Squirrel Glider Monitoring Program – Thurgoona / Wirlinga

Spring 2018 Report

For Albury Conservation Company

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Revision Modification Log

Rev	Section	Description of Modification	Reason
1	2.4	Added Section to include Monitoring Tracker	Relevance
2	1.2	Added Section to Separate Survey Design from Survey Area	Client Request
	1.2	Changed Figure 1 map to include land use type	Client Request
	2.2.1	Added Table 1 to include land use type data	Client Request
	3	Added assessment of survey adequacy.	Client Request

Table of Contents

List of Figures

Abbreviations

Abbreviation	Description
ACC	Albury Conservation Company
AEL	Albury Environmental Lands
CEnvP	Certified Environmental Practitioner
GPS	Global Positioning System
DMEco	DM Ecological
MEIANZ	Member of the Environmental Institute of Australia and New Zealand
SGMP	Squirrel Glider Monitoringt Plan

1. Introduction

DM Ecological (DMEco) was engaged by Albury Conservation Company (ACC) in April 2018 to implement Year 1 of a Squirrel Glider Monitoring Program (SGMP) in the greater Thurgoona – Wirlinga area of New South Wales (NSW). 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 Winter and Spring 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.

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 were a mix of public and private land and zoned as one of urban, rural or proposed development. Figure 1 (next page) 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.

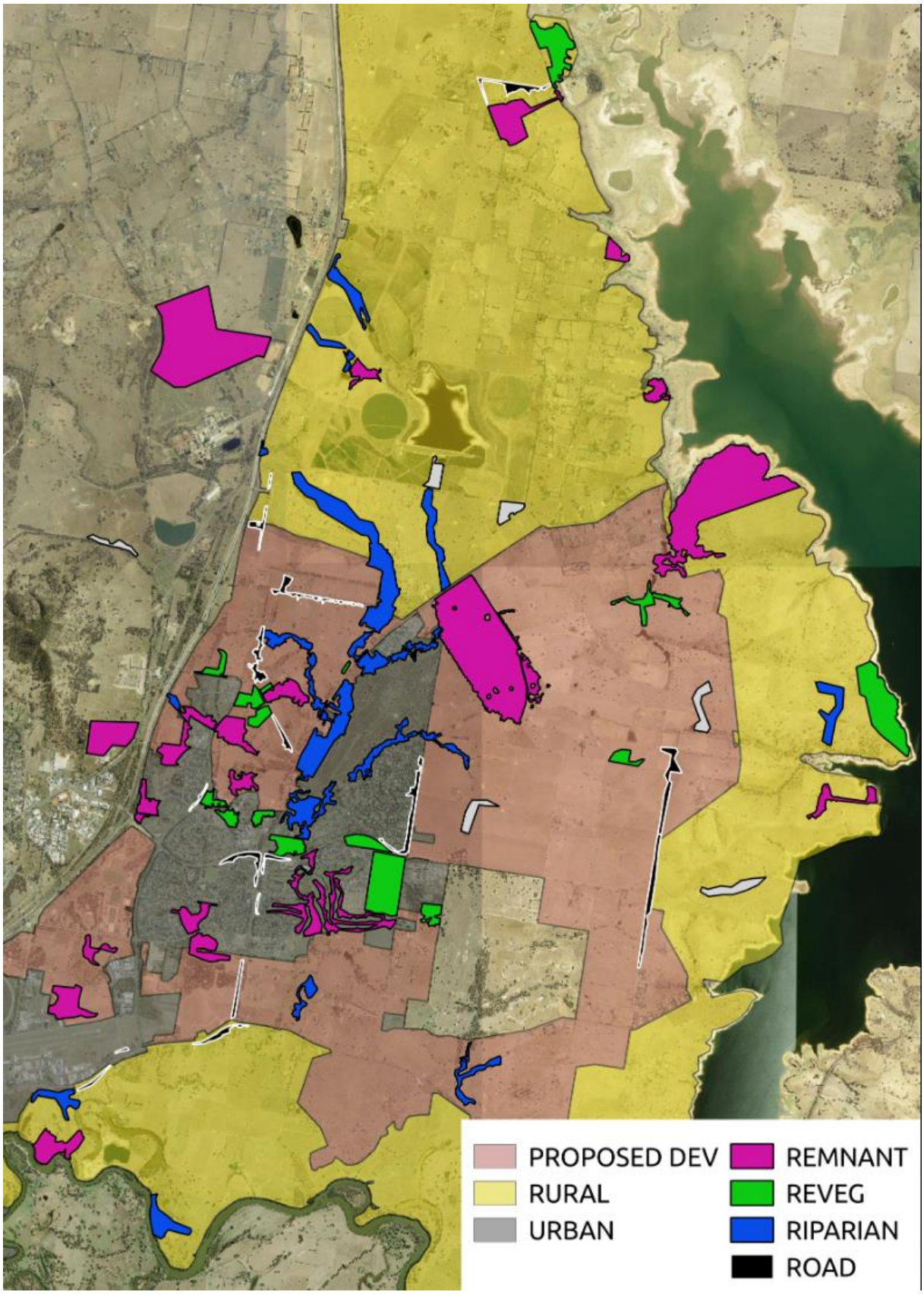


Figure 1: Squirrel Glider Monitoring Program (SGMP) potential survey sites by classification

1.3 Personnel

The assessment was undertaken by Ecologist Dylan McWhinney. Dylan is an experienced wildlife ecologist with skills 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 targeted Squirrel Gliders specifically 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 form 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 (next page) demonstrates a typical camera installation.

Basic data was captured at each site 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).

Supplementary data including vegetation quality assessments and bird surveys was collected at 35 monitoring sites throughout the Spring 2018 monitoring period, thanks to funding from Murray Local Land Services (MLLS). This data can be viewed in the *Squirrel Glider Monitoring Program – Supplementary Bird and Vegetation Quality Survey Report* (DM Ecological, 2018).

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

In addition to the use of motion sensing cameras, nearby nest boxes were physically inspected for use/ occupation where it was feasible from a time and accessibility perspective. Squirrel Gliders were detected in three nest boxes. Another was unoccupied but showed evidence of recent occupation (leaf nest – still green). These boxes were located between sites 23 and 24 (refer Figure 8 – page 16) in Thurgoona. The nesting Squirrel gliders and unoccupied nest are displayed in Figure 3 (next page).

Figure 3: Nest boxes occupied with Squirrel Gliders and showing leaf nest.

1.5 Limitations

Significant weather events occurred in each of the three monitoring periods during Spring 2018 which resulted in huge amounts of images captured due to rain and wind movements. Specifically, the following weather events impacted the SGMP.

- 20th October 2018 – Wind gusts to 59km/hr
- 2nd November 2018 – Wind gusts to 67Km/hr
- 5th November 2018 – Wind gusts to 57km/hr

Weather data sourced from Commonwealth of Australia, Bureau of Meteorology 2018 (www.bom.gov.au). A full transcript of Daily Weather Observations for October - November 2018 in the Albury-Wodonga region is provided in Appendix A.

The target number of sites for monitoring in each period was set at 68. In Spring 2018 only 64 sites were monitored. This was due the remaining sites being inaccessible for one of the following reasons:

- Landholders not contactable for access permissions (10 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 (1 Site)

Fifteen sites that were not able to be monitored during Spring 2018 are identified in Figure 4 (page 12).

Two additional sites from outside the original scope were able to be established and monitored to account for some of the inaccessible sites.

An original aim of the SGMP was to utilise local community members in the analysing of captured images. It was originally intended to be done online via citizen science website Zooniverse (https://www.zooniverse.org) however it proved problematic uploading over 500,000 12MP images due mainly to internet speeds. During the Spring 2018 monitoring period, a workshop was held at Charles Sturt University, Thurgoona where volunteers were guided through image analysis by DM Eco. Utilising a computer lab in the library, 12 volunteers were able to analyse images from 35 of the 64 sites monitored. All analysis was supervised and verified by DM Eco. The remainder of image analysis was undertaken by DM Eco.

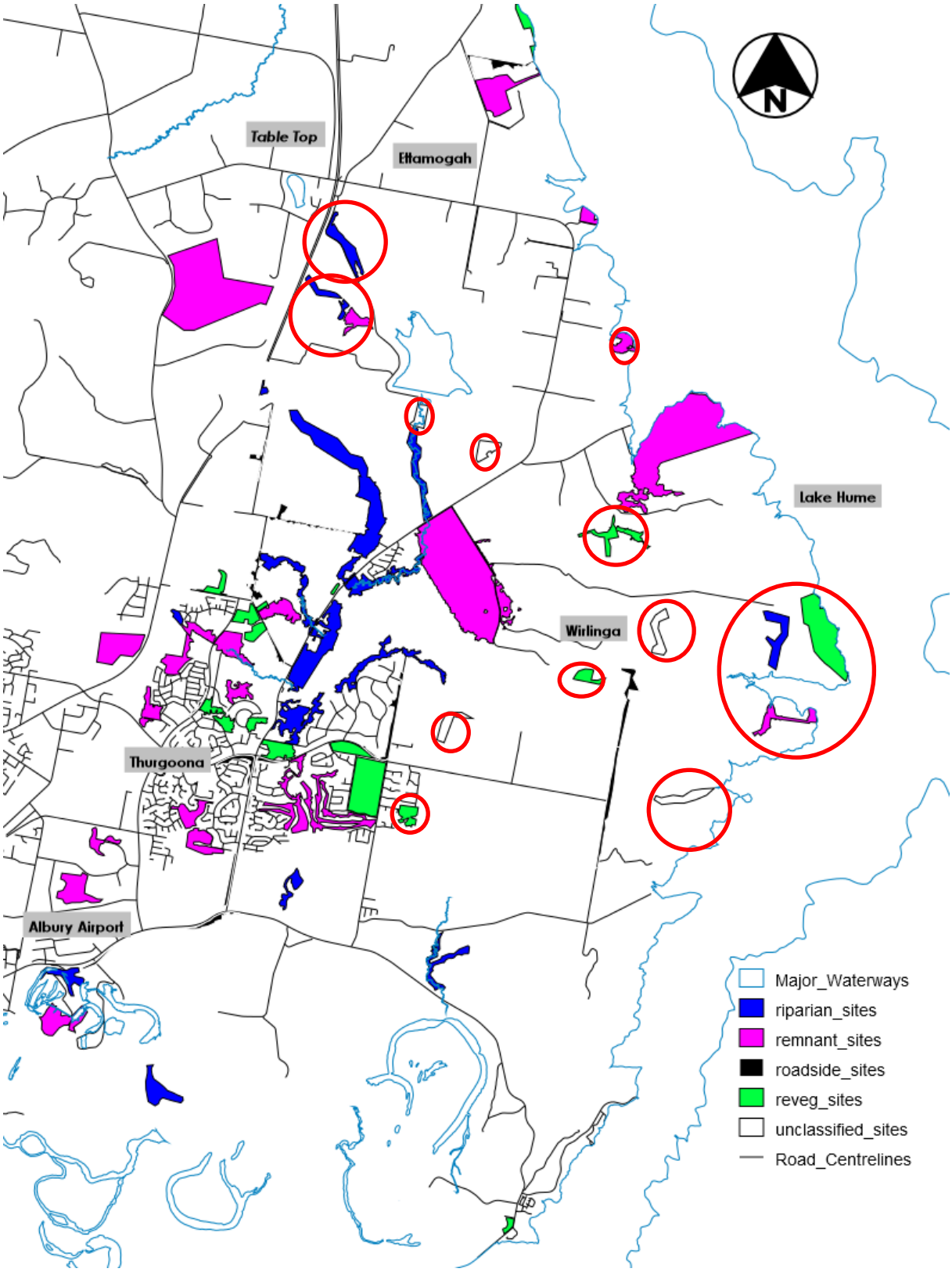


Figure 4: Sites not able to be monitored - Spring 2018.

1.6 Timing

The monitoring occurred over three separate periods during October - November 2018. They were:

- Monitoring Period 1: 13th October to 23rd October
- Monitoring Period 2: 24th October to 3rd November
- Monitoring Period 3: 4th November to 16th November

Analysis of captured images occurred throughout November and December 2018.

2. Results

2.1 Squirrel Glider detections

Of the 64 sites monitored during Spring 2018, Squirrel Gliders were positively identified at 21 of those sites, with a detection rate of 33%. The detection rate dropped from the 41.5% associated with the Winter 2018 monitoring period. This is not to say that Squirrel Gliders were not present at the remining 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 deemed 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 5 – 7, below.

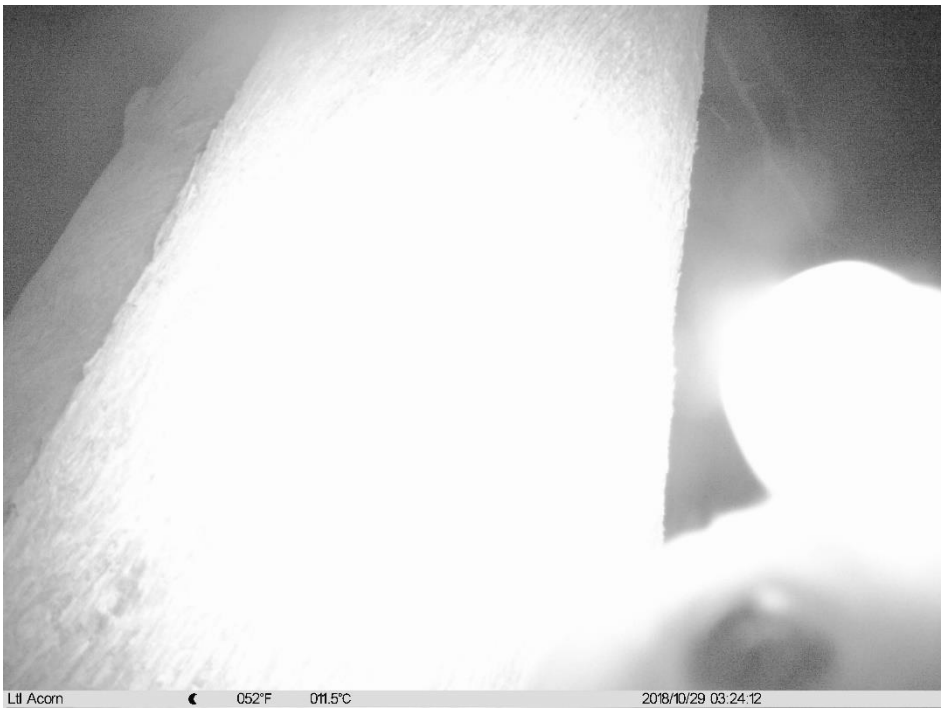


Figure 5: Image of partial eye and ear - species not identified.

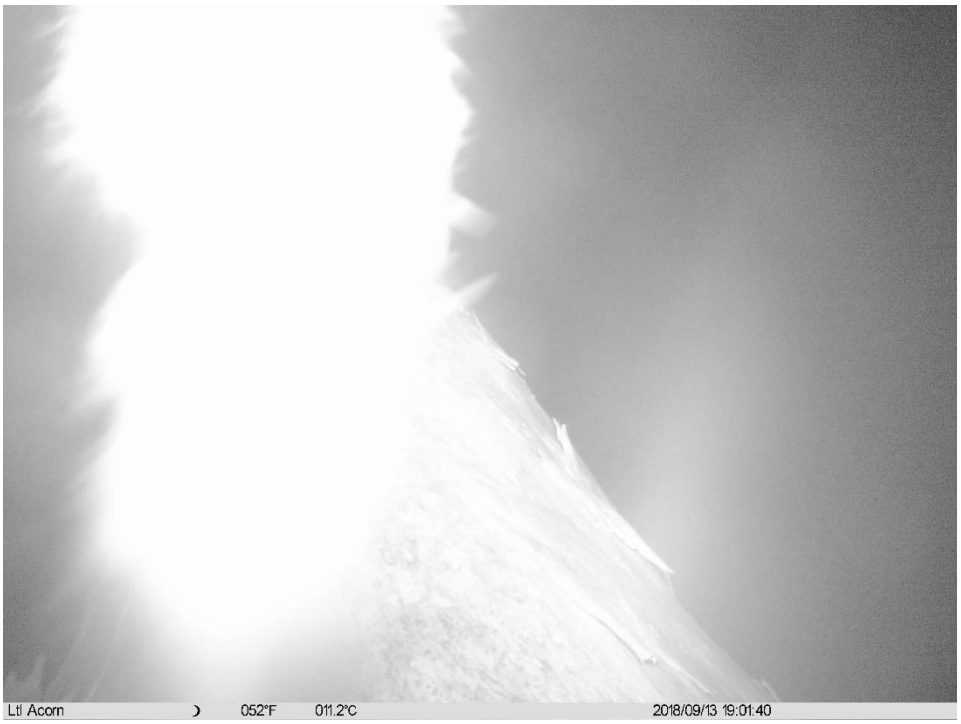


Figure 6: Image of partial tail/ abdomen - species not identified

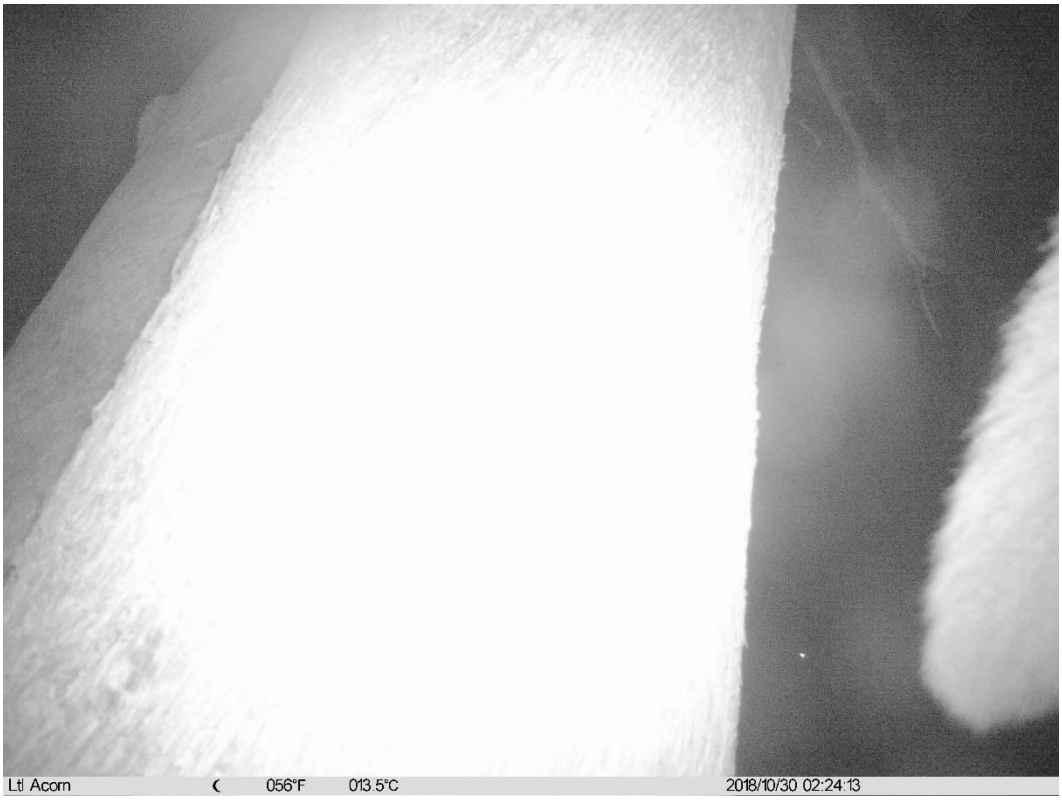


Figure 7: Partial tail - species not identified

A map displaying the location of the 65 deployed cameras and identifying those which had positive detections of Squirrel Gliders is shown in Figure 8, below.

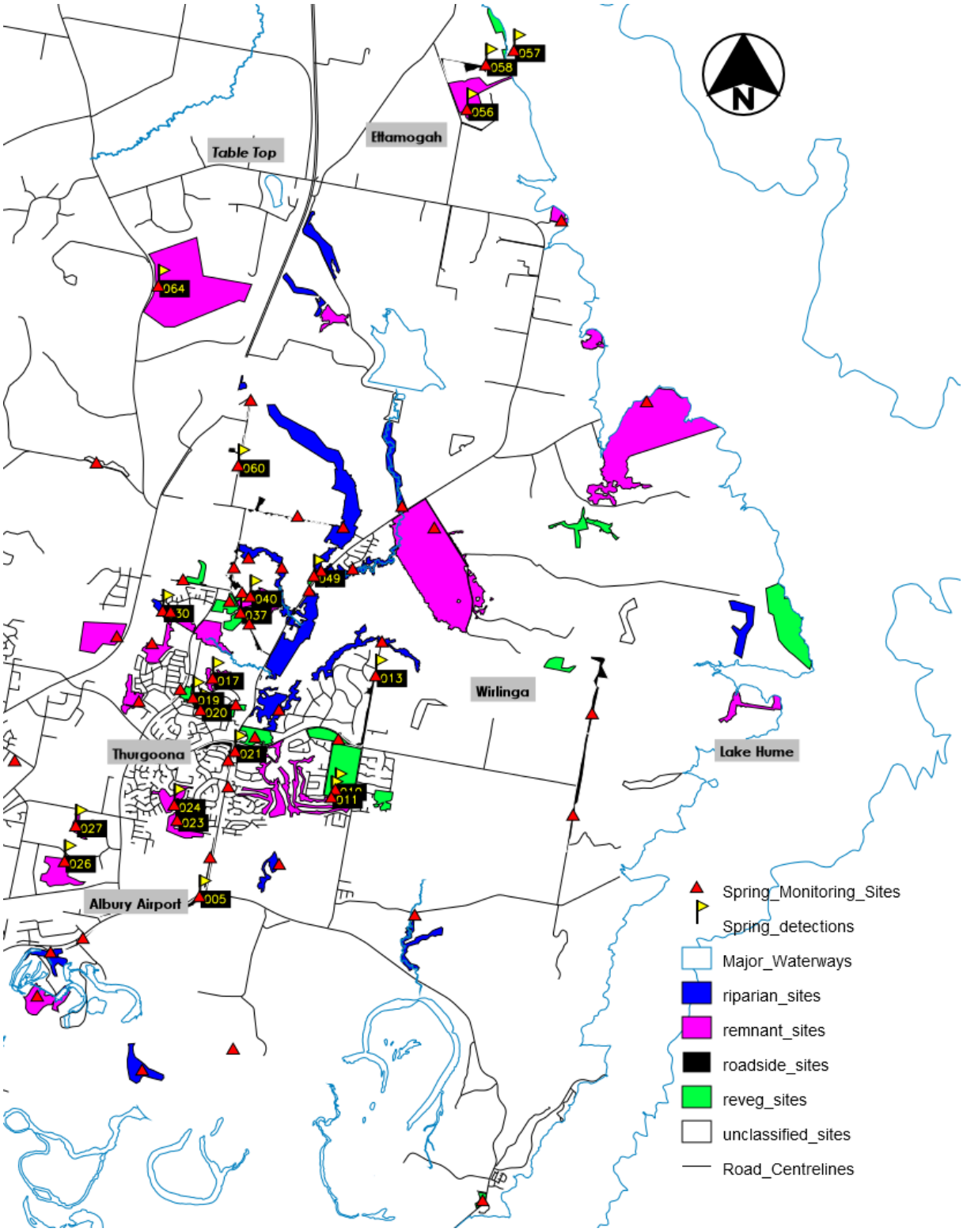


Figure 8: Deployed camera locations and Squirrel Glider detections (with Site ID)

2.2 Observations and Trends

2.2.1 Habitat Type

Of the 21 sites that had positive Squirrel Glider detections, few of these came from Riparian sites (1 detection from 15 sites) with detections occurring at only 6% of sites monitored. This is down from a 17% detection rate at riparian sites during the Winter 2018 monitoring period. Riparian sites had the lowest detection rate in both the Winter and Spring 2018 monitoring periods. Whilst detection rates in both remnant and revegetation patches remained similar from Winter to Spring, there was a significant decline in Squirrel Glider detecton rates in riparian and roadside patches. Figure 9 (below) displays the detection rates of each habitat type throughought both monitoring periods.

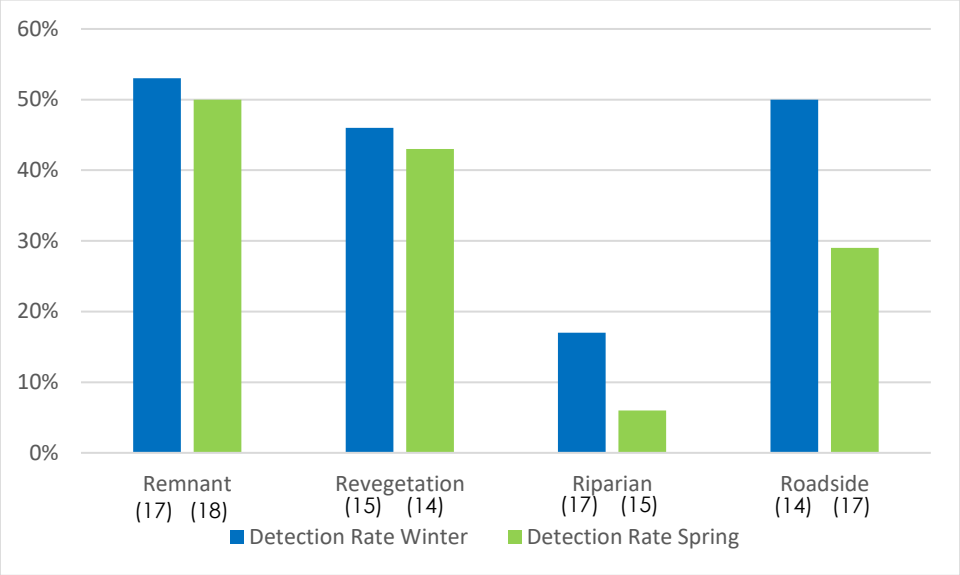


Figure 9: Squirrel Glider detection rates of each vegetation type across the Winter and Spring 2018 monitoring periods (Total sites monitored in brackets)

Squirrel Glider detections according to land use type as well as habitat type are displayed in the below table to provide further insight into the above detection rates.

Land Use Type	Urban		Rural		Proposed Development	
Habitat Type	Winter 2018	Spring 2018	Winter 2018	Spring 2018	Winter 2018	Spring 2018
Remnant	3	3	1	1	3	4
Revegetation	3	3	2	1	2	2
Riparian	0	0	1	1	2	1
Roadside	3	2	2	2	2	0

Table 1: Squirrel Gliders detected in year one of monitoring plan by habitat type and land use type.

2.2.2 Camera Height

Squirrel Gliders were detected at every height throughout the range monitored from 3m to 10m high in both the Winter and Spring 2018 monitoring periods. Glider detection rate seemingly increased when the camera was placed at 6m or greater in height as shown in Figure 10 below. Further monitoring efforts will provide more data to determine any significant correlations in this area and to evaluate optimal camera trap placement.

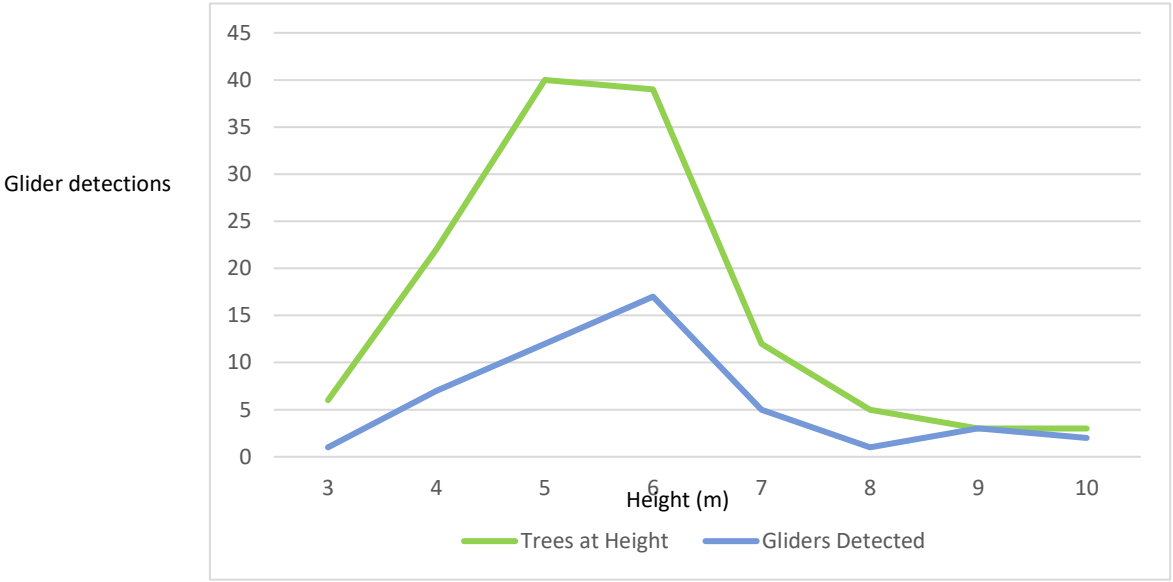


Figure 10: Squirrel Glider detections by height range

2.2.3 Tree Species

There were 13 different tree species monitored in Winter 2018 with Squirrel Gliders being detected in all but two species; Red Ironbark *(Eucalyptus sideroxylon)* and Manna Gum *(Eucalyptus viminalis)*. Figure 11 (below) demonstrates which tree species had better detection rates than others during that period.

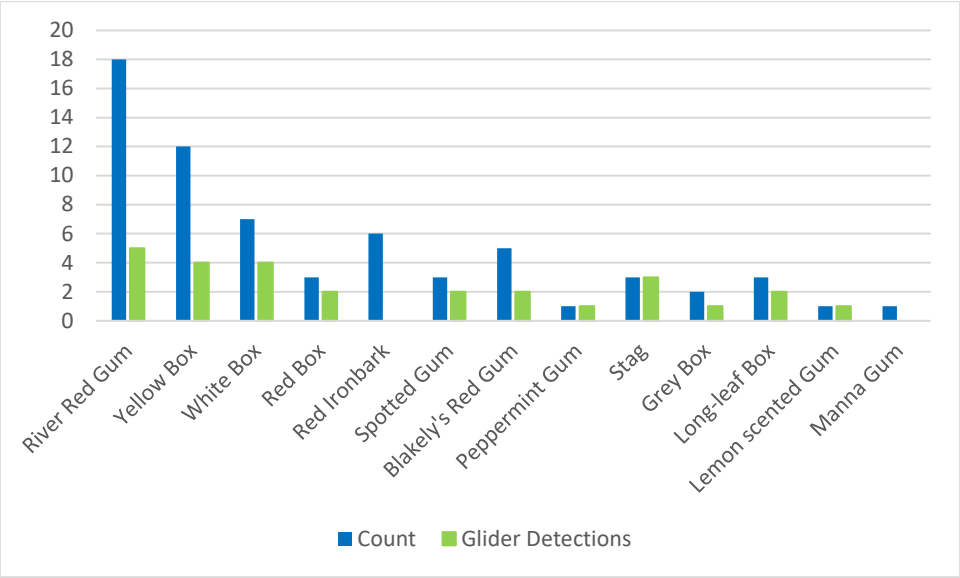


Figure 11: Squirrel Glider detections by tree species in Winter 2018

During Spring 2018, 12 species of tree were included in the monitoring program and Squirrel gliders were detected in nine of them. They were not detected in any Grey Box (*Eucalyptus microcarpa*), Lemon-scented Gum (*Corymbia citriodora*) or Peppermint Gum (*Eucalyptus nicholii*) trees during this period, having been detected in them in the previous monitoring period. Conversely, gliders were detected in Red Ironbark (*Eucalyptus sideroxylon*) trees this period, having not been detected in the during Winter. Figure 12 (below) demonstrates which tree species had better detection rates than others during the Spring period.

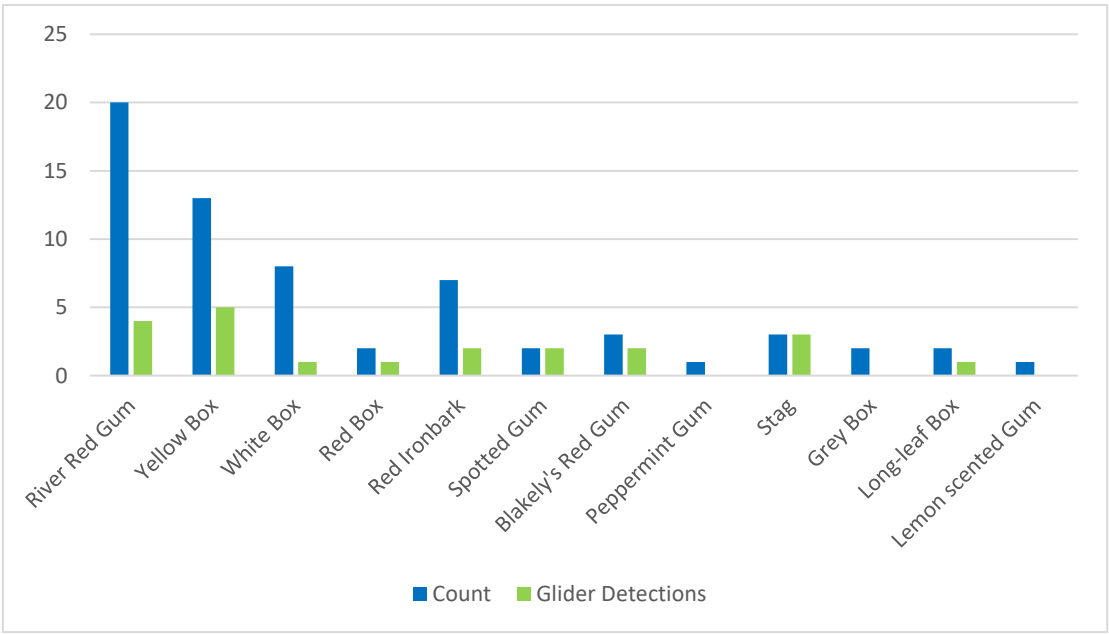


Figure 12: Squirrel Glider detections by tree species in Spring 2018

Positive identifications were recorded at 27 of the 65 sites monitored during Winter 2018 and 21 of the 64 sites in Spring 2018. Images from each of the sites detecting gliders in 2018 can be seen in Appendix B.

The number of detection nights per site from both Winter and Spring 2018 is displayed in Figure 12. Squirrel Gliders were detected up to eight of the ten monitoring nights at some sites and as few as one night at others. So far, only 11 of the 68 total sites monitored have detected Squirrel gliders across both survey efforts (Winter and Spring). This data may enable future monitoring at these sites to identify changes in population density, distribution and other characteristics.

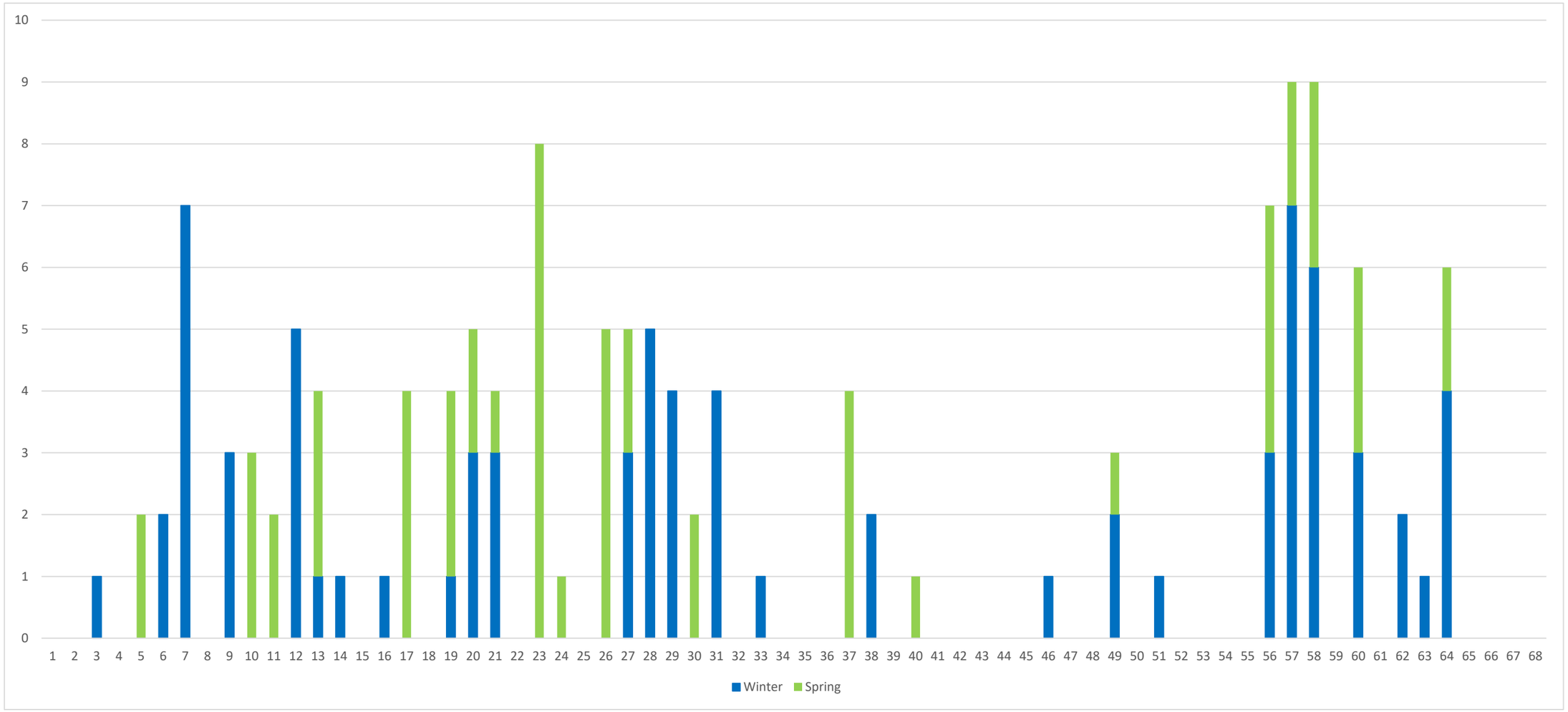


Figure 13: Number of Squirrel Glider detection nights at each site including both Winter and Spring survey data

2.3 Other Fauna Species

Several other non-target fauna species were detected during the monitoring period, none of which are listed under Commonwealth or State Conservation Legislations. Non-target species detected included:

- Australian Magpie (*Cracticus tibicen*)
- Blue-faced Honeyeater (*Entomyzon cyanotis*)
- Common Brushtail Possum (*Trichosurus vulpecula*)
- Common Ringtail Possum (*Pseudocheirus peregrinus*)
- Noisy Miner (*Manorina melanocephala*)
- Red Wattlebird (*Anthochaera carunculata*)
- White-plumed Honeyeater (*Ptilotula penicillatus*)
- Superb Fairy Wren (*Malurus cyaneus)*
- Willie Wagtail (*Rhipidura leucophrys*)

These were sightings from camera images only. All sightings recorded during the supplementary bird surveys can be seen in in the *Squirrel Glider Monitoring Program – Supplementary Bird and Vegetation Quality Survey Report* (DM Ecological, 2018).

2.4 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 two 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.

During year one of the SGMP all sites were monitored twice except for the below exclusions:

Omitted Winter 2018 – Sites 67, 68

Omitted Spring 2018 – Sites 4, 53, 59, 62

3. Discussion and Recommendations

Year one of the SGMP is now complete, with Squirrel Gliders detected at 37% of the sites monitored. Of some concern is the lack of gliders detected in Riparian habitats (detected at just 3 of 32 sites) as these areas would typically have the required resources to accommodate glider populations.

There was an obvious decrease in detections in Spring compared to the Winter survey effort, with a significant reduction in detections in roadside patches (50% detection rate in Winter compared to 28% in Spring). As spring is a common breeding time for many native hollow dependant species, it is possible that detections were lower due to gliders spending more time in the nest, tending to newborns. It is also possible that gliders were displaced by other hollow dependant species during their breeding/ nesting behaviour.

What is clear is that the Greater Thurgoona area is being developed at a rapid rate, and habitat loss and fragmentation has increased as a result. With developments now bordering on and in some cases encroaching these Riparian areas, it could be that competition from other hollow dependant species has resulted in Squirrel Gliders inhabiting other areas out of necessity.

One of the potential monitoring sites (previously identified as a revegetation site) situated just off Kerr Road, Thurgoona had largely been cleared of vegetation and was an active construction site at the time of monitoring (See Figure 13 below). With the rate of development witnessed during the year 1 of the program, it is expected that more of the 85 monitoring sites originally identified will be cleared before the SGMP is fully implemented (funded to 30th June 2021).

Figure 14: Monitoring site already cleared and under development

In both the Winter and Spring 2018 survey periods, there was very little monitoring done in the Wirlinga area, particularly in the east towards Lake Hume. This was 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).

The program would benefit from a targeted stakeholder engagement effort to:

a) Identify landholders who have not yet been contactable, and

b) Explain the SGMP, it's aims and its possible benefits to them in order to gain their approval for monitoring on their properties.

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 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 (Section 1.4 – Limitations and Appendix A) 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.

4. Acknowledgments

DM Ecological would like to thank the following people and organisations for their involvement in implementing year 1 of 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).

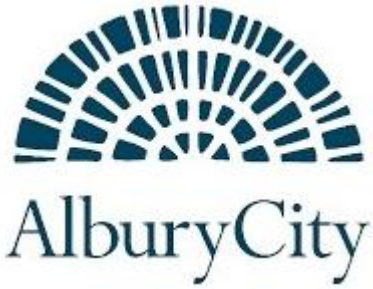
The people who volunteered in the implementing the SGMP in the field:

- Callum Crespan – Undergraduate, University of South Australia
- Nikita Cronyn – Undergraduate, La Trobe University

Those people who volunteered their time in the computer lab analysing images: Rhiannan Oates, Erika Cross, Geoff Hudson, Caroline de Koning, Trevor Osborne, Dionne Tommas, Claire Bremner, Matilda Terry, Ella Teuben

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 Environmental 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.



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DM Ecological, 2018, *Squirrel Glider Monitoring Program – Supplementary Bird and Vegetation Quality Survey Report*.

DM Ecological, 2018, *Thurgoona – Wirlinga Squirrel Glider Monitoring Program – Winter 2018 Monitoring Report*

Appendix A – October – November 2018 Daily Weather Observations for Albury-Wodonga

Albury-Wodonga
October 2018 Daily Weather Observations

Observations from Albury airport.

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Mo	3.0	22.9	0			ENE	22	16:01	13.1	66		SE	9	1028.6	22.6	33		SE	15	1024.2
2	Tu	5.9	25.6	0			ESE	19	10:49	15.9	54	1	E	6	1026.5	25.0	30	2	SE	13	1020.9
3	We	10.4	21.2	0			NNW	43	11:04	14.6	74	5	ESE	2	1017.2	15.9	98	8	SSE	11	1015.1
4	Th	11.9	21.4	23.6			S	31	18:29	15.5	70	7	SE	11	1017.5	20.4	59		SE	13	1015.0
5	Fr	11.7	21.2	0			SE	31	03:56	16.3	52		SE	17	1023.6	20.9	41		SSE	17	1021.1
6	Sa	5.6	22.8	0			W	26	13:01	14.1	60		ESE	7	1025.1	21.9	41		W	15	1020.4
7	Su	6.6	25.0	0			WNW	20	13:49	13.8	73		ENE	2	1023.9	23.4	36		WSW	11	1019.9
8	Mo	7.3	26.8	0			W	24	13:23	14.0	66		NE	4	1020.5	25.3	32		WNW	9	1016.1
9	Tu	10.5	22.0	0			SE	30	14:46	15.9	71		ESE	9	1014.7	20.3	57	2	S	15	1011.8
10	We	12.3	18.4	3.0			SE	57	09:57	13.2	77	8	SE	26	1016.3	17.0	49	3	SE	26	1016.8
11	Th	5.9	21.7	0			SE	33	23:50	12.2	51		SE	15	1022.9	20.2	35		SE	9	1020.7
12	Fr	4.5	23.1	0			NNE	31	21:24	11.9	71		Calm		1027.0	20.8	32		SE	17	1021.9
13	Sa	6.0	23.2	0			ENE	30	10:19	13.8	58		SE	17	1025.3	22.3	34	2	ENE	17	1020.9
14	Su	9.7	26.0	0			NE	35	10:53	14.4	71	5	SSE	2	1024.3	24.7	36	4	ENE	17	1020.3
15	Mo	10.3	28.4	0			NE	44	14:13	18.5	61		ESE	9	1022.3	27.4	31		NE	22	1017.6
16	Tu	16.3	24.5	0			W	44	18:33	22.1	51	5	NE	15	1018.0	18.7	94	8	SE	9	1016.4
17	We	14.0	22.2	3.6			W	26	18:34	15.7	94	8	Calm		1016.0	20.3	75	8	NNE	13	1013.7
18	Th	9.6	23.6	4.8			NNW	33	12:10	14.8	90	8	Calm		1017.0	22.3	49	8	NW	17	1015.3
19	Fr	8.1	27.4	0			SSE	26	13:59	15.3	76		ESE	6	1018.2	26.3	36		SE	13	1013.0
20	Sa	14.0	24.7	0			W	59	11:23	18.4	69		SE	6	1009.5	16.3	74	8	W	28	1011.3
21	Su	4.7	22.6	1.2			W	30	14:50	11.9	72		S	9	1019.3	20.9	36		SE	7	1015.8
22	Mo	5.6	25.6	0			SE	22	13:30	14.0	69		E	4	1018.1	24.3	32		ESE	11	1014.5
23	Tu	8.9	31.0	0			WNW	46	13:07	14.6	70		NE	6	1013.6	29.5	16		W	26	1009.4
24	We	7.1	24.6	0			SE	28	08:35	15.4	52		SE	20	1019.7	23.4	28		WSW	13	1017.6
25	Th	7.4	26.7	0			W	31	18:18	14.8	62		SE	7	1020.1	25.2	29		SW	17	1015.4
26	Fr	7.3	26.0	0			W	39	14:04	15.8	58		ENE	6	1017.5	25.1	20	1	WNW	24	1014.6
27	Sa	6.8	26.1	0			W	48	15:32	15.1	59		SE	7	1015.6	25.3	18		W	24	1011.8
28	Su	6.5	26.1	0			WSW	26	23:03	15.0	45		SE	15	1017.0	24.5	19		S	13	1014.0
29	Mo	6.7	28.3	0			N	22	13:07	15.6	51		SE	9	1016.2	27.3	13		W	9	1013.7
30	Tu	6.5	30.0	0			WSW	37	13:23	16.1	50		SSE	6	1018.9	28.8	11		W	22	1014.9
31	We	8.7	33.1	0			W	30	12:43	19.4	42		E	4	1018.8	31.6	12		WNW	20	1016.0
Statistics for October 2018																					
Mean		8.4	24.9							15.2	64	5		8	1019.7	23.2	38	4		15	1016.5
Lowest		3.0	18.4	0						11.9	42	1	Calm		1009.5	15.9	11	1	SE	7	1009.4
Highest		16.3	33.1	23.6			W	59		22.1	94	8	SE	26	1028.6	31.6	98	8	W	28	1024.2
Total				36.2																	

IDCJDW2002.201810 Prepared at 13:00 UTC on Thursday 3 January 2019

Albury-Wodonga
November 2018 Daily Weather Observations

Observations from Albury airport.

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Th	12.3	37.2	0			NNW	44	14:48	21.1	53		SSE	9	1019.0	36.0	11		N	15	1013.1
2	Fr	21.1	34.2	0			NNW	67	09:37	30.7	24		NNW	31	1011.2	27.5	44		SSE	13	1008.5
3	Sa	13.5	24.7	0			W	48	00:12	16.8	56		SW	13	1016.4	24.0	28		WNW	22	1014.7
4	Su	8.4	28.5	0			WSW	39	13:18	16.1	56		E	7	1015.4	28.1	21		W	24	1011.1
5	Mo	15.5	29.3	0			NW	57	17:06	17.9	64	7	S	6	1009.5	28.4	26	5	NNW	26	1005.8
6	Tu	17.9	25.5	8.8			N	41	16:27	19.1	100	8	NW	4	1007.1	22.1	76	8	N	19	1004.9
7	We	13.6	18.6	19.0			SSW	44	20:55	14.5	71	7	W	13	1008.5	15.7	47	3	W	15	1008.2
8	Th	6.8	19.6	0.2			WSW	35	12:16	12.0	58		W	9	1018.6	17.7	31	2	WSW	19	1018.2
9	Fr	5.9	23.6	0			W	39	13:04	12.9	60		ENE	7	1021.4	20.6	26	2	W	24	1017.6
10	Sa	7.8	26.5	0			WSW	35	14:06	15.1	59		E	7	1018.5	25.6	19		SSW	17	1015.7
11	Su	8.8	29.1	0			ENE	31	11:42	17.9	54		ESE	7	1020.2	26.9	24		S	11	1017.2
12	Mo	10.3	31.2	0			SSE	24	11:37	18.7	61		SSE	7	1020.4	29.1	22		SSE	13	1016.2
13	Tu	14.2	26.9	0			SW	24	08:09	19.9	60	2	S	11	1015.2	21.5	75	7	NNE	6	1014.6
14	We	16.9	27.7	12.2			W	30	14:03	19.2	90	8	Calm		1014.5	26.4	50	4	W	9	1013.1
15	Th	12.0	27.2	6.8			SSE	33	17:15	18.8	76		E	6	1018.1	25.7	36	1	NW	11	1016.9
16	Fr	10.3	27.2	0.2			WSW	30	15:01	16.8	57		SSW	7	1020.3	25.4	33		W	13	1016.5
17	Sa	14.3	26.8	0			ESE	33	07:29	19.7	47		SE	22	1018.8	26.1	24		ESE	19	1017.5
18	Su	11.7	27.4	0			NNE	30	15:15	19.2	46		SSE	11	1022.2	25.4	25		SSE	13	1018.5
19	Mo	11.1	28.9	0			ENE	35	08:47	20.5	44		ENE	22	1019.5	27.7	28		NE	15	1014.5
20	Tu	14.0	32.1	0			WSW	54	17:46	22.3	49		SSE	9	1010.7	30.7	32	3	ENE	13	1003.8
21	We	14.6	24.6	10.4			W	61	20:45	15.0	93	7	W	13	1001.6	23.3	35		W	15	999.7
22	Th	9.6	14.3	4.6			NW	59	14:17	11.5	68	8	NW	20	999.0	12.8	80	6	N	24	996.8
23	Fr	9.3	18.2	7.6			WSW	52	10:54	13.4	62	8	W	31	1003.2	14.7	59	8	W	26	1003.6
24	Sa	10.7	21.6	0			W	44	15:41	14.6	65	5	W	17	1005.8	19.4	45	8	W	24	1004.7
25	Su	8.1	24.8	0			SSE	35	16:40	15.3	68		S	6	1004.3	23.8	33	1	W	19	1001.8
26	Mo	9.6	26.5	0			S	26	13:15	18.2	54		SSE	13	1007.0	24.2	32		SW	9	1004.3
27	Tu	13.0	27.5	0			NNE	30	18:22	18.1	69		ESE	6	1005.2	25.9	28	5	E	11	1001.8
28	We	16.9	26.2	0			SSE	48	12:01	20.7	53	1	SE	22	1002.5	25.1	40		SE	26	1004.3
29	Th	11.1	27.7	0			SSE	33	07:41	19.1	46		SE	24	1011.4	26.0	28		ESE	15	1009.1
30	Fr	12.1	29.5	0			W	41	13:29	20.4	54		NW	6	1011.2	27.9	22		WNW	20	1008.2
Statistics for November 2018																					
Mean		12.0	26.4							17.9	60	6		12	1012.6	24.5	36	4		16	1010.0
Lowest		5.9	14.3	0						11.5	24	1		Calm	999.0	12.8	11	1	NNE	6	996.8
Highest		21.1	37.2	19.0			NNW	67		30.7	100	8	#	31	1022.2	36.0	80	8	#	26	1018.5
Total				69.8																	

IDCJDW2002.201811 Prepared at 16:00 UTC on Wednesday 2 January 2019

Weather data sourced from Commonwealth of Australia, Bureau of Meteorology 2019 (www.bom.gov.au).

Appendix B –Detection Images (Spring 2018) by Site ID

Site 5 (roadside). Yellow Box. 5m High

Site 10 (Revegetation). Red Ironbark. 10m High

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

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

Site 17 (Remnant). Stag. 5m high

Site 19 (Revegetation). Blakely's Red Gum. 4m high

Site 20 (Revegetation). Yellow Box. 4m high

Site 21 (Roadside). Blakely's Red Gum. 4m high

Site 23 (Remnant). White Box. 5m high

Site 24 (Remnant). River Red Gum. 5m high

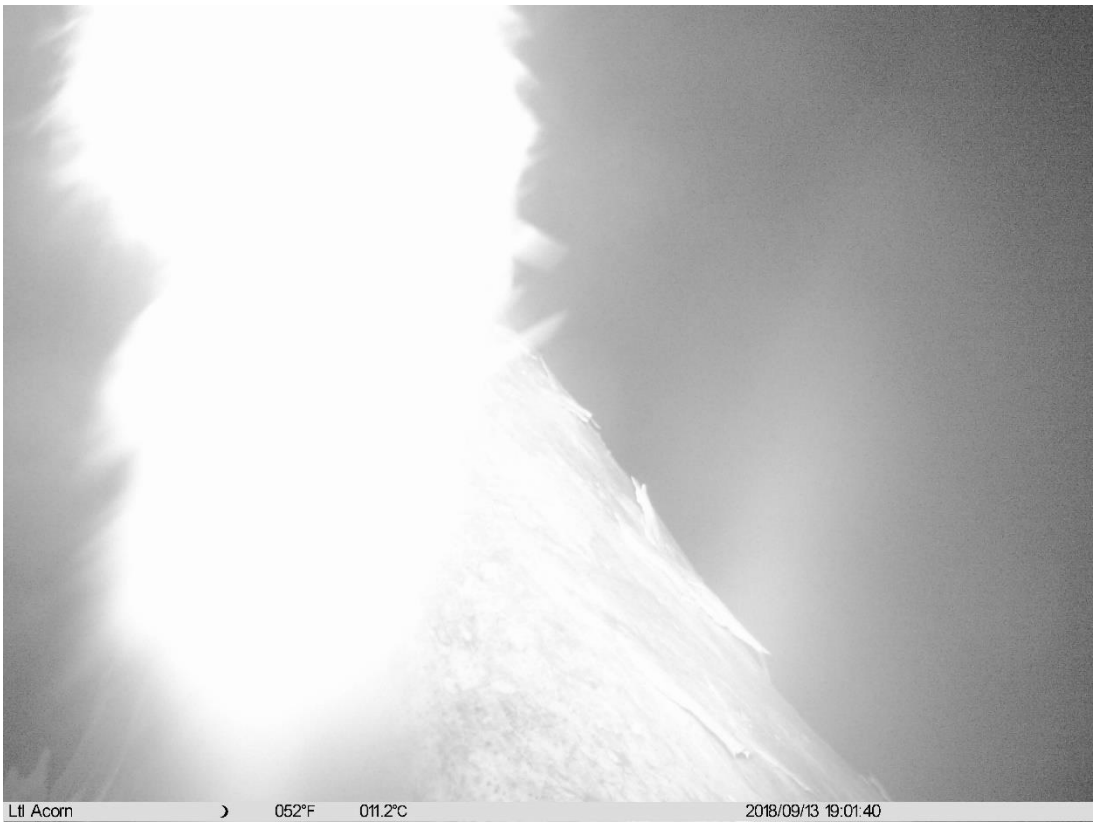
Site 26 (Remnant). Yellow Box. 5m high

Site 27 (Remnant). River Red Gum. 6m high

Site 30 (Riparian). River Red Gum. 9m high

Site 37 (Revegetation). River Ironbark. 5m high

Site 40 (Remnant). Yellow Box. 7m high



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

Site 56 (Remnant). Long Leaf Box. 5m high

Site 57 (Revegetation). Stag. 6m high

Site 58 (Roadside). Spotted Gum. 5m high

Site 60 (Roadside). Yellow Box. 5m high

Site 64 (Remnant). Stag. 4m high