Kangaroo Grazing and effects of exclusion on pasture growth in the Aranda Snow Gums Heritage Site.

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The Snow Gums Heritage area below Aranda Bushland is a frost-hollow grassland in grassy woodland. Centrally there are a band of Snow Gums, and peripherally there are sparse old Yellow Box and Blakely's Red Gum, with Candle Bark and Apple Box. Walking in the area disturbs groups of 10-30 Eastern Grey kangaroos, and there will be perhaps 4 or 5 groups visible from a central point in the evening. They graze each day in the Snow Gums and adjoining areas, and rest under the eucalypts.

It has been clear to us from the time when we began planting *Themida* (kangaroo grass) to try and improve the grass composition in the Snow Gums area, that we had formidable opposition. The 'roos systematically pulled out all our plants, ate the leaves and rejected the roots. Providing protection was not much help, they still ended up eating all our planted grass!

To try and get a better understanding of the issues we did two activities in conjunction with Parks staff. The first was to carry out two sweep-counts of 'roos. Our area is bounded by three high-speed roads and the suburb. We began the sweep from William Hovell Drive to the south, and proceeded north slowly in an open extended line of observers. We counted the 'roos coming back past the line. In a discrete area like ours the only 'roos that can be missed had to cross the roads, and Canberra Nature Parks rangers were patrolling the roads to turn them back. I did not hear of any 'roos that tried to cross, which fits with the concept that they are very local and territorial. Road deaths of 'roos on our high speed roads are relatively few considering the abundance of animals.

We counted 163 Eastern Grey 'roos on 4th Sept 2005, and 196 on 21st July 2010 in the whole of Aranda Bushland, plus some swamp wallabies. Sweep counts were also done in 2017 and 2018 by Parks, each time counting over 400 'roos. The rainfall in 2010 was 544mm. The rainfall pattern from 2014 to 2016 was an average of nearly 700mm in Aranda, with good grass and forb growth, which may account for the greater prolificacy of the 'roos over these years. Clearly the population has doubled, without death rates matching birth rates.

The Eastern Grey female breeds from about 2 years of age and lives to be 10 to 15 years old. About 80-90% of adult females have viable young every year. The sex ratio is heavily in favour of females, with only a small proportion of males becoming breeding animals. In 400 'roos, we can assume that about 300 are breeding females, and a large proportion of the rest are juvenile males and females. On this basis the birth rate in our current population is around 250 young 'roos each year, and in a stable population birth rate equals death rate. In Eastern Grey 'roos death rates peak sharply at around 2 years of age in late winter and spring (For background see ACT Kangaroo Management Plan, 2010).

The cause of this high death rate is a combination of physiology, climate/feed and intestinal parasites. A breeding female with a good diet will have a very young joey on one teat, and a pouch young feeding from another. She may even have a dormant blastocyst waiting in her uterus. The older young remains feeding from the mother's

teat until about 18 months of age, as well as eating grass. From 18 months the young are entirely dependant on grazing, and have a light body frame and large surface-area to body weight ratio. This means that their energy demand is high. When this coincides with late winter/early spring at 2 years of age their survival depends on good feed. In the Snow Gums area there is almost no feed in late winter and ground temperature reaches minus 10 C on cold nights. Most of the young die of starvation and probably parasite infection, particularly males.

The dead are rapidly eaten by foxes and crows, and occasional wedge-tailed eagles, who are also very hungry at this time of year. Walking round the area shows numerous fresh 'roo bones scattered in the grasslands and adjoining woodland.

Aranda Bushland has, until 2018, never been a site for culling of kangaroos, so the events which we have described are simply the natural consequences of high population density and seasonal variations in food scarcity. The populations of 'roos in ACT Parks vary from about 5 per ha to below 1 per ha. . The overall area of this grassland and grassy woodland is about 50 ha, with the Aranda Bushland itself a further 120ha. of dry sclerophyll forest.

If we average our current 'roo numbers, there are about 2 per ha over the whole area, but of the whole area only 50ha is grassy woodland or grassland, and of that about 20ha is top quality 'roo grazing. Even in the frost hollow itself much land is occupied by sedges which are not palatable to 'roos. This means about 20 'roos per ha grazing on the top palatability pastures, and 8 per ha overall in the grassy locations. Rainfall will obviously affect vegetation growth and hence 'roo survival, and the higher rainfall during the last five years has coincided with a doubling of the 'roo population. For the last 9 months rainfall has been exceptionally low, at 231mm.

To see just what impact this grazing has on our grasslands, in June 2010 Dr. Don Fletcher and Ms Claire Wimpenny with ourselves and other Friends of Aranda Bushland members, Jim Arnold and Roy McAndrew, set up five pairs of cylindrical exclosures, one of each pair to allow rabbits and exclude roos and the other to exclude both. The open mesh hingejoint exclosures which allow rabbits to graze were damaged by 'roos pushing their heads through the mesh almost immediately, but the weldmesh exclosures keeping both species out are still working well in 2018.

The cylindrical exclosures and nearby control areas were photographed in August 2011, November 2011, March 2012 and August 2013. The five sites are located in quite different areas of the rural lease and Snow Gums grassland.

Sites 1 and 2 are the most western, closer to Bindubi St, set up in the rural lease with permission from Neville Stuart, the lessee. Site 1 (Photo 1) understory is largely *Phalaris* dominated, and has not been grazed by livestock since the exclosures were set up. Hence it is covered in coarse dead *Phalaris* stalks, not palatable to roos. The site photos are from August 2013 .

Site 2 (Photo 2) to the east of site 1 is dominated by the sedge *Carex appressa* (cutting grass) which is not eaten by roos. Site 3 (Photo 3) in the middle of the west-

east line across the area is very mixed, patches of *Carex*, *Phalaris* and mixed native grasses. The enclosure was placed on an area of native grasses. Sites 4 and 5 (Photos 5 and 6) are located in the pasture adjacent to Caswell Drive/ William Hovell Drive intersection, across from the entry stile to the interpretative walk, in heavily grazed native pasture.

To get an impression of the heavily grazed grasses, the photo below is representative of the land surface at Site 5. There are a few live leaves close to the ground, but most of the area is dead grass, with some tufts of whole kangaroo grass *Themeda* which have been pulled out by grazing. The ground shows many 'roo droppings, fresh and old. In this paddock the *Poa* clumps have also been heavily grazed.



Photo 1. Detail of groundcover adjacent to site 5 Aug 2013. Numerous 'roo droppings and dead tufts of Themeda pulled out by kangaroos.

Examination of the species of grass in the enclosures showed almost all *Themeda* in Sites 5 and 6, showing a basically *Themeda* paddock.

It is not possible to separate rabbit grazing from 'roo grazing in this experiment, but there are no active warrens within the CNP boundary of the Snow Gums area. Unfortunately in the rural lease there are active warrens, about 200-300 metres from enclosures 1, 2, 5 and 6, so some of the grazing pressure may come from rabbits.

The long-term effects of continued heavy grazing of *Themeda*, to the extent that it does not flower at all, have been detrimental. Areas formerly of *Themeda* are being replaced by Patterson's Curse, requiring spraying, and leaving bare ground to be colonised by annual weeds. As the native pasture cover deteriorates, St. John's Wort invades, as is clearly illustrated by our photographs.



Photo 2. Early summer, Nov. 2011 Site5. Themeda flowering in circular exclosure surrounded by rust-coloured stems of dead St. John's Wort after Starane spraying.



Photo 3. Midwinter August 2013 Site 5. Overgrazed pasture with Themeda stalks in exclosure.

The native forb understory is sensitive to spraying, even with selective herbicides, so that ultimately the biodiversity is damaged.

On the basis of the cylindrical enclosure trials, Friends of the Aranda Bushland proposed to trial larger enclosures that will allow regeneration and seeding of the *Themida*, with the intention of moving these enclosures about three yearly to progressively recover the pasture. Parallel reduction in 'roo numbers will be required to support regeneration.

These larger 'roo enclosures have been constructed by Parks ACT during 2014 and 2015 in three locations in block 1399, near Site 5, adjacent to the Black Mountain car park. There are 3 rectangular enclosures of dimensions 1m by 10m with a substantial metal structure and fencing, entirely 'roo proof.



Photo 4. The first enclosure, constructed during a wet winter.



Photo 5. Pasture outside the enclosure, left, and inside, right, at the time of the erection of the enclosure. June 2014

These exclosures have demonstrated the great benefit to the pasture of removing grazing, allowing strong grass growth and Themeda flowering in profusion.



Photo 6. The first exclosure taken in February 2016, 20 months after establishment.



Photo 7. The second enclosure erected in 2015, during the very dry winter in July 2018



Photo 8. Pasture under 'roo grazing, July 2018. The green leaves are St. John's Wort and introduced clover.

The intention from the beginning has been to move the exclosures after successful Themeda seeding, to see if the revived seed bed can assist in regenerating the pasture. The grazing pressure from 'roos will need to be reduced if this is to be successful.



Photo 9. Residual Themeda stubble, one month after relocation of the exclosure. September 2018.



Photo 10. Relocated exclosure, September 2018.

In 2018 for the first time Aranda Bushland was scheduled for 'roo culling with the intention of removing some 300 'roos, and hence restoring a much reduced grazing pressure.

Due to the topography only 27 animals were removed, the others bounding into the forest. We understand that culling will be scheduled again in 2019, using a different approach.

It will be valuable to hold a 'roo count in early 2019 prior to culling, to assess the natural die-off due to starvation and parasites following the dry winter.

This exploration of 'roo exclusion will continue until a better understanding of approaches to pasture restoration are achieved, which may include other methods, for example local low-temperature grass burns. There are no easy solutions to the problem of 'roo numbers in predator-free locations, where the only natural controls are starvation and disease, simultaneously with ecosystem destruction.

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