



Albury Conservation Company



# Squirrel Glider Monitoring Program – Thurgoona / Wirlinga (NSW) Spring 2019 Report For Albury Conservation Company

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### 1 Introduction

DM Ecological (DMEco) was engaged by Albury Conservation Company (ACC) in April 2019 to implement Year 2 of a Squirrel Glider Monitoring Program (SGMP) in the greater Thurgoona / Wirlinga area of New South Wales (NSW), after implementing Year 1 of the SGMP throughout 2018.

The SGMP has the following aims:

- To determine the impact of urbanisation on Squirrel Glider (*Petaurus norfolcensis*) populations within key 'stronghold' patches (as indicated in previous studies).
- To evaluate the effectiveness of management actions designed to improve the persistence of Squirrel Glider populations in 'lower quality' patches.
- Engage the community in the protection and enhancement of Squirrel Glider populations by providing avenues to participate in monitoring and restoration works.
- Maintain a strong base program but be amenable to incorporating complementary research projects as funding and opportunities become available.

The wildlife surveys were carried out in September – November 2019 using motion sensing cameras as the primary method. Thirty motion sensing cameras were provided by ACC to undertake the SGMP. Post each monitoring period, data conveying the locations of detected Squirrel Gliders and other threatened species will be uploaded to the Atlas of Living Australia where it will become publicly accessible and hopefully contribute to sound decision making in managing threatened species in the region.

A total of 68 sites have now been monitored at least once across the four SGMP monitoring periods so far; Winter 2018, Spring 2018, Autumn 2019 & Spring 2019. Squirrel Gliders have been detected at 45 of these sites – 66% of sites monitored. The overall detection rate has decreased slightly from 32% in the Autumn 2019 survey, to 30% in Spring 2019 survey.

#### 1.1 Survey Area

Thurgoona is an outer suburb of the regional city of Albury in southern NSW, Australia. Wirlinga is a rural area which borders Thurgoona in the west and Lake Hume in the east. The SGMP was implemented across the greater Thurgoona / Wirlinga area from the Murray River at the south to Ettamogah at the north.

#### 1.2 Experimental design

ACC identified 85 potential survey sites for the SGMP in the survey area and classified these according to the broad habitat type at each site. This was done via a mix of desktop and site assessments. The 85 potential sites are a mix of public and private land and zoned as one of urban, rural or proposed development. Each site was required to be a minimum of 5ha in size. Figure 1 (page 7) shows the identified sites of each habitat type and land use type. The three sites east of the Hume Freeway were not a part of any zone overlays.



Figure 1: Squirrel Glider Monitoring Program (SGMP) potential survey sites by classification

#### 1.3 Personnel

The assessment was undertaken by Ecologist Dylan McWhinney. Dylan is an experienced wildlife ecologist with expertise in the development and implementation of flora and fauna surveys throughout Eastern Australia. Dylan has worked on threatened species projects in Victoria, Queensland and New South Wales and specifically targeted Squirrel Gliders in all three states. He has performed capture and relocation roles on the clearing fronts of multiple large-scale development projects and is a licensed wildlife controller. Dylan holds a Bachelor of Environmental Science (Wildlife and Conservation Biology), is a Member of the Environmental Institute of Australia and New Zealand (MEIANZ) and is a Certified Environmental Practitioner (CEnvP) as administered by the Institute.

#### 1.4 Methodology

The primary method of survey for the SGMP was the use of 30 motion sensing wildlife cameras as provided by ACC. The cameras utilised are the Little Acorn LTL-5610 Series. They can take 12MP High Definition images and store up to 12GB of data. The zero-glow technology makes them ideally suited for monitoring nocturnal species. The cameras were deployed arboreally at a height range of 3-10m depending on tree suitability, target area, reach, safety and potential for theft of cameras.

Cameras were typically placed on an auxiliary branch/limb facing a target area on the main trunk or another branch/limb with significant surface area. Distance from camera to target area varied from 0.5-2m. Care was taken to minimise the likelihood of leaves triggering images, however this is a common occurrence when utilising motion sensing cameras in an arboreal survey.

With the camera installed, the target area on the tree was sprayed with an attractant mix comprised of water, honey and sugar to provide a scent lure and improve the likelihood of detecting the target species at each location. Figure 2 (page 9) demonstrates a typical camera installation.

Basic data was captured at each initial site visit, including Site ID, Camera ID, Tree Species, Approximate Height (meters), Tree Circumference (cm) and a waypoint taken using Garmin Etrex 10 Global Positioning System (GPS).

During the Spring 2019 monitoring period, DM Eco also undertook opportunistic bird observations with the view to record threatened species, as directed by ACC. The bird surveys provide an opportunity to identify and record other threatened species in the Thurgoona / Wirlinga region and contribute the data to publicly accessible data bases (Atlas of Living Australia), where it will provide value in planning assessments or other population monitoring/ distribution research. Birds were recorded after being directly observed or identified via their call.



Figure 2: Camera installed in River Red Gum (Eucalyptus camaldulensis) with target being adjacent limb.

# 1.5 Limitations

During project inception, the target number of sites for monitoring in each period was set at 68. In Spring 2019 63 sites were monitored. This was due the remaining sites being inaccessible for one of the following reasons:

- Landholders not contactable for access permissions (11 Sites)
- Landholders contactable but not willing to participate in the SGMP on their property (4 Sites)
- Site already cleared of habitat and an active construction development site (2 Sites)

Seventeen sites that were not able to be monitored during Spring 2019 are identified in Figure 3 (page 8)



Figure 3: Sites not able to be monitored during Spring 2019 are circled in red

# 1.6 Timing

The monitoring occurred over three separate periods during September - November 2019. They were:

- Monitoring Period 1: 21st September 5th October
- Monitoring Period 2: 6th October 16th October
- Monitoring Period 3: 15<sup>th</sup> November 25<sup>th</sup> November

Analysis of captured images occurred throughout January 2020.

#### 2 Results

#### 2.1 Squirrel Glider Detections

Of the 63 sites monitored during Spring 2019, Squirrel Gliders were positively identified at 19 of those sites, with a detection rate of 30%. This detection rate has continued to decline over the four monitoring periods since the project inception (Table 1 - below). This is not to say that Squirrel Gliders were not present at the remaining sites, just that they were not detected during this monitoring period. It should also be noted that some of the cameras at these sites captured images of arboreal mammals, but it was not possible from the features identifiable in the images to determine whether the animal was indeed a Squirrel Glider or another species. As such, these sites were not detemed to have detected Squirrel Gliders as there was not enough evidence to support an entry into the Atlas of Living Australia database. Some examples of these images are provided in Figures 4 – 6 (pages 10-11).

Monitoring Period	Sites Monitored	Sites with Squirrel Glider Detections	Detection Rate	Trend
Winter 2018	65	26	40%	N/A
Spring 2018	64	21	33%	<b>↓</b>
Autumn 2019	62	20	32%	Ļ
Spring 2019	63	19	30%	Ļ

Table 1: Squirrel Glider detection rates across four monitoring periods since the program was implemented.



Figure 4: Partial tail image – species not identified





Figure 6: Partial tail image – species not identified



A map displaying the location of the 63 deployed cameras is shown in Figure 7, below.

Figure 7: Deployed camera locations



A map displaying 20 sites with Squirrel Glider detections is shown in Figure 8, below.

Figure 8:Squirrel Glider detections (with Site ID)

#### 2.2 Habitat and Land Use Type

Over the course of the first three monitoring periods (Winter 2018, Spring 2018 and Autumn 2019) there had been a downward trend in detection rates in each habitat type, except for riparian sites, which had a sharp increase in detection rates (a 6% increase to 43%) from Spring 2018 to Autumn 2019. In the Spring 2019 period, riparian detection rates declined after the previous increase (43% down to 24%) whilst detection rates at remnant sites experienced a significant increase (27% up to 44%). Revegetation and roadside habitat type detection rates have continued their downward trend since the initial monitoring period (Winter 2018) (Figure 9, below).



Figure 9: Squirrel Glider detection rates according to each vegetation type across each monitoring period

The drop in riparian site detections is due to the nil detections from riparian sites in the rural land use setting during Spring 2019. This combined with the continued lack of detections in riparian sites in the urban setting since monitoring commenced, may suggest some restriction in Squirrel Glider use of riparian habitat in the study area in general and warrant further investigation.

No Squirrel Gliders were detected in roadside vegetation in the proposed development land use type during Spring 2019. Until now, roadside habitat sites had accounted for detections across all land use types. Remnant habitats continue to the primary source of detections in the urban land use type area, likewise with revegetation habitats in the rural land use type area (Figure 10, next page).



Figure 10: Squirrel Glider detection rates of each habitat type according to land use type for the Spring 2019 monitoring period.

The actual number of Squirrel Glider detections has been tracked over each of the monitoring periods to give a visual representation of the habitat type in each land use area where Squirrel Gliders are recorded (see Figure 11, next page).



Figure 11: Squirrel Gliders detected across each monitoring period according to habitat type and land use type

#### 2.3 Camera Height

Squirrel Gliders have been detected at every height throughout the range monitored from 3m to 10m high during each monitoring period so far. There has been a general upward trend in glider detection rates when the camera is placed higher in the tree, particularly above 8m in height. This trend has been similar across the four monitoring periods as shown in Figure 12, below.



Figure 12: Squirrel Glider detection rates (%) at each height (m) across each monitoring period.

It should be noted that fewer trees have been monitored in the 8+ meter height range due to availability and accessibility of suitable target areas within specified sites. Only one tree has been monitored at 10m high (Site 30), which has had a positive Squirrel Glider detection in each monitoring period, hence the 100% detection rate at the 10m height range. The trend of increased detection rates above 8m in height is noticeable when the average detection rate at each height across the three monitoring periods is displayed as per Figure 13 below.



Figure 13: Average Squirrel Glider detection rate (%) at each height (m) across each monitoring period.

#### 2.4 Tree Species

In Spring 2019, 11 different tree species were monitored, and Squirrel Gliders were detected in 9 of them. This is a decrease from 10 of 11 tree species recording Squirrel Gliders in the previous monitoring period, Autumn 2019. The species to not record a detection from Autumn to Spring in 2019 was Grey Box (*Eucalyptus microcarpa*), at a roadside habitat site in the urban land use area. It is worth noting that this site is being encroached by development, with new roads and housing lots being constructed within 20m of the target tree. Detection rates for each tree species during the Spring 2019 monitoring period are displayed in Figure 14, below.



Figure 14: Squirrel Glider detections according to tree species in Spring 2019

Average detection rates per tree species across the four monitoring periods is shown in Figure 15, below:



Figure 15: Average Squirrel Glider detection rates per tree species across each monitoring period

#### 2.5 Detection Tracking

Positive identifications were recorded at 27 of the 65 sites monitored during Winter 2018, 21 of the 64 sites in Spring 2018, 20 of 62 sites in Autumn 2019 and 19 of 63 sites in Spring 2019. Images from each of the sites detecting Squirrel Gliders in Autumn 2019 can be seen in Appendix A.

The number of detection nights per site from across each monitoring period so far is displayed in Figure 16 (next page). Squirrel Gliders were detected up to seven of the ten monitoring nights at some sites and as few as one night at others. So far, only 4 of the 68 total sites monitored have detected Squirrel gliders across all four survey efforts (Winter and Spring 2018 and Autumn and Spring 2019). This data may enable future monitoring at these sites to identify changes in population density, distribution and other characteristics.



Figure 16: Number of Squirrel Glider detection nights at each site across all surveys to date.

#### **3** Other Fauna Species

Several other non-target fauna species were detected using the motion sensing cameras during the monitoring period, none of which are listed under Commonwealth or State conservation legislation. Non-target species detected included:

- Common Brushtail Possum (Trichosurus vulpecula)
- Common Ringtail Possum (Pseudocheirus peregrinus)
- Tawney Frogmouth (Podargus strigoides)
- Australian Owlet-nightjar (Aegotheles cristatus)

#### 3.1 Monitoring Site Tracker

A site monitoring tracker has been developed to show which sites have been monitored during each monitoring period. So far, 68 sites have been monitored across the three monitoring periods and there are another 13 potential sites which have been identified but not yet monitored (Section 1.4 – Limitations). The sites which have not been monitored have not yet been assigned a Site ID and as such are not included in the tracker. It is the objective of the SGMP to include these sites in future where possible.

The following omissions have occurred in each monitoring period due to the limitations discussed in Section 1.5.

- Omitted Winter 2018 Sites 67, 68
- Omitted Spring 2018 Sites 4, 53, 59, 62
- Omitted Autumn 2019 Sites 14, 53, 59, 62, 66, 68
- Omitted Spring 2019 Sites 14, 53, 59, 62, 66

#### 3.2 Woodland Birds

Bird species observations were recorded at SGMP sites as described in Section 1.4 Methodology. These observations produced common species at all sites monitored, as per the species list in Table 2 (page 25). A total of 38 bird species were recorded with one of those being a non-native species (House sparrow).

Bird Species		
Common Name	Scientific Name	
Australian Magpie	Cracticus tibicen	
Australian Raven	Corvus coronoides	
Australian Reed Warbler	Acrocephalus australis	
Australian White Ibis	Threskiornis molucca	
Australian Wood Duck	Chenonetta jubata	
Black-faced Cuckoo-shrike	Coracina novaehollandiae	
Blue-faced Honeyeater	Entomyzon cyanotis	
Blue-winged Parrot	Neophema chrysostoma	
Crested Pigeon	Ocyphaps lophotes	
Crimson Rosella	Platycercus elegans	
Common Starling	Sturnus vulgaris	
Eastern Rosella	Platycercus eximius	
Galah	Eolophus roseicapillus	
Grey Shrike-thrush	Colluricincla harmonica	
Grey Teal	Anas gracilis	
House Sparrow*	Passer domesticus	
Laughing Kookaburra	Dacelo novaeguineae	
Magpie-lark	Grallina cyanoleuca	
Masked Lapwing	Vanellus miles	
Nankeen Kestrel	Falco cenchroides	
Noisy miner	Manorina melanocephala	
Pacific Black Duck	Anas superciliosa	
Pied Currawong	Strepera graculina	
Pied Butcherbird	Cracticus nigrogularis	
Purple Swamp Hen	Porphyrio porphyrio	
Red-browed Finch	Neochima temporalis	
Red Wattlebird	Anthochaera carunculata	
Red-rumped Parrot	Psephotus haematonotus	
Restless Flycatcher	Myiagra inquieta	
Sulphur-crested Cockatoo	Cacatua galerita	
Superb Fairy-wren	Malurus cyaneus	
Welcome Swallow	Hirundo neoxena	
White-browed Babbler	Pomatastomus superciliosis	
White-faced Heron	Egretta novaehollandiae	
White-plumed Honeyeater	Lichenostomus penicillatus	
White-throated Treecreeper	Cormobates leucophaea	
White-winged Chough	Corcorax melanorhamphos	
Willie Wagtail	Rhipidura leucophrys	

Table 2: Species list compiled from targeted bird surveys across the SGMP area in Spring 2019.\*Indicates non-native species.

#### 4 **Discussion**

A total of 68 sites have now been monitored at least once across the four SGMP monitoring periods so far; Winter 2018, Spring 2018, Autumn 2019 and Spring 2019. Squirrel Gliders have been detected at 48 of these 68 sites – 70% of sites monitored. The overall detection rate has been slowly declining over the life of the project, down 2% (32% to 30%) from the previous monitoring and down 10% (40% -to 30%) since the first monitoring period (Winter 2018).

Remnant sites were the only habitat type to see an increase in detection rates form the previous period, with riparian site detection rates falling after an increase in the Autumn 2019 monitoring period. There were no Squirrel Glider detections made in riparian habitats in either the urban or rural land use types. Possible pressures influencing Squirrel Glider presence in riparian areas could include water scarcity due to ongoing drought, continued reduction in availability of resources (competition with other hollow dependent fauna) due to surrounding land clearing. Possible pressures influencing Squirrel Glider presence in urban environments could include noise, light and domestic animals (although Squirrel Gliders have been recorded in the other habitat types in the urban land use area).

Squirrel Glider detection rates in revegetation and roadside habitat sites have continued to decline since the commencement of the monitoring program in Winter 2018. The preliminary data trends produced by the program to date justify continued monitoring to identify changes in population density, distribution and other characteristics.

Stags (dead trees) have continued to provide the highest detection rate over the four monitoring periods, highlighting their ecological importance in the landscape for hollow dependent species such as the Squirrel Glider. Retaining dead trees in the landscape should be of a high priority, particularly in landscapes undergoing urbanisation due to their habitat significance.

As well as two monitoring sites being cleared so far during the SGMP, another eight sites have been encroached by development since commencement of the SGMP. That is, these sites have been partially cleared or immediately adjacent land has been cleared with developments underway. There are still difficulties accessing proposed monitoring sites in the Wirlinga area, particularly in the east towards Lake Hume. This is due to landholders being either uncontactable or not amenable to the monitoring occurring on their properties (as discussed in Section 1.4 of this report). If the SGMP could include those sites not yet monitored in future surveys, a greater understanding of the species distribution on a regional scale may be obtained. This would ensure that the SGMP has covered the largest possible survey extent and has some relevant baseline data with which to plan, implement and analyse future monitoring efforts with the aim of protecting important Squirrel Glider habitat from urbanisation.

The survey methodology and extent would appear to be adequate at this point in time. Cameras being deployed for 10 nights allows for some variation in home range foraging by Squirrel Gliders as well as short term weather events which may impact foraging behaviour. There have been instances of weather events (high wind gusts) over a period of nights that have resulted in no Squirrel Glider detections, however there were detections either side of the weather event. For this reason, it is recommended camera deployment remain at 10 nights. A recommendation made in previous SGMP reports was to extend the SGMP geographically into the City of Wodonga (Vic) aligning with the intent of the Regional Natural Environment Strategy (RNES) as well as to target additional threatened species. Albury Conservation Company has seen this recommendation has come to fruition via a grant from RE Ross Trust and a partnership with Wodonga Council. This project will address the scarcity of baseline data for endangered species in Wodonga Councils major urban growth areas, for the purpose of empowering the community to maintain viable populations of endangered species. The project will establish a strategic landscape-scale monitoring program to collect baseline data for endangered species in Wodonga over three years. It will expand the monitoring program we have been implementing since 2018 in Albury's major urban growth area. Expansion into a cross-border program strongly aligns with the RNES currently being developed by Albury and Wodonga councils.

#### 5 **Recommendations**

- 1. To extend the SGMP to include yet to be monitored sites in Thurgoona /Wirlinga in future surveys to obtain even greater understanding of the species distribution on a regional scale.
- 2. To continue the current monitoring methodology, including motion-sensing cameras being deployed for 10 nights per site.
- 3. For the data collected to be pro-actively used by key stakeholders, particularly Albury City Council in the urban planning/ development application process, as well as other stakeholders engaged in on ground conservation activities.

#### 6 Acknowledgements

DM Ecological would like to thank the following people and organisations for their ongoing involvement in implementing the SGMP:

Albury Conservation Company, particularly Sam Niedra (Co-ordinator) and Dr. Damian Michael (Board Director) for their assistance in obtaining background information, permits and approvals, contacts and support throughout, including peer review of this report.

Albury City Council for their assistance in land access and supply of GIS data.

Murray Local Land Services and NSW Department of Industry - Lands for their access to crown reserves and Albury Environmental Lands (AEL).

Albury Conservation Company would also like to acknowledge funding gratefully received from:

- Albury City Council to support implementation of the program for three years until 2020/21.
- Wettenhall Environment Trust for providing a small grant to help purchase motion sensing cameras specifically for the monitoring program.
- Donations from members of the public via our 2017 Edge Pledge crowdfunding campaign, used to purchase motion sensing cameras.

This research has been approved by the Charles Sturt Animal Care and Ethics Committee (Protocol number A18021) under NSW Office of Environment and Heritage scientific licence (SL102071) and Department of Crown Lands combined licence (RI596463).



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# Appendix A - Detection Images (Autumn 2019) by Site ID

Site 2 (Roadside). Yellow Box. 4m High



Site 3 (Remnant). River Red Gum. 5m High



Site 11 (Remnant). Spotted Gum. 6m high



Site 12 (Revegetation). Blakely's Red Gum. 3m high



Site 13 (Roadside). River Red Gum. 5m high



Site 13 (Remnant). Stag. 5m high



Site 26 (Remnant). Yellow Box. 9m high



Site 28 (Remnant). River Red Gum 7m high



Site 29 (Remnant). White Box. 8m high







07TF021 BC2010/16 20 39 33Site 33 (Revegetation). River Red Gum. 7m high



Site 37 (Revegetation). Red Ironbark. 4m high





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 Site 42 (Riparian). River Red Gum. 6m high



Site 44 (Riparian). Long Leaf Box. 5m high





Site 49 (Revegetation). Red Box. 6m high



Site 57 (Revegetation). Stag. 9m high