

Symposium Presentation No. 2

Squirrel Gliders in agricultural landscapes

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This talk is a summary of aspects of Mason's PhD thesis. Mason described his studies of Squirrel Gliders in the south-west slopes of NSW. His studies provide valuable information on habitat use and preferences in fragmented environments that could be used as a basis for glider management in other places and other species.

Spotlight surveys on south-west slopes of NSW

Spotlight surveys were carried out at 219 sites: 65 planted sites and 154 remnant sites.

Gliders were found in 5 (8%) of the 65 planted sites but only where plantings were aged at least 10 years, with a mean age of 18 years. (In another study, 4 year old wattles were used by Squirrel Gliders.) Three habitat factors were significant in the plantings: heavily flowering eucalypts (*E. maculata*, *sideroxylon* and *leucoxylon*), Silver Wattles and ribbon-barked gums (*E. viminalis*, *globulus*). Not all these species are indigenous to the area but do quickly provide habitat for gliders.

Remnant sites comprised road reserves, travelling stock routes and small clusters of paddock trees. Of the 154 sites, 27 (18%) contained Sugar Gliders.

Spotlight surveys have limitations: gliders are hard to see, especially in big tree canopies. So it is hard to do statistical analysis on habitat use. However this long-term study did show changes in population, with a big decline over the millennium drought and a rapid recovery from 2009 peaking in 2011.



Focused Squirrel Glider Study

This study aimed to identify the key habitats of gliders and gain a clearer understanding on how gliders use the landscape and the various countryside elements within them. The study provides a basis to inform on-ground management and broader planning. Five sites were used and 32 gliders were collared and tracked to 153 den trees and 372 nocturnal sites.

Characteristics of den trees:

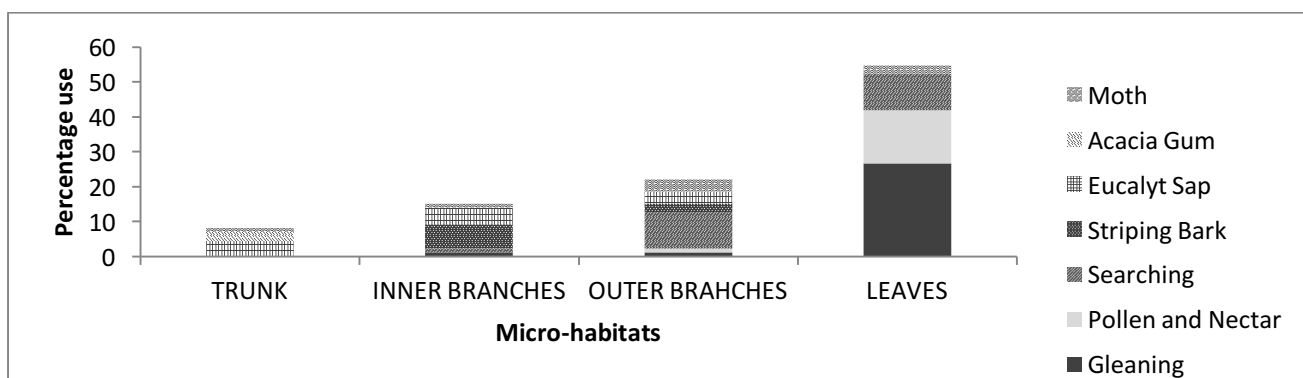
- All den sites identified were in living or dead eucalypts. Squirrel Gliders preferred dead trees and *E. microcarpa* for dens.
- Use increased with the number of visible hollows and also with tree size independent of the number of hollows.
- Dieback was also a positive indicator of use, probably because they had more hollow-forming processes; healthy trees were preferred if hollows were available.
- The abundance of surrounding trees, the distance to the nearest tree and the number of surrounding large trees were all positive indicators of den tree selection.

Use of den trees

- Over a five month period, individual gliders used 7 den trees on average.
- The average denning range was 3.6 ha and den trees were at an average density of 2.7 per hectare.
- Gliders would regularly swap dens and, on average, would move 218 m to a new den site.
- A strong association also was found between the location of denning sites and nocturnal feeding activity (see below).

Nocturnal habits of Squirrel Gliders

- Foraging almost exclusively took place in eucalypts, with only two records of acacia feeding (few acacias were available at that time).
- 74% of time was spent in foliage and outer branches high in the canopy, feeding on flowers, gleaning lerps and insects, and stalking moths. They spent little time moving or feeding on the lower branches and trunks where they were easier to detect with spotlights.



- Gliders preferred large healthy trees as feeding sites as well as denning sites. Large trees were more likely to flower but large trees were preferred even when not flowering. *E. melliodora* was preferred: they have big canopies, more lerps and more loose bark containing insects and spiders. *E. microcarpa* was also preferred, and *E. sideroxylon* was preferred during flowering.
- In the absence of flowering trees, the majority of time was spent in trees close to drainage lines, notably in *E. melliodora*, despite a history of heavy grazing. But gliders moved to the upper slopes and ridges when flowering trees were available (particularly *E. sideroxylon*). Some used the same tree over many successive nights, and gliders also moved to den trees near the flowering trees at this time. When flowering stopped, they moved back to the low-lying areas.

So it is important how we join the landscape up. Trees do not flower every year, and the lower sites are important to maintain populations particularly between flowering events. But they also need access to the boom times when flowering allows an increase in body weight and breeding.

Patterns of habitat use were recorded for a variety of landscapes but the most distinctive patterns were in the large remnants along the old stock routes.



Value of countryside elements

The elements used by Squirrel Gliders are scattered (relict) trees in paddocks with heavily modified understorey (upper photo), linear roadside remnants, larger remnant patches (mostly travelling stock reserves that provide most of the patches of high quality native vegetation: lower photo), and tree plantings most less than 30 years old.

- Some gliders exclusively used linear roadside remnants. Others lived in the travelling stock reserves and some survived solely in the scattered paddock trees.
- Tree plantings were rarely used and only where extra countryside elements were also available: roadsides and scattered trees providing den trees and heavy flowering, and plantings containing ribbon-bark trees and acacias.



- Scattered trees were preferred, possibly because they were all large (and provided they were within gliding distance). The availability of scattered trees enabled gliders to maintain smaller home ranges than when these trees were less available and gliders only relied on remnant patches and roadsides. So scattered trees had a disproportionately high value for gliders.

Effect of wildfire on scattered trees

After every fire there is a loss of scattered trees and hollow-bearing trees and hence loss of a keystone resource for Squirrel Gliders. In a study of burnt and unburnt sites:

- 20% of scattered trees were lost on average, with higher losses in the larger and more intense fires often associated with drier conditions.
- the increase of woody vegetation occurring in the region was slowed by fires.

Predation

In response to a question, Ross and Mason said that :

- foxes were not a big threat to gliders according to both speakers
- cats do kill gliders. But Mason said that in his study areas cats brought in smaller animals including Antechinus and Feathertail Gliders but not Squirrel Gliders, and Ross noted that, despite expectations cats did not seem to be a big threat in the remnant patches in urban areas.
- Mason said that barbed wire may be a more significant threat .

References

Crane, M. J., R. M. Montague-Drake, R. B. Cunningham and D. B. Lindenmayer. 2008. The characteristics of den trees used by the squirrel glider (*Petaurus norfolcensis*) in temperate Australian woodlands. *Wildlife Research* 35, 663–675.

Crane, Mason J, David B. Lindenmayer and Ross B. Cunningham. 2010. The use of den trees by the squirrel glider (*Petaurus norfolcensis*) in temperate Australian woodlands. *Australian Journal of Zoology* 58, 39–49.

Crane. M. J., D. B. Lindenmayer and R. B. Cunningham. 2012. Use and characteristics of nocturnal habitats of the squirrel glider (*Petaurus norfocensis*) in Australian temperate woodlands. *Australian Journal of Zoology* 60, 320–329. <http://dx.doi.org/10.1071/ZO12080>.

Crane, M.J., Lindenmayer, D.B., Cunningham, R.B. 2014. The Value of Countryside Elements in the Conservation of a Threatened Arboreal Marsupial *Petaurus norfolcensis* in Agricultural Landscapes of South-Eastern Australia—The Disproportional Value of Scattered Trees. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0107178>

The above papers are available on application. Mason has other related work in preparation including his PhD and papers on the impact of fire, and the SWOT analysis (see Presentation 2b).