

Queensland Glider Network

Who We Are

- A community environmental organisation
- Small staff, dedicated members – QLD wide
- Many volunteers - supporters concerned for conservation of wildlife and its habitat.
- Not for profit organization
- Funded by donations from the public
- Grants from various funding bodies
- Deductible Gift Recipient



Vision

People value, respect and support the conservation of
Queensland's native wildlife

Mission

To be the leading non-government organisation advocating,
protection and conservation of Queensland's native terrestrial
and marine plants, animals and landscapes by educating and
engaging communities, influencing decision-making, advancing
solutions and connecting people with wildlife

Qld Glider Network

Raise awareness of gliders and their habitat requirements. Six gliding mammals occur in Queensland

QGN aims

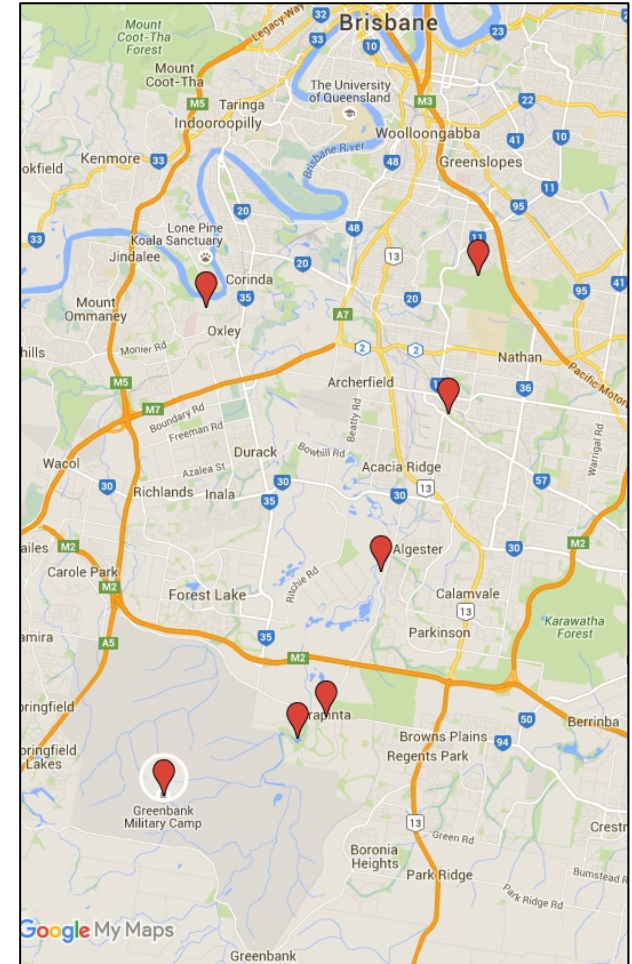
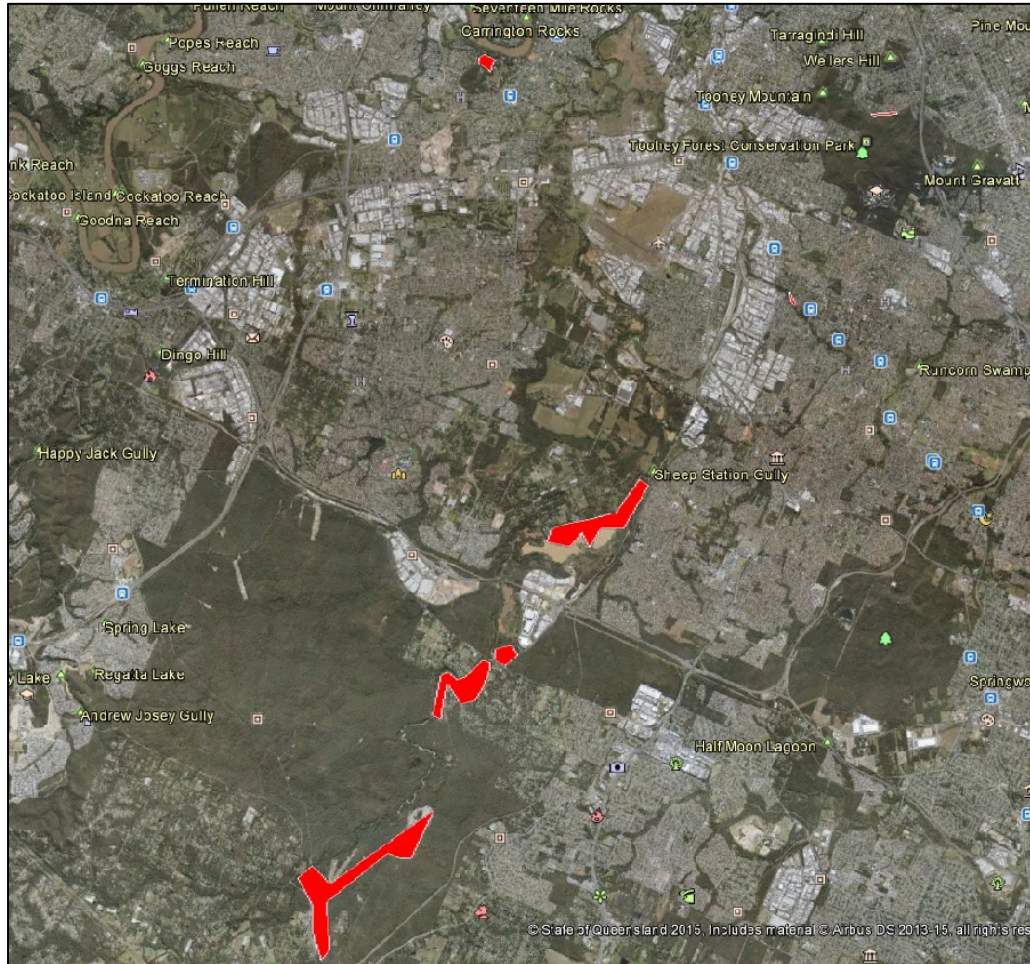
- To improve community knowledge and interest in gliders
- Become a centre for glider conservation and information exchange in Queensland
- Empower communities to support their local glider populations by conserving natural tree hollows or installing nest boxes where hollows do not exist







Location	Total Number of Boxes	Glider Specific Boxes
Tarragindi (Toohey Forest)	4	0
Gaddes Park (Coopers Plains)	4	2
Fort Road Reserve (Oxley)	17	4
Sgt. Dan Stiller Reserve	39	25
Greenwood Lakes	88	44
Greenbank Training Area	18	11
Holcim (Oxley Creek Quarry)	26	22



Nest Box Monitoring and UQ GPEM

From 2013 onwards University of Queensland GPEM students have run the project under Wildlife Queensland / Queensland Glider Network supervision

Conduct the routine monitoring and investigate a side 'question'

HOME IS WHERE THE ARTIFICIAL HOLLOW IS

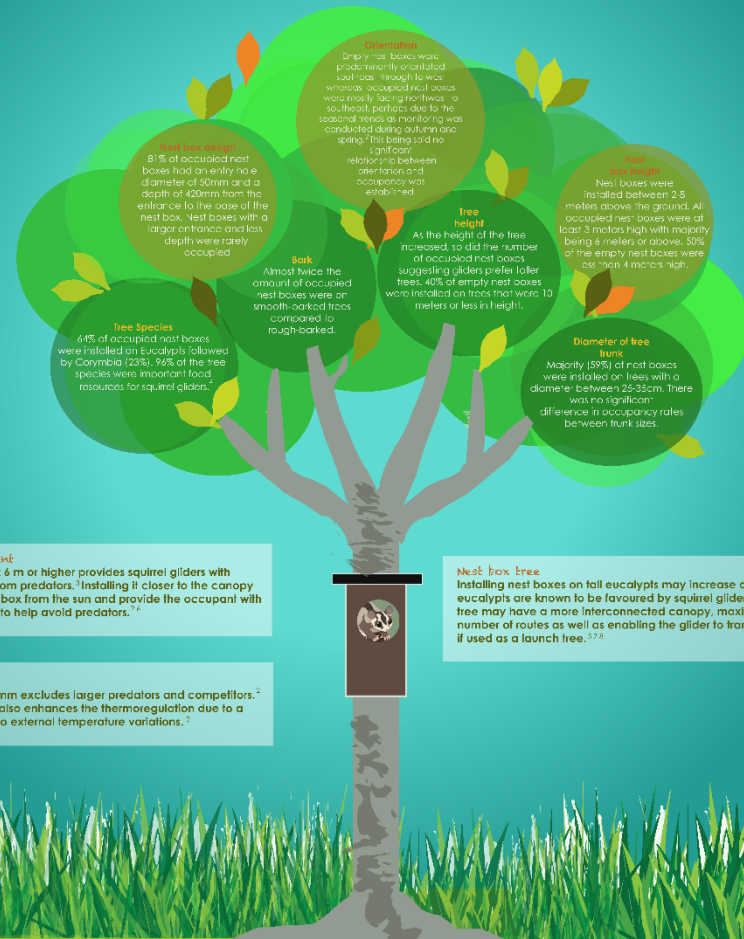
Identifying the preferred design and placement attributes of nest boxes for squirrel gliders, *Petaurus norfolcensis*

Introduction: Natural hollows are being destroyed at a faster rate than they are being created due to activities such as logging, agriculture and urban development. Nest boxes are often used as substitutes to support cavity-dependent species in areas that lack tree hollows.¹ To support and enhance squirrel glider populations, the Queensland Glider Network installed approximately 160 nest boxes within the Flinders Karawatha Corridor.² Biannual monitoring since 2011 revealed that ~ 22% of nest boxes have had a squirrel glider present during surveys.

Aim: Identify the preferred nest box attributes for squirrel gliders to improve nest boxes as a conservation management tool.

Methods: Of the 160 nest boxes, 22 empty nest boxes (those that had no signs of occupancy i.e. leaf nest or fauna) and 22 nest boxes that have been occupied by a squirrel glider, were subject to free and nest box surveys. Seven variables in relation to the nest box tree and the design and placement of the nest box were measured and statistically analysed.

Results and Discussion: Of the seven variables (illustrated below) only the design and height of the nest box were significant determinants of squirrel glider occupancy rates.



Acknowledgements
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Bibliography

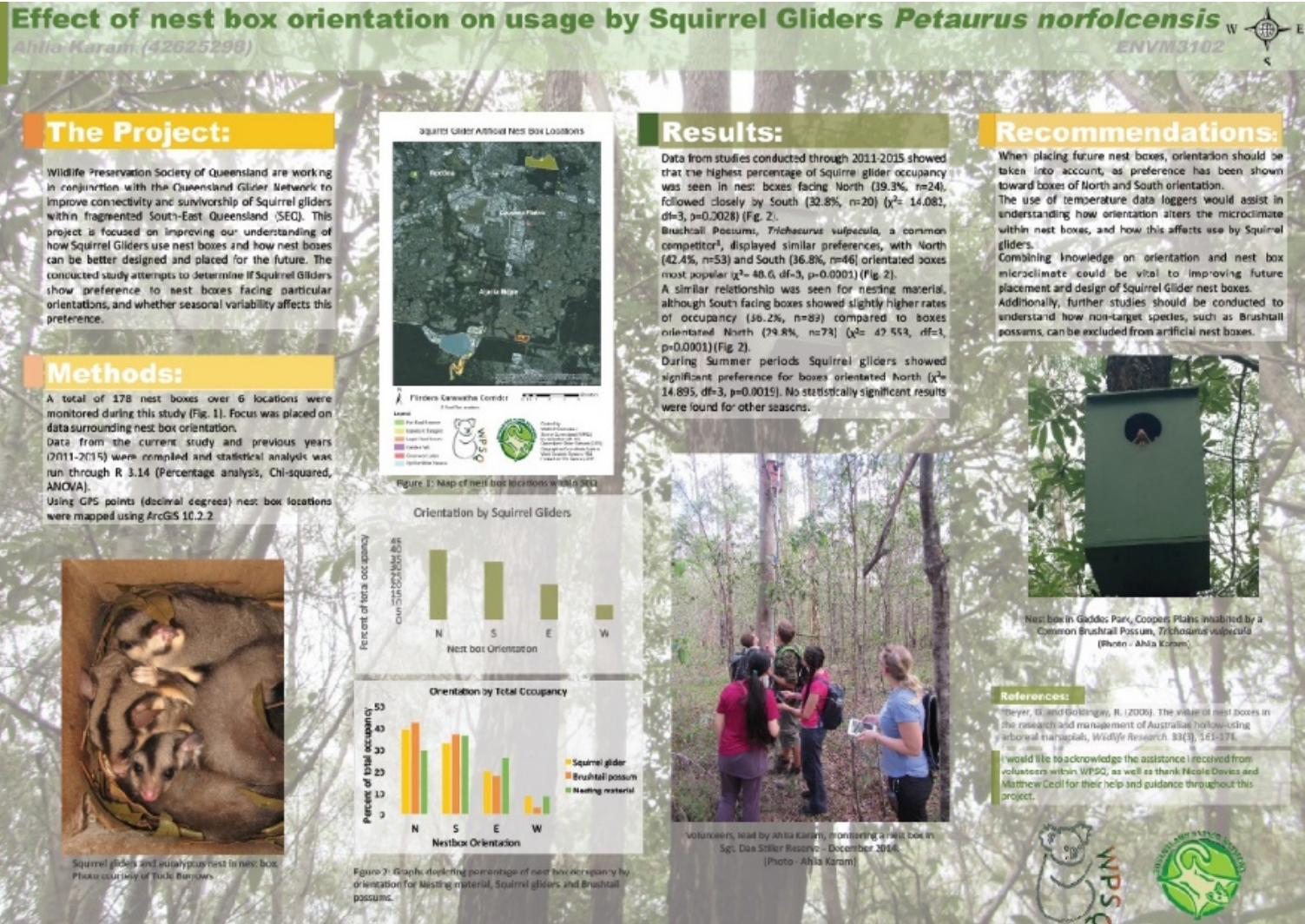
1. Hocking, C. 1995. 'Nest boxes for squirrel gliders, *Petaurus norfolcensis*, in south-east Queensland', Wildlife Research, vol. 22, pp. 571-574.
2. Hocking, C. & Collins, K. 2009. 'The value of nest boxes for the squirrel glider and the eastern grey kangaroo in south-east Queensland', Wildlife Research, vol. 36, pp. 414-419.
3. Collins, K., Hocking, C. & Collins, K. 2009. 'The value of nest boxes for the squirrel glider and the eastern grey kangaroo in south-east Queensland', Wildlife Research, vol. 36, pp. 414-419.
4. Collins, K., Hocking, C. & Collins, K. 2009. 'The value of nest boxes for the squirrel glider and the eastern grey kangaroo in south-east Queensland', Wildlife Research, vol. 36, pp. 414-419.
5. Collins, K., Hocking, C. & Collins, K. 2009. 'The value of nest boxes for the squirrel glider and the eastern grey kangaroo in south-east Queensland', Wildlife Research, vol. 36, pp. 414-419.
6. Collins, K., Hocking, C. & Collins, K. 2009. 'The value of nest boxes for the squirrel glider and the eastern grey kangaroo in south-east Queensland', Wildlife Research, vol. 36, pp. 414-419.
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8. Collins, K., Hocking, C. & Collins, K. 2009. 'The value of nest boxes for the squirrel glider and the eastern grey kangaroo in south-east Queensland', Wildlife Research, vol. 36, pp. 414-419.

What did Ella find out?

- Preference for nest box design: Entry holes <50mm and a depth of 420mm from the entrance to the base of the nest box
- Smooth-barked vs rough-barked: Almost twice the number of gliders were found in nest boxes on smooth barked trees
- Gliders preferred tall (>6m) Eucalypt trees: a larger interconnected canopy
- Nest box height: Nest boxes should be placed >6m above the ground and near the canopy

What did Alhia find?

- Gliders preferred nest boxes oriented to the North and South
- Brush-tail possums exhibited similar preferences
- During summer periods, squirrel gliders displayed significant preference for north-oriented boxes.



What did Cameron find?

- Decreasing trend in glider occupancy
- Increasing trend in brush-tail possum occupancy
- Competition exists between possums and gliders; statistical analysis implies possums have a negative impact on glider occupancy
- Southern sections of Greenwood Lakes and Sgt. Dan Stiller Reserve contain the highest glider sightings – least urbanised areas

Are gliders disappearing from Brisbane?

A study on glider occupancy trends in the Flinders Karawatha Corridor

Cameron Jones – School of Geography, Planning & Environmental Management



Squirrel glider in Dan Stiller Memorial Park (Photo: Cameron Jones)

Methods

A total of 159 nest boxes in 5 sites within the FKC were monitored over the study period from July-November 2015 (Figure 1). Data was gathered from each nest box on occupancy, as well as many other factors to identify nesting preferences for each occupant species. Data from the most recent round of monitoring along with data from the previous 4 years was statistically analysed (regression, ANOVA, correlation analysis) to identify trends. Spatial analysis was conducted using QGIS.



Example of a nest box being used in Greenwood Lakes, Forestdale (Photo: Cameron Jones)

The Project

Wildlife Preservation Society of Queensland have been working alongside the Queensland Glider Network to improve connectivity in the Flinders Karawatha corridor (FKC) in South East Queensland. Part of their efforts revolve around the installation and monitoring of a number of nest boxes located within the corridor that aims to improve connectivity, and allows for valuable data collection about nest box usage and glider occupancy. Currently natural hollows are being destroyed at a faster rate than they are being replaced and only occur in very mature trees¹. Nest boxes help address this problem by providing a substitute living space for hollow dependent species, such as gliders¹. This project aims to identify any trends in glider nest box occupancy, and findings will guide future conservation efforts and identify areas for further research.

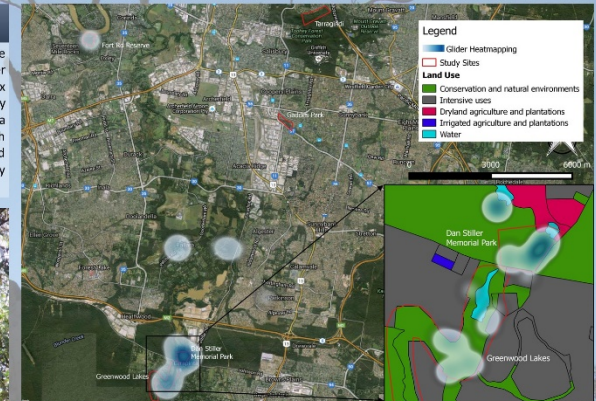


Figure 1: Map of the FKC study sites (outlined in white) with heat mapping of glider sightings in blue, darker blue represents higher glider sighting areas. Inset shows land use surrounding the main glider hotspots.

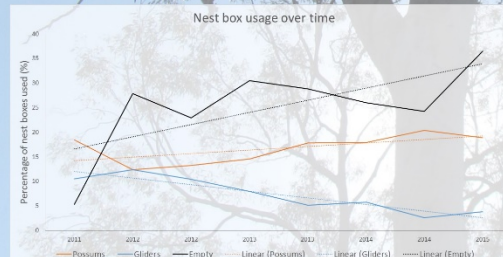


Figure 2: Graph displaying the percentage of total nest boxes used by key species and number of empty boxes over the study period.

Results

Data gathered over the study period (2011-2015) indicates that number of gliders utilising nest boxes has been steadily decreasing (Figure 2). Regression analysis shows an increase in possum and empty nest box use results in a decrease in glider use ($R^2 = 0.935$, $F(2,7) = 35.96$, $p < 0.01$). Correlation shows possums have a negative impact on glider occupancy ($r = -0.80$, $p < 0.01$), while empty has no effect ($r = 0.41$, $p = n.s$).

Spatial analysis indicates the area with the highest glider nest box usage is in the southern sites of Dan Stiller Memorial Park and Greenwood Lakes. These areas are the least urbanised and are surrounded by more conservation and natural environment than other sites (see inset figure 1).

Conclusions

The results indicate management efforts in the FKC need to be improved to address the downward trend in glider occupancy rates. A clear negative relationship between brushtail possum and glider occupancy highlights the need for the installation of glider specific boxes that exclude brushtail possums. Excluding non-target species from glider boxes will reduce the competition gliders face, and increase the number of nest boxes available to gliders. Nest box installation should be focused in the southern sites of Dan Stiller Memorial Park and Greenwood Lakes as these areas have been identified as hotspots of glider activity. Further research should examine why occupancy is higher at these sites and attempt to determine how occupancy might be increased at less active sites.

Acknowledgements

I wish to acknowledge the support and assistance I received from WPSQ staff, namely my supervisor Matt Cecil, my university supervisor Nicole Davies and all volunteers that ensured this project was able to be completed.

References

¹Bali, T., Goldingay, R. and Wake, J. (2011). Den trees, hollow-bearing trees and nest boxes: Management of Squirrel Glider (*Petaurus norfolcensis*) nest sites in tropical Australian woodland. *Australian Mammalogy*, 33(1):106-116.

What did Dee find?

- Orientation significantly influences glider occupancy
- Most gliders found in Northern and Southern Orientations (similar to Ahlia (summer 2014/2015))
- Nest boxes maintained and stabilised internal temperatures compared to the environment
- No significant relationship observed between orientation and temperature



Flinders Karawatha Project

Wildlife Preservation Society Of Queensland in conjunction with Queensland Glider Network, carry out biannual nest box monitoring surveys to monitor glider populations and to improve glider habitats in the Flinders Karawatha Region. Gliders are heavily dependent on hollow-bearing trees. Due to urbanisation and fragmentation, cavities available for gliders to inhabit are decreasing rapidly. Over the last 20 years, nest boxes have become a substitute for hollows. Nest boxes face different orientations and its exterior receives direct sunlight at different times of the day, influencing temperatures inside nest boxes⁴. This project aims to identify the most suitable orientation for nest boxes to face to increase glider occupancy.

Methodology

Thermochron iButtons DS1921G were installed inside 9 Hollow Log Homes (HH) glider nest boxes (fig 1). Nest boxes were grouped into 4 categories facing different orientations (Cat 1: 0°-90°; Cat 2: 90°-180°; Cat 3: 180°-270° Cat 4: 270°-360°), as seen in figure 2. Temperatures were monitored from 23 December 2015 to 26 January 2016. Data was retrieved and collated to produce various temperature line graphs.



Fig. 1. Thermochron DCP210 installed in a nest box.
Photo: WP3Q



Fig. 2. A compass displaying glider sightings (2016) and the 9 installed temperature data loggers in their respective orientations.

Results

ANOVA analysis confirmed that nest box orientation significantly influenced glider occupancy ($F_{2,4}=1.77$, $p=0.05$), as gliders were mostly found in northern and southern orientations, similar to summer 2014/2015.

No significant differences in temperatures were observed between the 4 categories (Max: $F_{3,196}=0.49$, $p=0.05$; Min: $F_{3,196}=0.43$, $p=0.05$).

73.33% (n=11) of gliders were observed in eastern orientations, while 26.67% (n=4) gliders were observed in western orientations. Hence, temperature line graphs were constructed between eastern and western orientations (Fig 3 and 4). Analysis showed there were no significant differences in temperatures observed, (Max: $t(35) = -0.22$, $p > 0.05$; Min: $t(35) = -0.58$, $p > 0.05$).

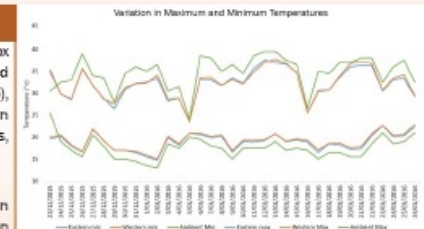


Fig. 3. Variation in Maximum and Minimum Test pressures between eastern and western

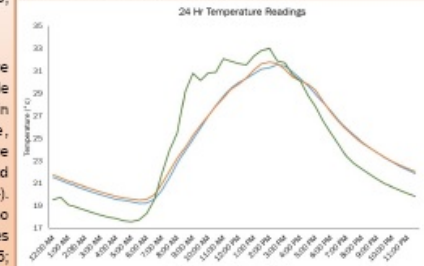


Fig 4. 24 Hour Temperature readings

Conclusion

In this study, northern orientations were favoured by gliders, followed by southern orientations. However, there was no significant relationship between orientation and temperature. The extent of this study was limited due to the number of temperature data loggers available. Furthermore, this study did not include effects of canopy cover. Further research can investigate effects of canopy cover on temperature to identify its role on glider occupancy. This could suggest explanations to high glider occupancy in northern orientations.



Gruber is a news box at Greenwood Lake.
(Photo: WPSU)

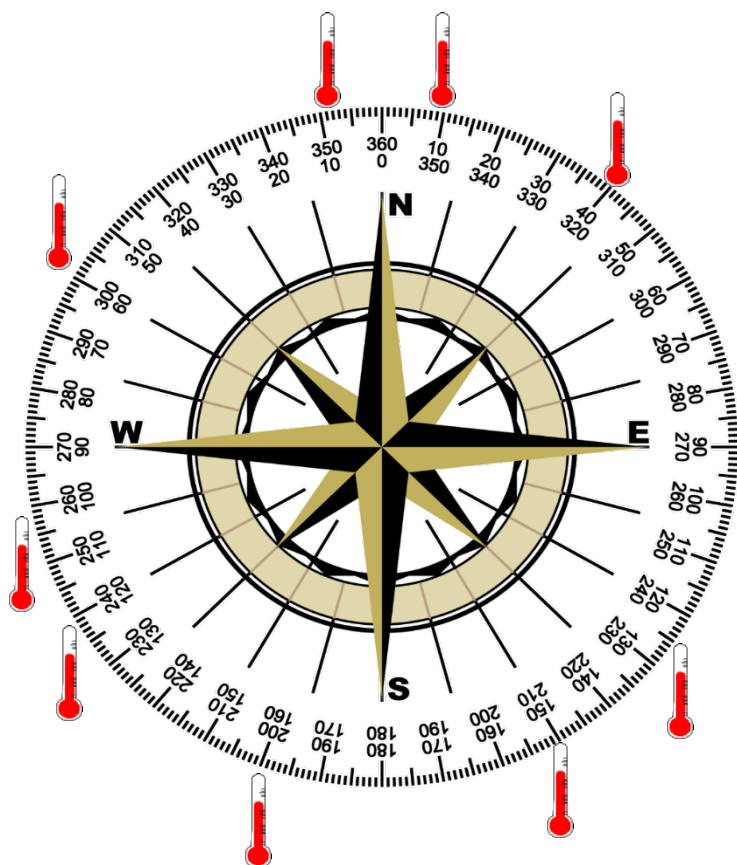
Acknowledgements

I would like to acknowledge my placement supervisor Matt Cecil, my UQ academic supervisor Nicole Davies, volunteers and staff at WPSO for their guidance and support in this project.

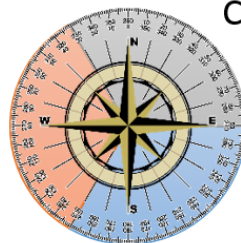
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⁴ Calder TG, Gidding SG, and Manderson AD 1983. Management for arboreal species in the Wombat State Forest. Environment Report No. 35. Graduate School of Environmental Science, Monash University, viewed on 18 Feb 2016.
<http://www.publish.csiro.au/entry/libary/ug.edu.au/>

Orientation-Temperature Experiment



Cat 2



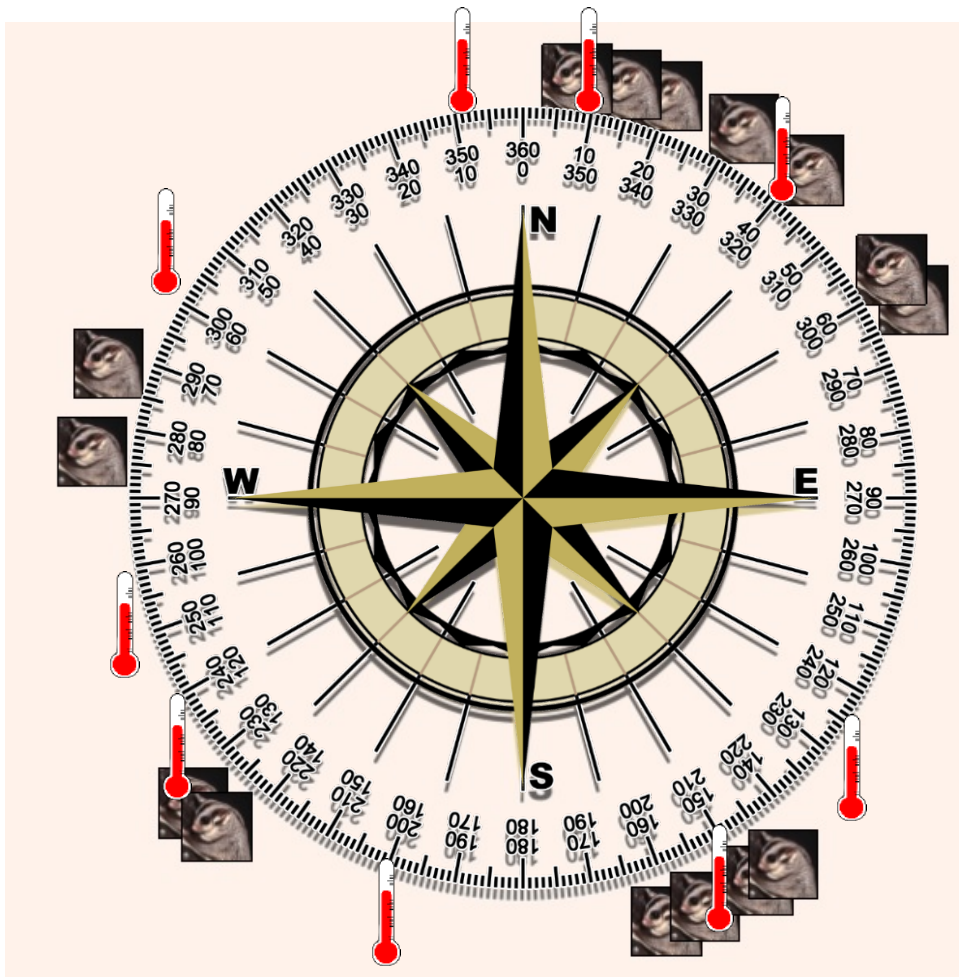
Cat 3

Cat 1

Category 1	90°-209°
Category 2	210°-329°
Category 3	330°-89°



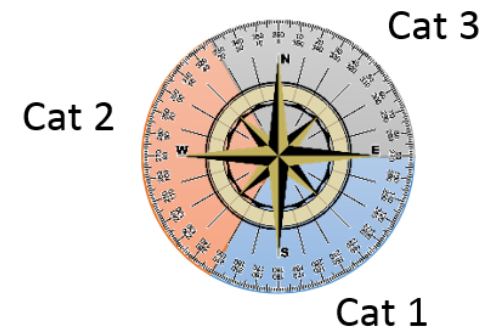
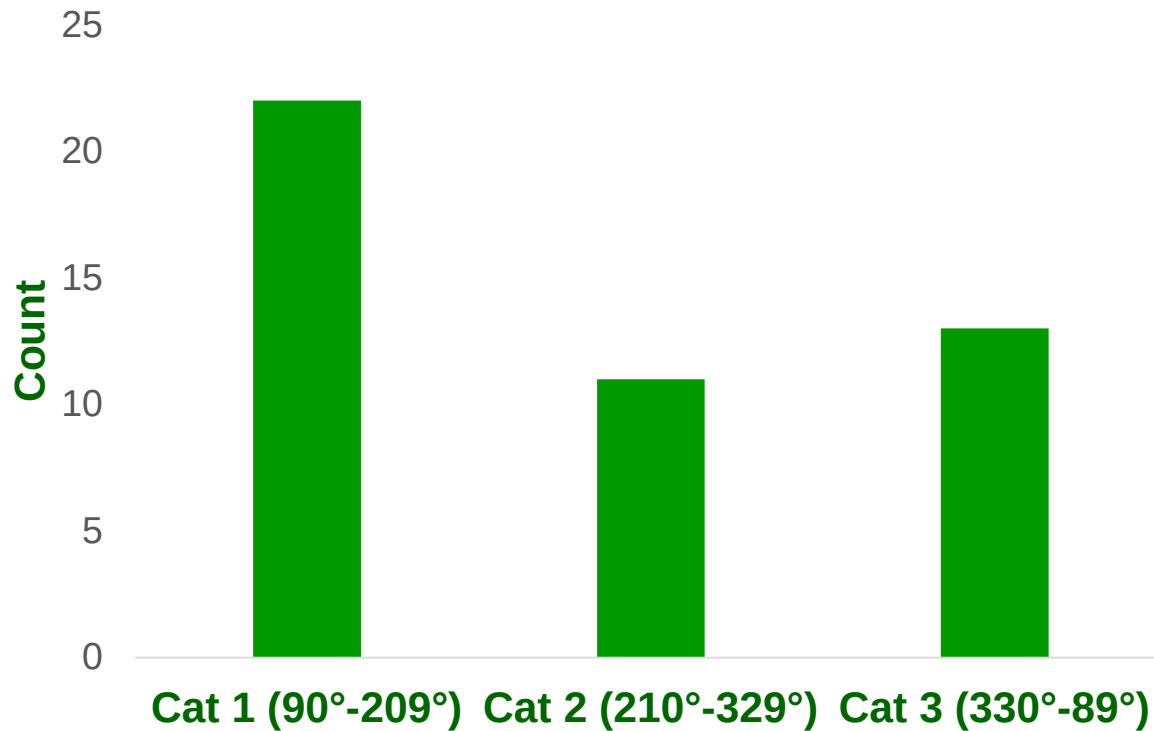
Glider Occupancy Orientation 2016



- North-east (29°, 40°, 59° and 64°).
- North (3°, 10° and 16°)
- South East (145° and 149°)
- South (158° and 164°)
- South-west (224° and 228°)
- West (273° and 286°)

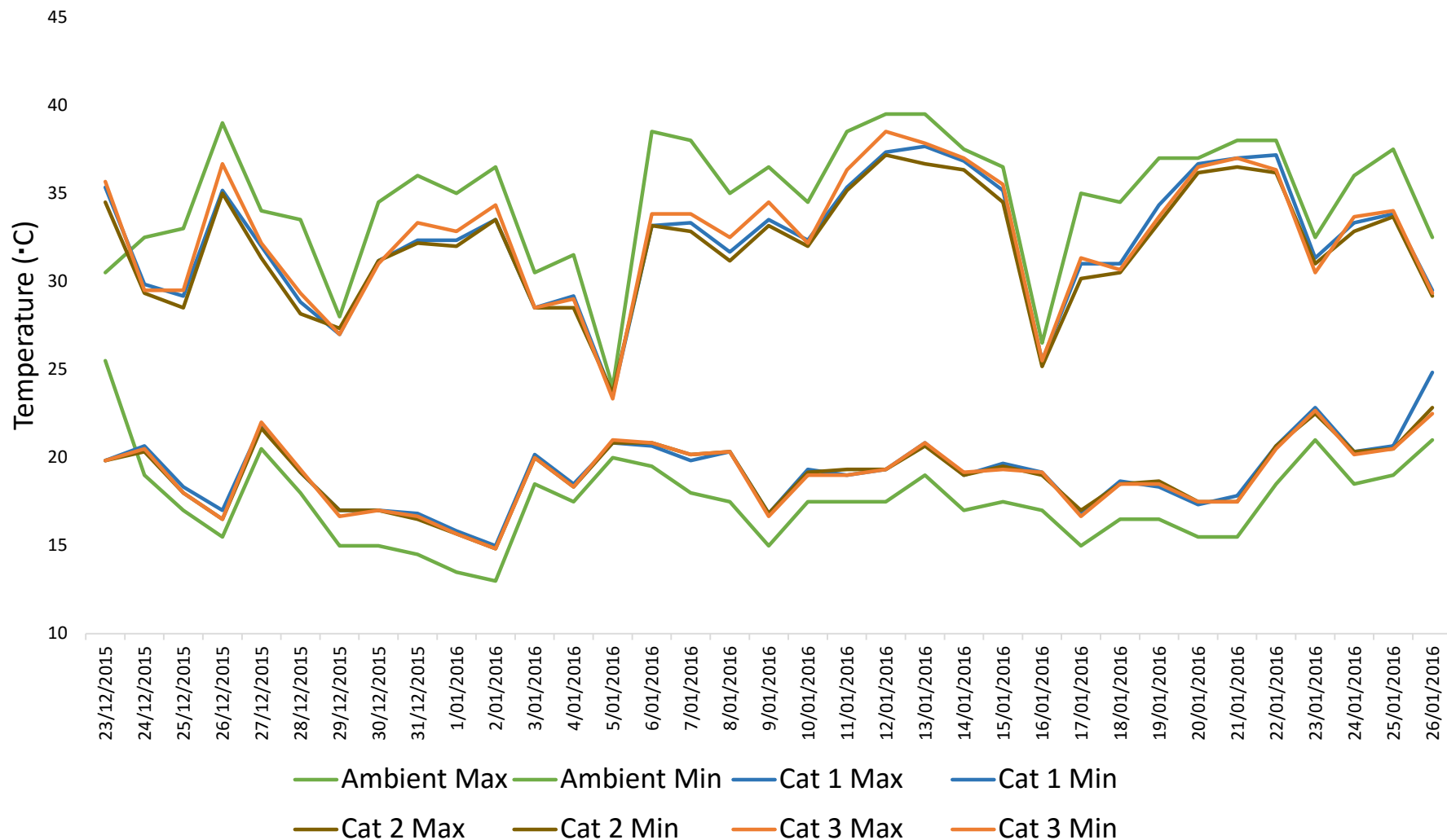
No boxes occupied by gliders faced north-west.

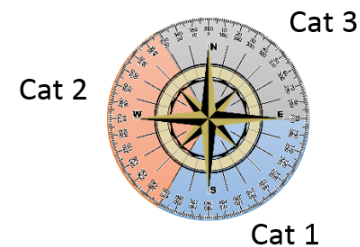
Glider Occupancy Orientation Summer 2014 & 2015



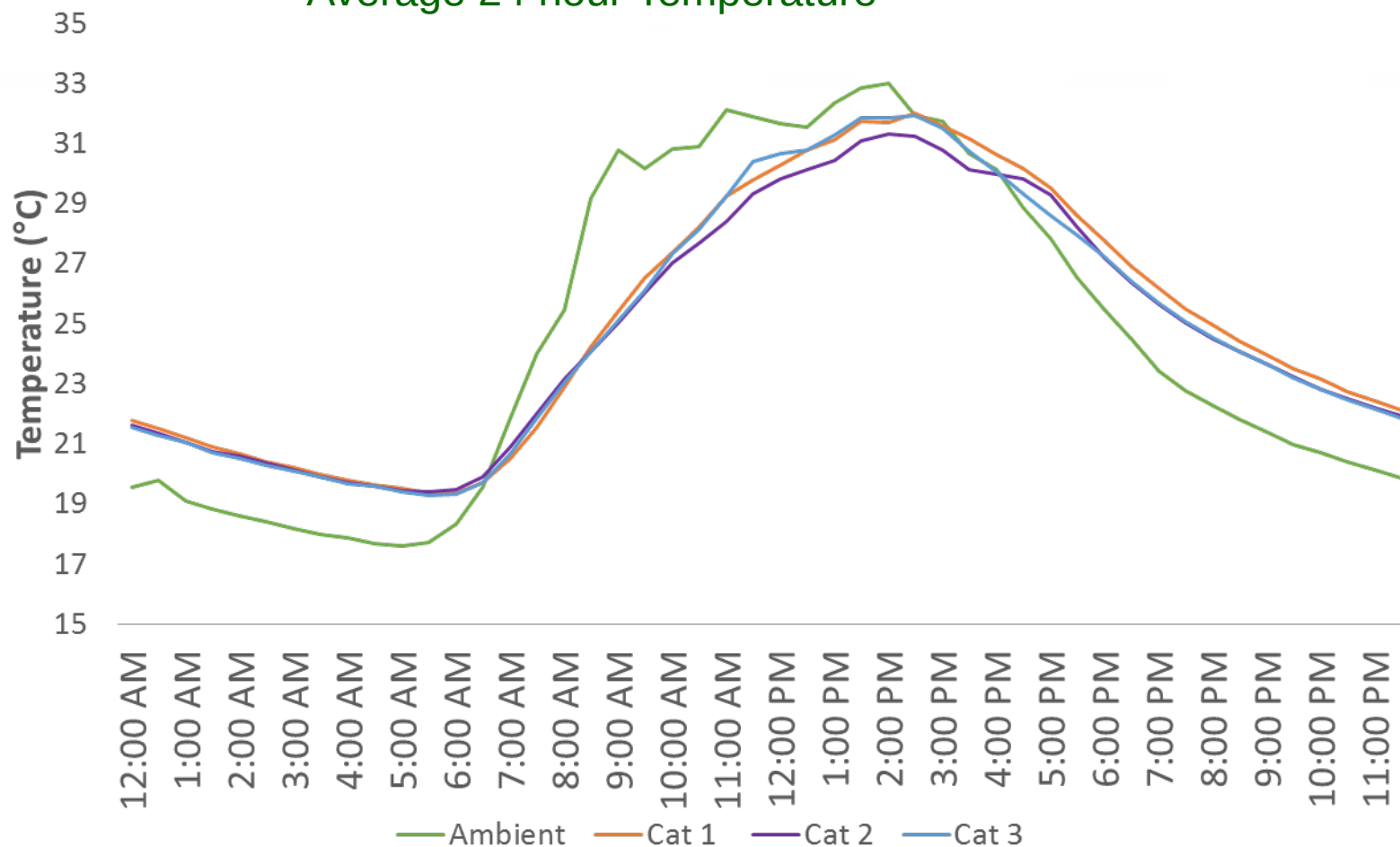
Note: Data includes active nest material

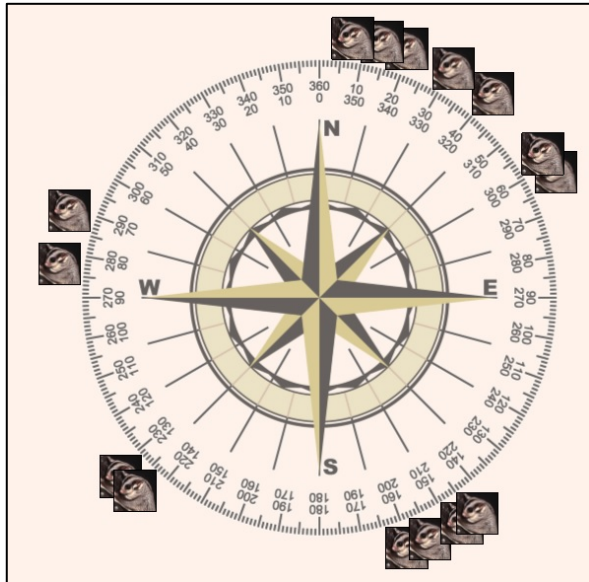
Variation in Maximum and Minimum Temperatures



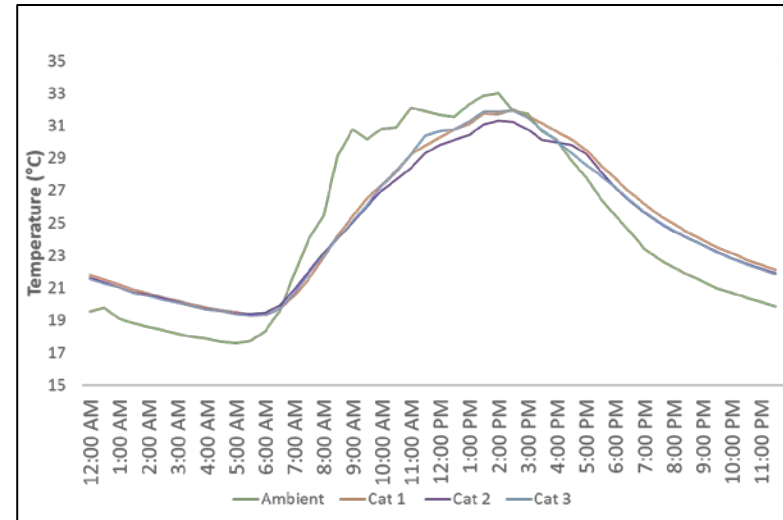


Average 24 hour Temperature



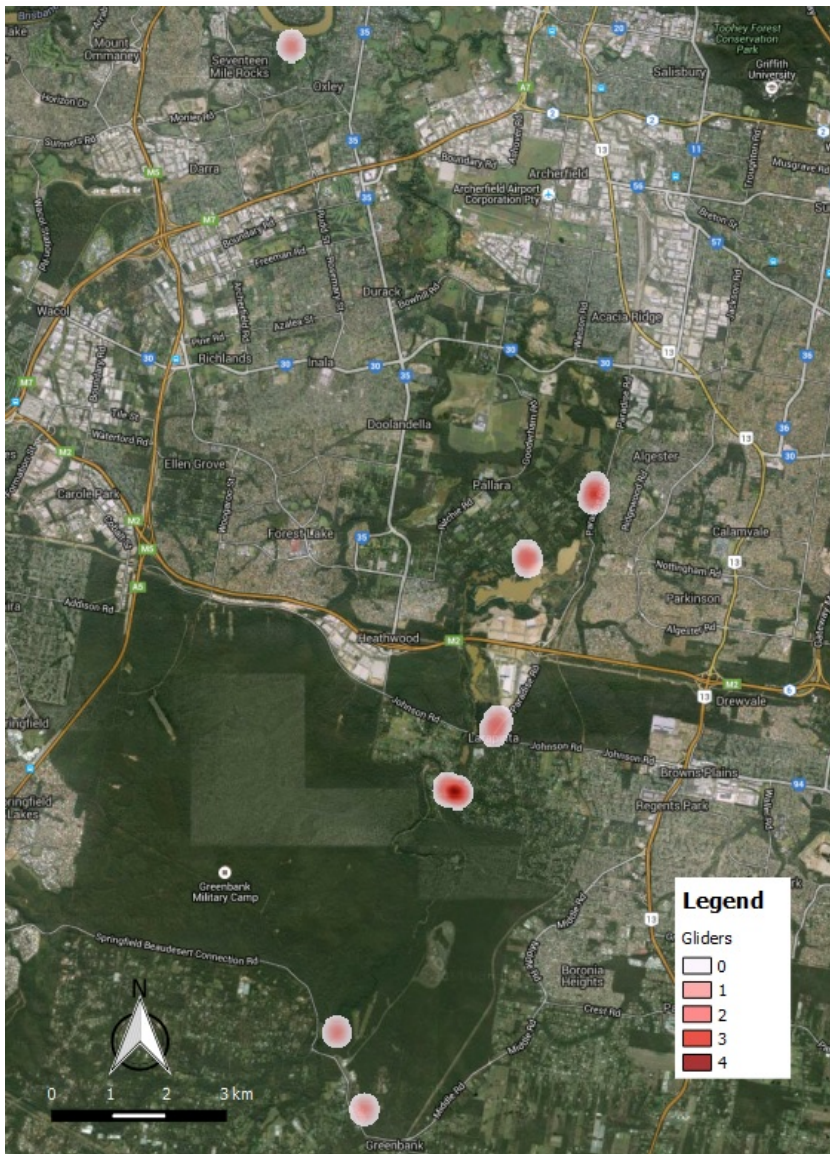


- Orientation significantly influences glider occupancy
- Most gliders found in Northern and Southern Orientations (similar to Ahlia (summer 2014/2015))



- Nest boxes maintained stable internal temperatures compared to the environment
- No significant relationship observed between orientation and temperature

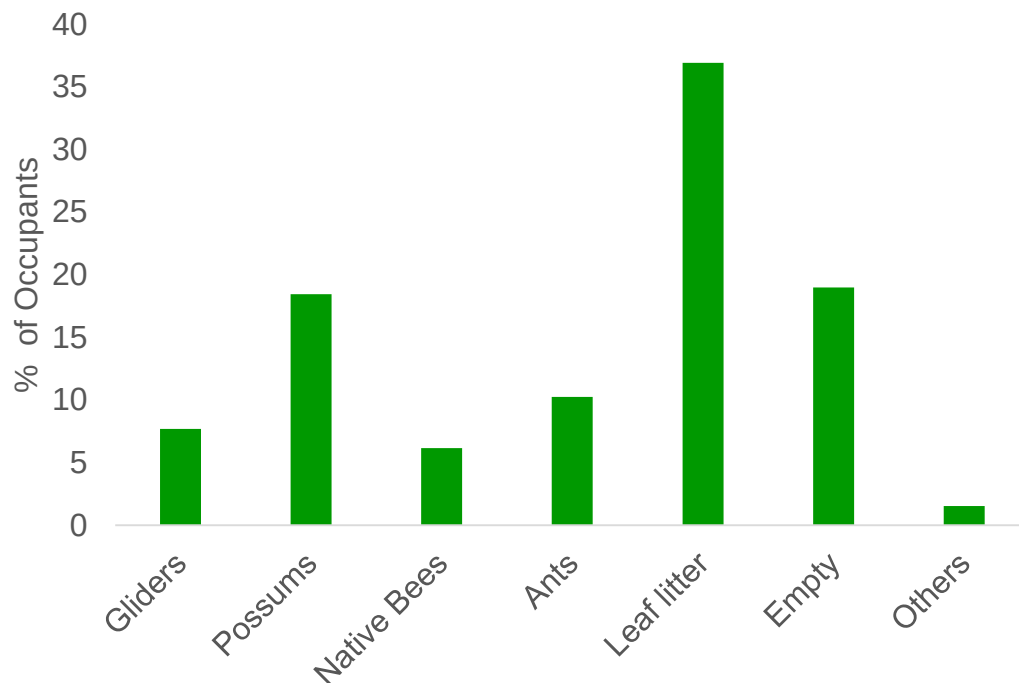
Glider Populations & Data



Glider Density Heatmap 2015

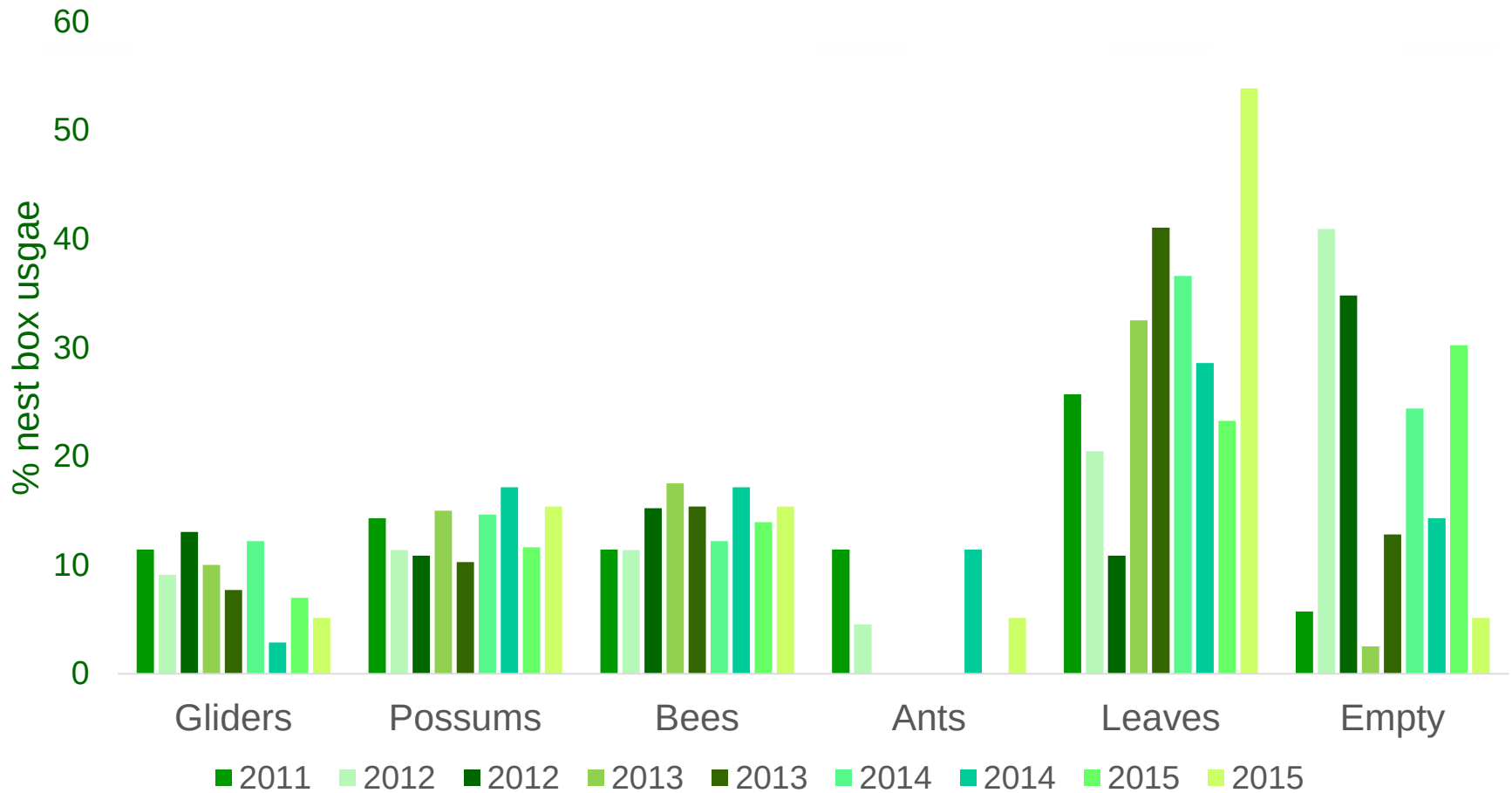
Locations	Occupied boxes	Total Number of Boxes	Glider Specific Boxes
Fort Road Reserve	1	17	4
Tarragindi	0	4	0
Gaddes Park	0	4	2
Holcim Quarry	5	26	22
Sgt. Dan Stiller Memorial Reserve	2	39	25
Greenwood Lakes	5	88	44
Greenbank	2	18	11

Occupancy by Species 2016

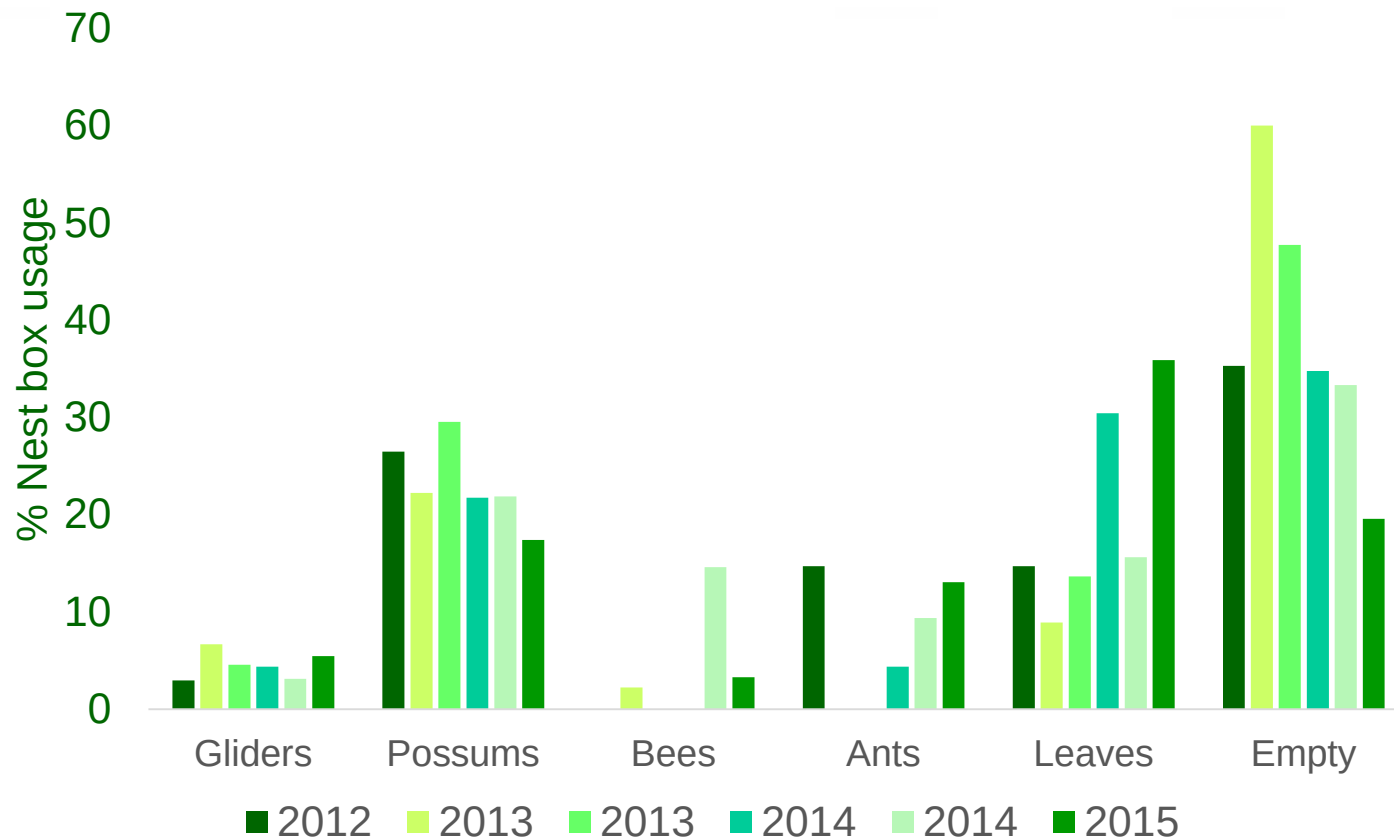


Occupant	n	%
Gliders	15	7.69
Brushtail possums	36	18.46
Native bees	12	6.15
Ants	20	10.26
Leaf Litter	72	36.92
Empty	37	18.97
Other	3	1.54

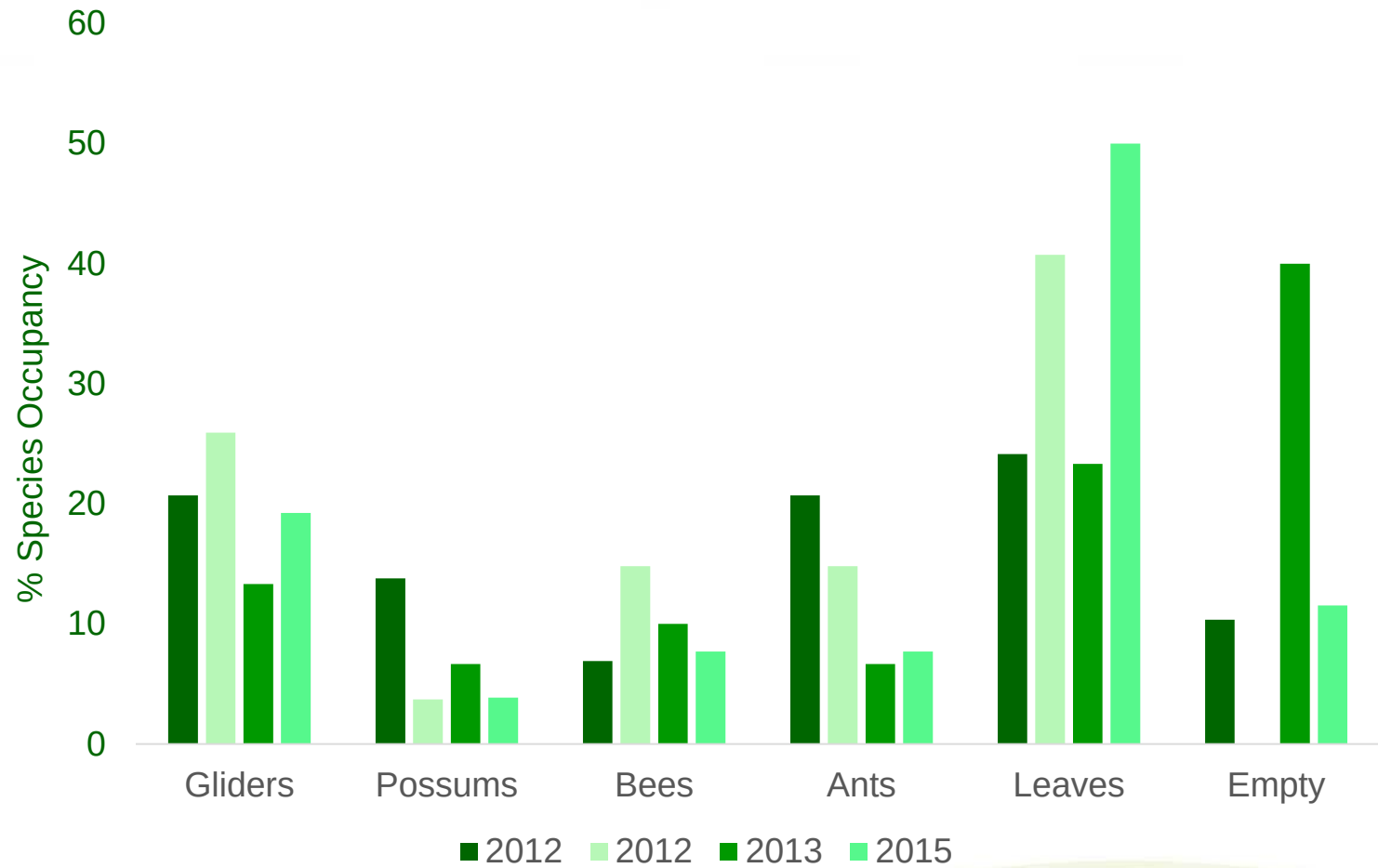
Sgt. Dan Stiller Reserve 2011-2015



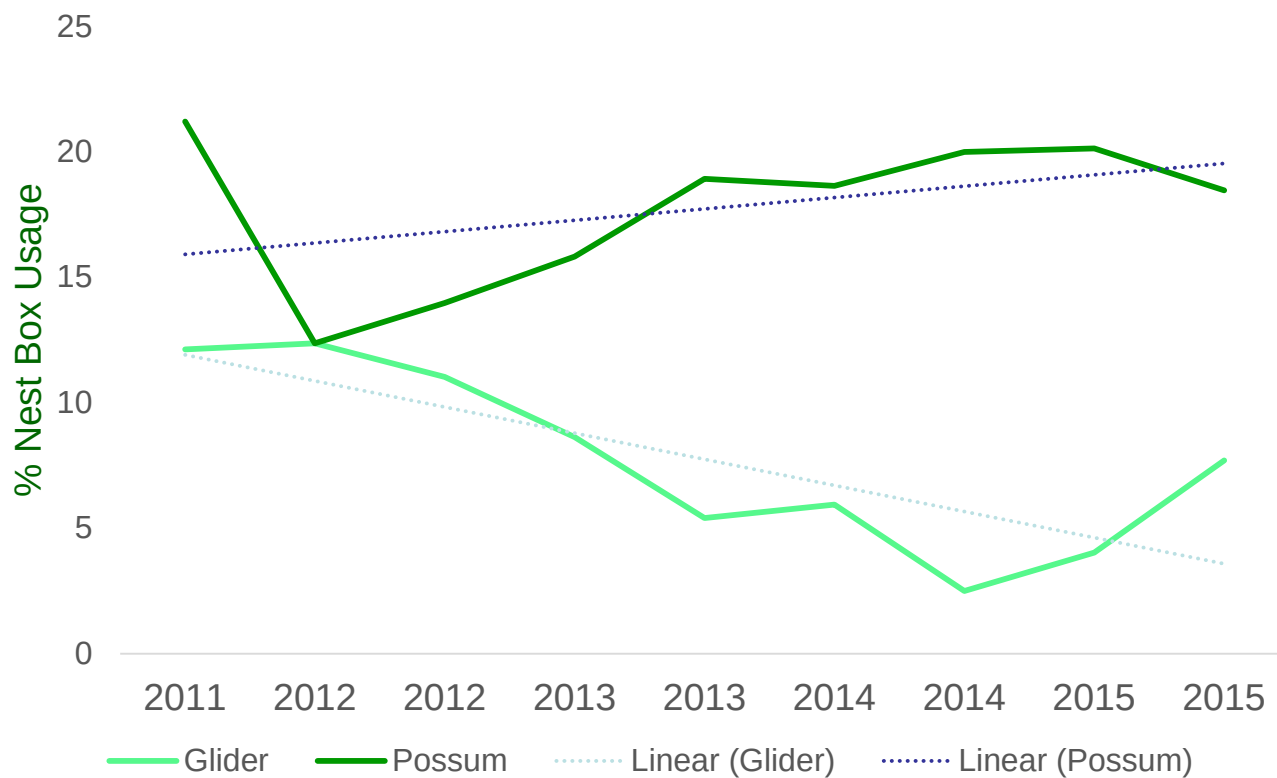
Greenwood Lakes 2011-2015



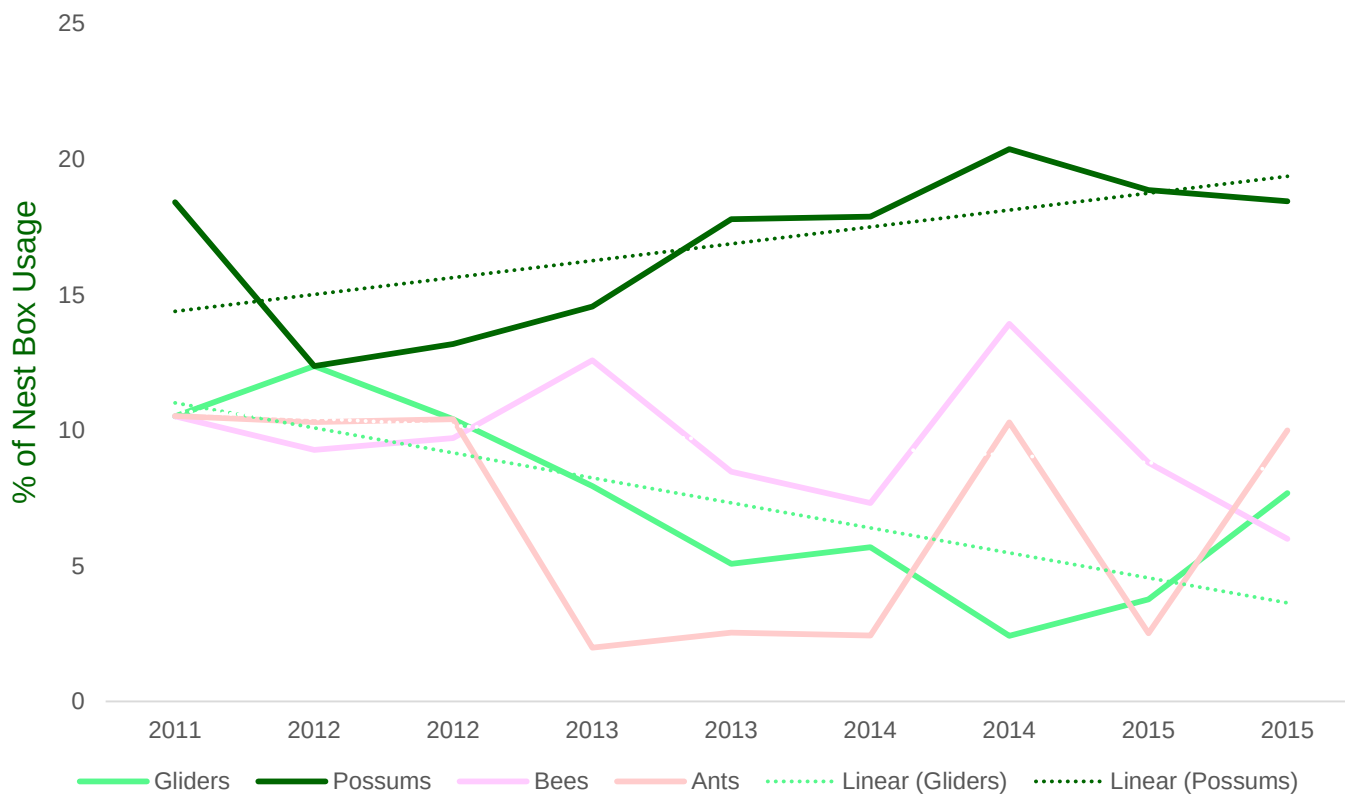
Holcim Quarry 2012-2015



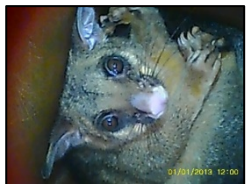
Trends in Gliders and Possum Occupancy



Trends in Gliders and Possum Occupancy – Influence of native bees and ants



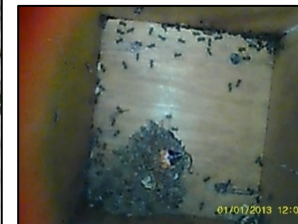
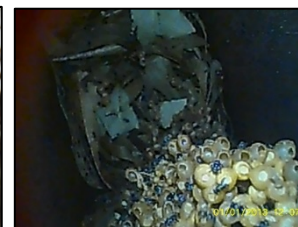
Competition



Boxes with no lids	Glider boxes
21 (10.71%)	11



Occupant	No. of boxes used	Glider Boxes
Ants	20	10
Native Bees	13	11



More than 1/3 of glider boxes were unsuitable for gliders to occupy



So.....

- Ensure nest box lid's are well attached
- Install multiple glider boxes to allow for non-target species
- Install nest boxes in a north, north-east orientation, at 6 metres or higher on a smooth bark eucalypt!
- Provide a mix of box types to provide habitat for a range of hollow dependent wildlife
- Monitor nest boxes



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