

# ALBURY WODONGA THREATENED SPECIES MONITORING PROGRAM 2020 ANNUAL REPORT



Albury  
Conservation  
Company

DM  ecological

**Cover photo:** Squirrel Gliders at Kiewa River, Wodonga (Amy Daeche, 2021)

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## Executive Summary

The Albury Wodonga Threatened Species Monitoring Program (TSMP) has been strategically monitoring Albury Wodonga's wildlife since 2018, with a focus on arboreal mammals and in particular the Squirrel Glider (*Petaurus norfolcensis*). Albury Conservation Company (ACC) has engaged DM Ecological to implement the program, which started in Albury (Thurgoona – Wurlinga) and expanded into Wodonga in 2020.

In 2020, the program monitored wildlife at over 120 sites using motion-sensing cameras as the primary survey tool. Two monitoring periods occurred in the Thurgoona - Wurlinga study area in 2020, Autumn and Spring. The survey effort in each period was 62 sites and 60 sites monitored respectively. Results showed:

- 22 Squirrel Glider detections in the Autumn monitoring period (detection rate of 35%)
- 23 Squirrel Glider detections in the Spring monitoring period (detection rate of 38%).

This was an increase in overall glider detection rates from the previous year (2019), where the respective detection rates were 32% (Autumn 2019) and 30% (Spring 2019). The 2020 monitoring periods have shown an increase in the glider detection rates to nearly that of the initial 40% in Winter 2018, after three consecutive decreases in the rate.

Two monitoring periods occurred in the Wodonga study area in 2020, Winter and Spring. The survey effort in each period was 48 sites and 53 sites monitored respectively. Results showed:

- 13 Squirrel Glider detections in the Autumn monitoring period (detection rate of 27%)
- 13 Squirrel Glider detections in the Spring monitoring period (detection rate of 25%)

Whilst both the Winter and Spring 2020 surveys detected gliders at 13 sites, there was an increase in detection nights per site (average = 4) during Spring compared to Winter (average = <2). The increased activity in spring may be associated with breeding and denning behaviour. As this is the first year of monitoring within the Victorian study area, these detection rates will provide a baseline moving forward.

Recommended actions include:

1. Implementation of the Albury Wodonga Threatened Species Monitoring Program should be continued across the major urban growth areas of Albury (Thurgoona / Wurlinga) and Wodonga (Leneva / Baranduda). This will continue to improve knowledge of threatened species and identify critical habitats, linkages, and management interventions to ensure the populations remain viable in the face of urbanisation.
2. The Albury Wodonga Threatened Species Monitoring Program should continue to be supported by Albury City and Wodonga Council as it closely aligns with the Regional Natural Environment Strategy (RNES), and meets many of the listed actions in the RNES Action Plan (2020-24).
3. The Albury Wodonga Threatened Species Monitoring Program should continue to explore opportunities to expand the current list of sites being monitored, include additional species being targeted, and engage interested community groups, key stakeholders, researchers and other individuals.
4. The Albury Wodonga Threatened Species Monitoring Program should conduct follow-up surveys in the Wodonga study area to identify Squirrel Glider and/ or Krefft's Glider presence and contribute to a species identification protocol.

The Albury Wodonga Threatened Species Monitoring Program has been made possible with funding from Albury City Council, Ross Trust, Wettenhall Environment Trust, Wodonga Council and others.



# 1 Introduction

## 1.1 Project background

DM Ecological has been engaged by Albury Conservation Company (ACC) since April 2018 to implement a Squirrel Glider Monitoring Program (SGMP) in the greater Thurgoona / Wirlinga area of New South Wales (NSW). The SGMP at its inception had the following objectives:

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

In line with objective four (above), the program was extended across the State border to include sites within the Wodonga Council local government area (LGA) in Victoria, after funding was received from both the Wodonga Council and the Ross Trust. This provided a substantial increase in geographic area, monitoring sites and potential threatened species presence to the work previously being funded by Albury City Council and the Wettenhall Environment Trust in the Thurgoona – Wirlinga landscape. With this extension to the program, the SGMP was renamed the Albury Wodonga Threatened Species Monitoring Program (TSMP) to account for the potential of encountering other threatened arboreal or semi-arboreal mammals such as the Brush-tailed Phascogale (*Phascogale tapoatafa*) and Spotted-tailed Quoll (*Dasyurus maculatus*).

Monitoring across the study areas (hereafter referred to as Thurgoona - Wirlinga and Wodonga) occurs biannually in Autumn and Spring. Due to delays in obtaining relevant permits/ licenses in Victoria, the Wodonga monitoring commenced in Winter 2020. Select sites are monitored using arboreal mounted motion sensing cameras (trail cams), paired with a scent lure (honey, water, and sugar mix) with the purpose of attracting target species in front of the camera and recording their presence. Records are verified and uploaded to publicly available datasets via the NatureMapr (<https://naturemapr.org/home>) citizen science platform ([Albury Wodonga Nature Map](https://naturemapr.org/home)), which feeds into the Atlas of Living Australia (ALA) (<https://www.ala.org.au/>).

In Thurgoona – Wirlinga a total of 69 sites have now been monitored at least once across the six monitoring periods (biannually 2018-20). In Wodonga, 52 sites have been monitored at least once across the two monitoring periods (biannually in 2020). No threatened species other than the Squirrel Glider have been detected using the motion sensing cameras so far.

## 1.2 Location of study area

The study area includes major urban growth corridors within the Albury City Council LGA and the Wodonga Council LGA. It is focused in Thurgoona – Wurlinga in NSW and the Leneva urban growth corridor in VIC extending from White-Box rise in Wodonga to Baranduda (Figures 1, 2 and 3).

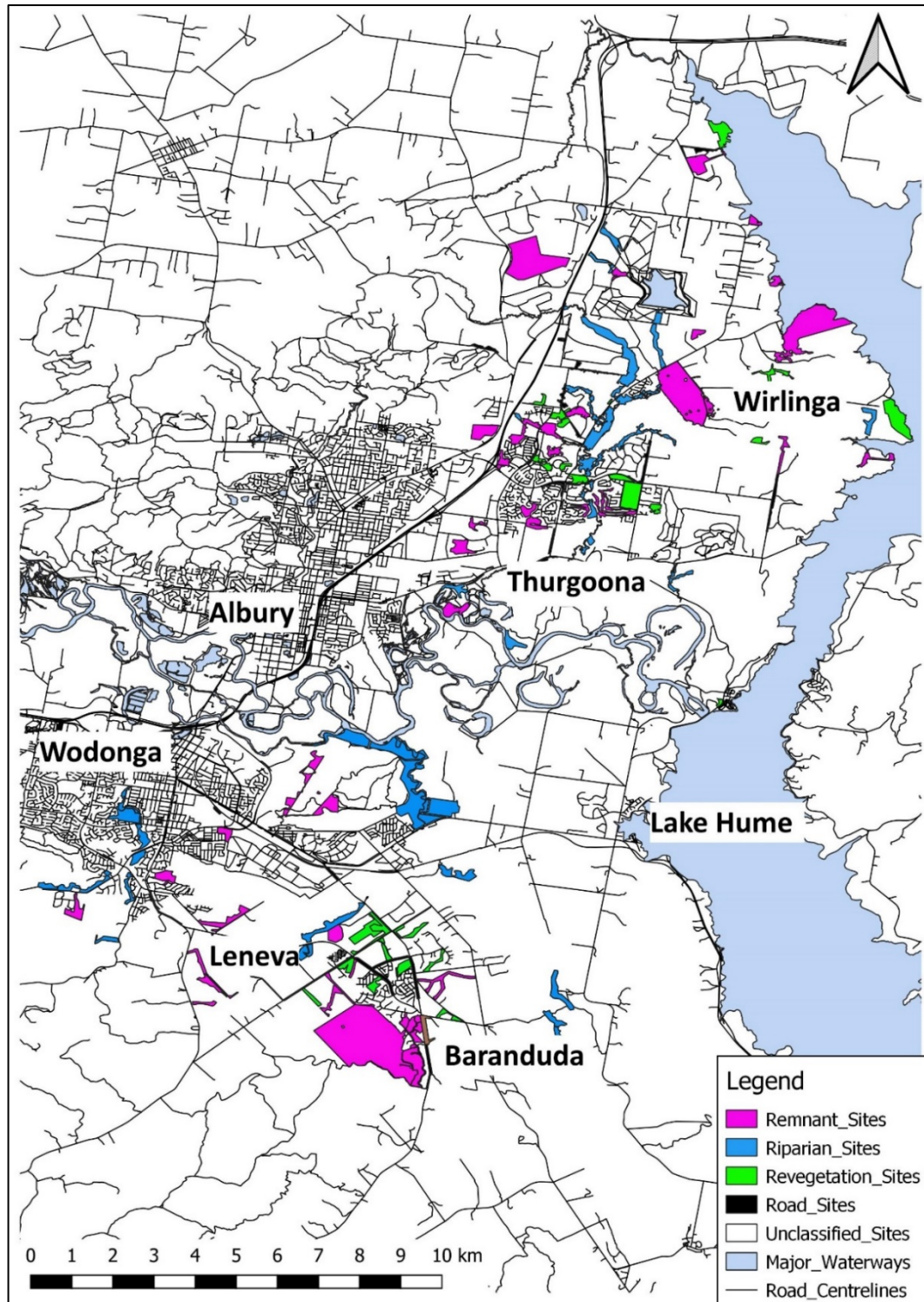


Figure 1: Location of Thurgoona - Wurlinga and Wodonga TSMP study areas

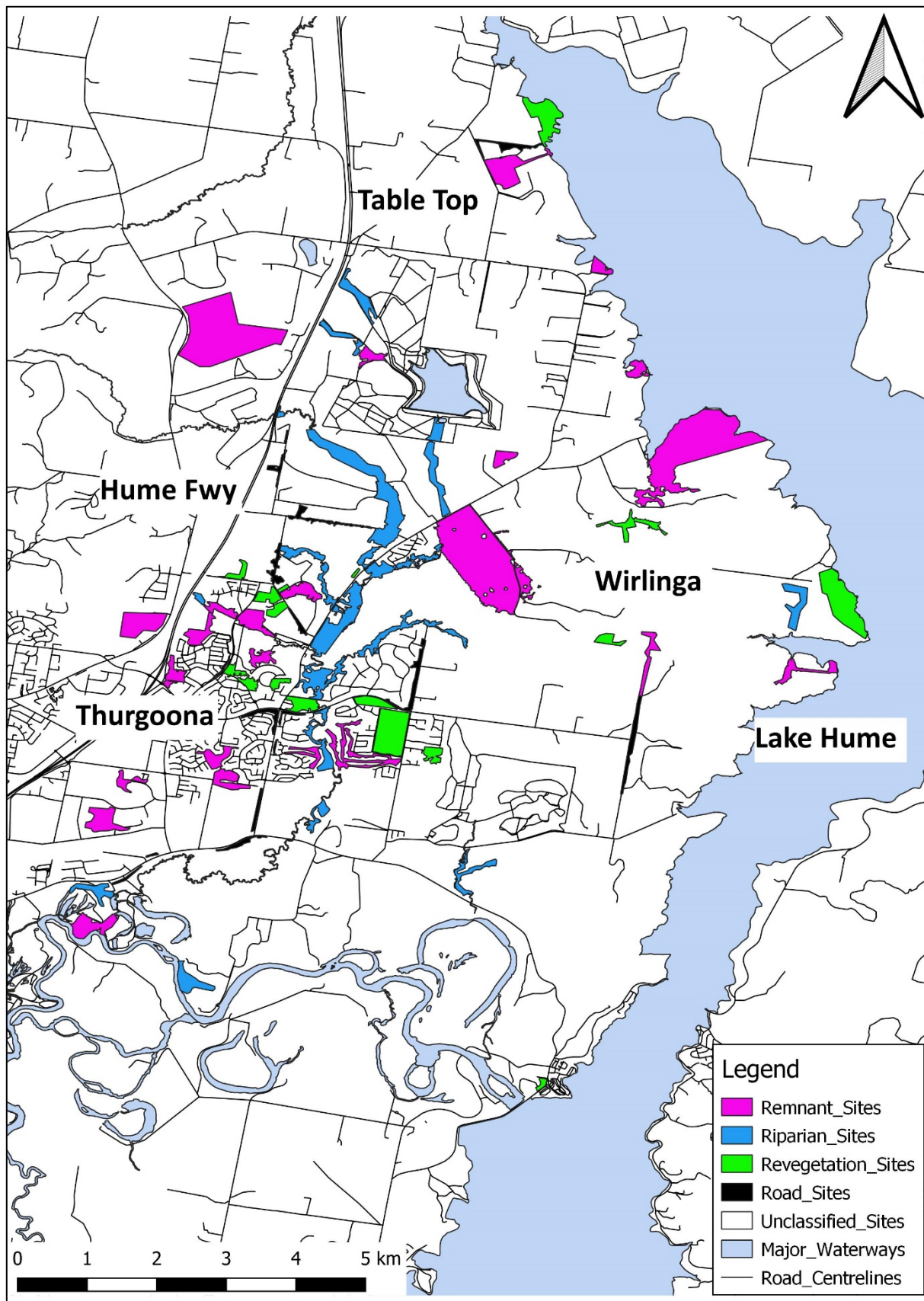


Figure 2: Location of Thurgoona - Wirlinga study area



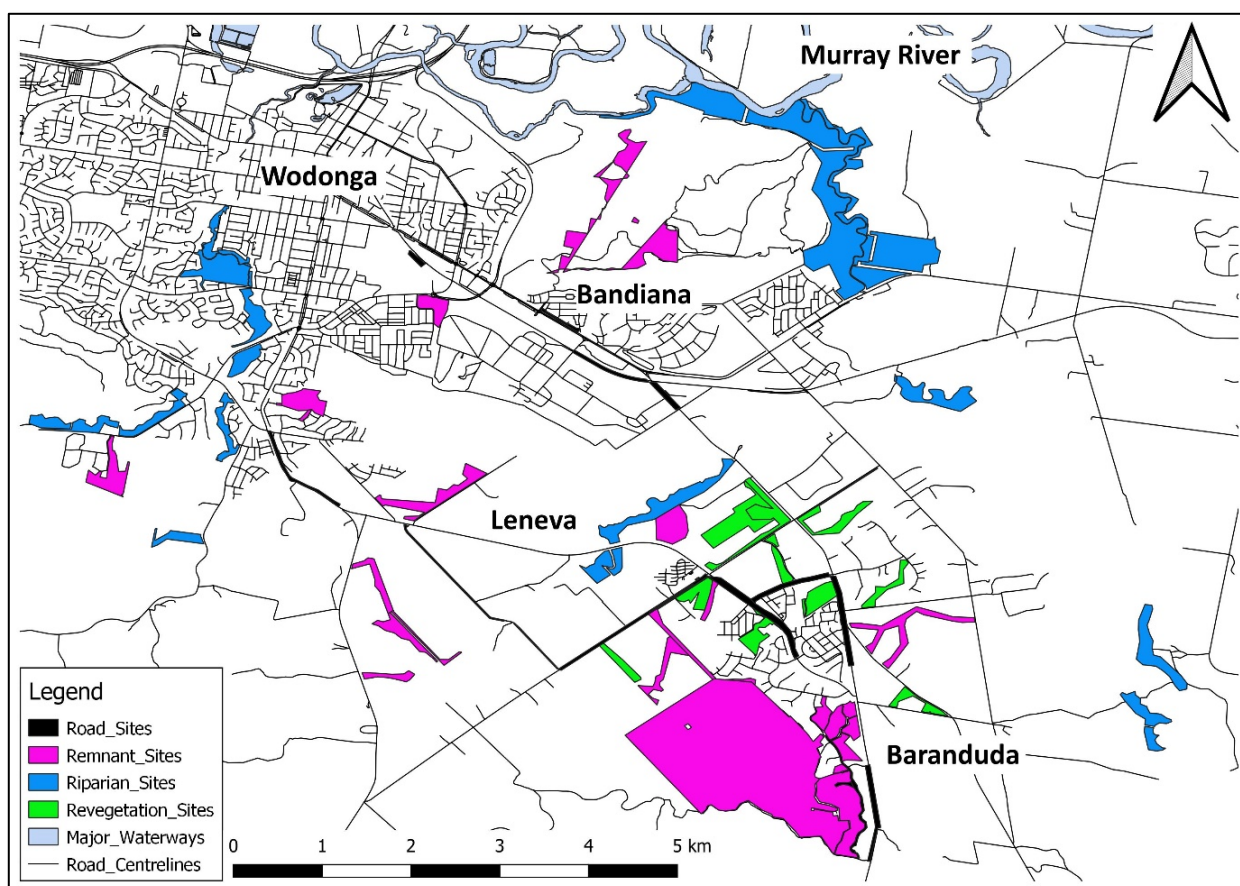


Figure 3: Location of Wodonga study area

## 2 Methodology

### 2.1 Study Design

The TSMP involves 85 potential survey sites in Thurgoona – Wurlinga and 60 potential survey sites in Wodonga. Native vegetation greater than 5 hectares (ha) was mapped and stratified by:

Habitat type:

- roadside verges
- patches of remnant vegetation
- riparian corridors
- forward tree plantings.

Land use zone:

- urban
- peri-urban (future development)
- rural (agricultural land).

Sites delineated from this exercise were randomly selected and weighted to locations with pre-existing Squirrel Glider records (Michael et. al 2021). Further potential survey sites have been identified in the field and where these are incorporated into the program, they are also defined by their broad habitat type, minimum 5 ha size and zoned land use.

## 2.2 Threatened Species Monitoring Protocol

The primary survey method being used in the TSMP is motion sensing wildlife cameras (Little Acorn LTL-5610 Series and the Little Acorn LTL-6310 Series). The cameras 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 are deployed in trees between 3-10 m depending on tree suitability, target area, reach, safety, and to minimise the potential for theft.

Cameras were typically placed on an auxiliary branch facing a target area on the main trunk or another branch with significant surface area. The distance from camera to target area was 1-2 m to ensure the best chance of capturing a clear image that could be positively identified. Care was taken to minimise the likelihood of leaves triggering images. 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 4 (page 11) demonstrates a typical camera installation.

A range of 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 E-trex 10 Global Positioning System (GPS).

Cameras were deployed for a minimum of 10 nights and a maximum of 14 nights at each location. After cameras were retrieved, the images were downloaded and analysed by ecologists to identify wildlife observations and calculate detection rates per site. Priority is given to target (threatened species) identification and once confirmed, each record (images and GPS location) is uploaded to [Albury Wodonga Nature Map](#) where it can be verified by expert moderators. This record is accessible to Albury Wodonga Nature Map users only, however data is regularly harvested and uploaded to the Atlas of Living Australia where the records become publicly accessible.

During camera installation and retrieval, staff also recorded opportunistic bird observations with purpose of reporting other threatened species. The bird surveys provide an opportunity to identify and record other threatened species in the study area and contribute data to publicly accessible data bases (e.g. Albury Wodonga Nature Map and Atlas of Living Australia), where it will provide value in planning assessments or other population monitoring/ distribution research. Birds are recorded after being directly observed or identified via their call.



Figure 4: Typical camera placement

## 2.3 Limitations

ACC set the target for sites monitored at 68 in the NSW study area and 60 in the VIC study area during each monitoring period. So far, the greatest number of sites monitored as been 65 and 52 in each study area respectively. Table 1 (below) shows the monitoring efforts of the 2020 monitoring periods.

**Table 1: 2020 TSMP Survey efforts (No. of sites monitored)**

Monitoring Period	No. of sites monitored NSW	No of sites monitored VIC
Autumn/ Winter 2020	62	48
Spring 2020	60	53

Limitations to achieving the desired survey effort has primarily been due access restrictions on private property. There have been several occasions where monitoring sites have been cleared for development and no longer provide a viable site ( $n = 3$ ). Wet weather was also a limiting factor preventing access to some sites in 2020. Over the course of the TSMP, three cameras have been stolen whilst deployed in the field resulting in a reduction in survey effort for the associated monitoring period.



Sites not monitored in 2020 and their associated information are shown in Table 2

**Table 2: 2020 TSMP Survey limitations**

Study Area	Site ID	Land Use Type	Habitat Type	Limitation
NSW	12	Urban	Revegetation	Camera malfunction during Spring 2020 period
NSW	14	Urban	Revegetation	Site was cleared for development prior to Autumn 2019 period.
NSW	21	Urban	Roadside	Camera stolen during Spring 2020 period
NSW	51	Rural	Revegetation	Camera malfunction during Spring 2020 period
NSW	52	Proposed Development	Roadside	Camera malfunction during Spring 2020 period
NSW	53	Proposed Development	Revegetation	Landholder not contactable for access
NSW	59	Rural	Riparian	Landholder did not permit access
NSW	62	Rural	Riparian	Landholder not contactable for access
NSW	66	Proposed Development	Roadside	Landholder did not permit access
VIC	148	Rural	Road	Landholder not contactable for access during Winter 2020 period
VIC	149	Rural	Remnant	Too wet to access during Winter 2020 period
VIC	150	Rural	Riparian	Too wet to access during Winter 2020 period
VIC	151	Rural	Riparian	Too wet to access during Winter 2020 period
VIC	152	Urban	Remnant	Landholder not contactable for access during Winter 2020 period
VIC	TBC (FID57)	Rural	Riparian	Landholder did not permit access for 2020 monitoring periods
VIC	TBC (FID58)	Rural	Riparian	Landholder did not permit access for 2020 monitoring periods
VIC	TBC (FID56)	Rural	Riparian	Too wet to access during 2020 monitoring periods
VIC	TBC (FID15)	Rural	Riparian	Landholder did not permit access for 2020 monitoring periods
VIC	TBC (FID1)	Rural	Riparian	Landholder not contactable for access during 2020 monitoring periods

In the Victoria study area, there is the added limitation of accurate species identification with the potential overlap in distribution between the Squirrel Glider (*Petaurus norfolcensis*) and Krefft's Glider (*Petaurus notatus*) which are visually similar species. The main distinguishing features between the two species the overall size, underbelly fur colour, tail size and colour and muzzle shape (See Table 3, page 13). These distinguishing features can be difficult to discern on the black and white images captured, which do not provide scale or a consistent pose amongst individuals for comparisons. Where a distinction could not be made between the two species, the records were uploaded as a glider species only, and do not contribute towards the threatened species detections. This may result in a lower detection rate within the Wodonga study area when compared to Thurgoona - Wirringa.

**Table 3: Squirrel Glider (*Petaurus norfolcensis*) and Krefft's Glider (*Petaurus notatus*) distinguishing features.**

Species	Head Body Length	Tail Length	Weight	Underbelly Fur	Other
<i>P. norfolcensis</i>	170-240 mm	220-300 mm	190-300 g	Clear White	Muzzle longer, pointed. Tail never white tipped.
<i>P. notatus</i>	160-200 mm	165-210 mm	90-150 g	Cream White	Muzzle shorter, rounded. Tail frequently white tipped

Table source: Menkhorst and Knight (2011)

Examples of discerning features between the two species as well as an image captured during the monitoring program where differentiation is not possible are provide in Figures 5-7 below.



Figure 5: Squirrel Glider displaying long, pointed muzzle and tail length significantly longer than head body length. Tail fur is long and all black (Albury Wodonga Nature Map- User WingsToWander, 2020)



Figure 6: Krefft's Glider displaying shorter, rounded muzzle with a tail length comparable to head body length. Tail fur is noticeably shorter and white-tipped (Albury Wodonga Nature Map - User WingsToWander, 2020)



Figure 7: Example of an image captured by a motion sensing camera where it was not possible to definitively differentiate between the two *Petaurus* species (Albury Wodonga Nature Map - User DMeco, 2020)

## 3 Results

### 3.1 New South Wales – Albury (Thurgoona - Wirlinga)

#### 3.1.1 Survey effort and Squirrel Glider detection rate

Two monitoring periods occurred in the Thurgoona - Wirlinga study area in 2020, Autumn and Spring. The survey effort in each period was 62 sites and 60 sites monitored respectively. They resulted in 22 Squirrel Glider (hereafter referred to as glider) detections in the Autumn monitoring period (detection rate of 35%) and 23 glider detections in the Spring monitoring period (detection rate of 38%). This was an increase in overall glider detection rates from the previous year (2019), where the respective detection rates were 32% (Autumn 2019) and 30% (Spring 2019). The 2020 monitoring periods have shown an increase in the glider detection rates to nearly that of the initial 40% in Winter 2018, after three consecutive decreases in the rate. Table 4 (below) shows the overall survey efforts and glider detection rates in the Thurgoona-Wirlinga study area since the beginning of the program.

**Table 4: TSMP survey effort and associated Squirrel Glider detection rates between Winter 2018 and Spring 2020**

Monitoring Period	Sites Monitored	Sites with Squirrel Glider Detections	Detection Rate	Trend
Winter 2018	65	26	40%	
Spring 2018	64	21	33%	↓
Autumn 2019	62	20	32%	↓
Spring 2019	63	19	30%	↓
Autumn 2020	62	22	35%	↑
Spring 2020	60	23	38%	↑

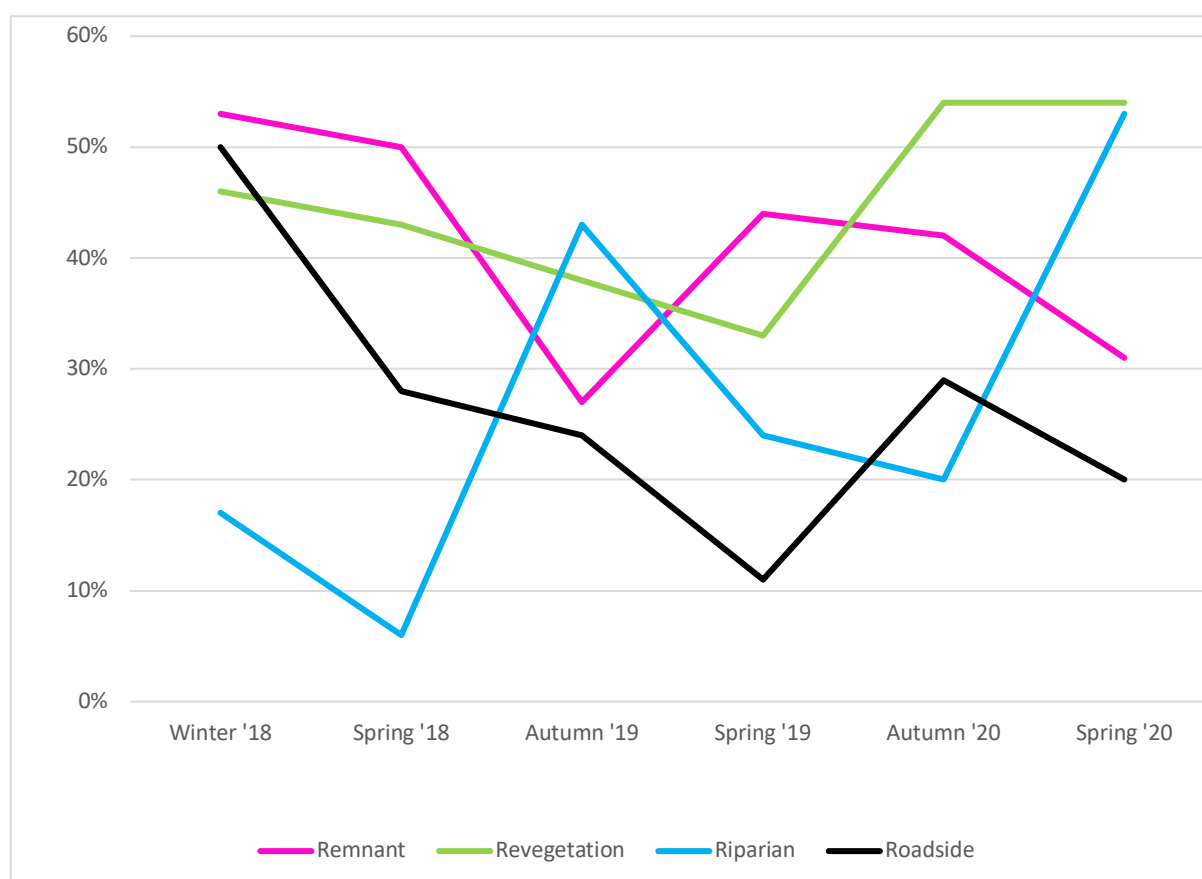
#### 3.1.2 Trends in detection rates among habitat types and land use zones

Over the course of the TSMP in Thurgoona - Wirlinga, there has been an overall downward trend in glider detection rates at remnant sites (53% in Winter 2018 to 31% in Spring 2020) and roadside sites (50% in Winter 2018 to 20% in Spring 2020). Conversely, revegetation sites and riparian sites have shown an overall upward trend in glider detection rates between the Winter 2018 and Spring 2020 periods with the rates increasing from 46% to 54% and 17% to 53% respectively. In 2020, results showed a moderate reduction in glider detection rates at remnant and roadside sites, a stable rate at revegetation sites and a significant increase in glider detection rates at riparian sites (Table 5, page 13). The glider detection rates per habitat type for each monitoring period are shown in Figure 8, page 15).



**Table 5: Detection rates according to habitat type in 2020**

Habitat	Autumn		Spring		Trend
	Sites Monitored	Detection Rate	Sites Monitored	Detection Rate	
Remnant	19	42.11%	19	31.58%	↓
Revegetation	11	54.55%	11	54.55%	→
Riparian	15	20.00%	15	53.33%	↑
Roadside	17	29.41%	15	20.00%	↓
All	62	35.48%	60	38.33%	↑



*Figure 8: Squirrel Glider detection rates according to each habitat type in each monitoring period in Thurgoona - Wirlinga*

Within a study period (2020 calendar year) it is difficult to discern any real habitat preference or change thereof by gliders, with detection rates showing significant variation within habitat type and land use zone across the two monitoring periods. This is not unexpected, with studies showing that Squirrel Glider home ranges are on average 5.6 - 6.2ha, cover multiple vegetation types, often overlap and consist of multiple den sites (Sharpe and Goldingay 2007). In a study of the denning behaviour of Squirrel Gliders occupying road reserves at Euroa VIC, individuals radio tracked for an average of 44 days used from 1–15 den sites, but the average was around 5–6 (van der Ree 2000). The Squirrel Gliders mobility and propensity to change den sites within their home range, combined with the monitoring sites being static (i.e., the same tree is monitored each monitoring period) means there is a strong probability of recording a false absence within a monitoring site, habitat type or even land use zone. That is gliders may be utilising a different part of their home range to the monitoring site at the time of monitoring. Figures 9 and 10 (below) demonstrate the difference in detection rates at each habitat and land use type within the study period (2020 calendar year).

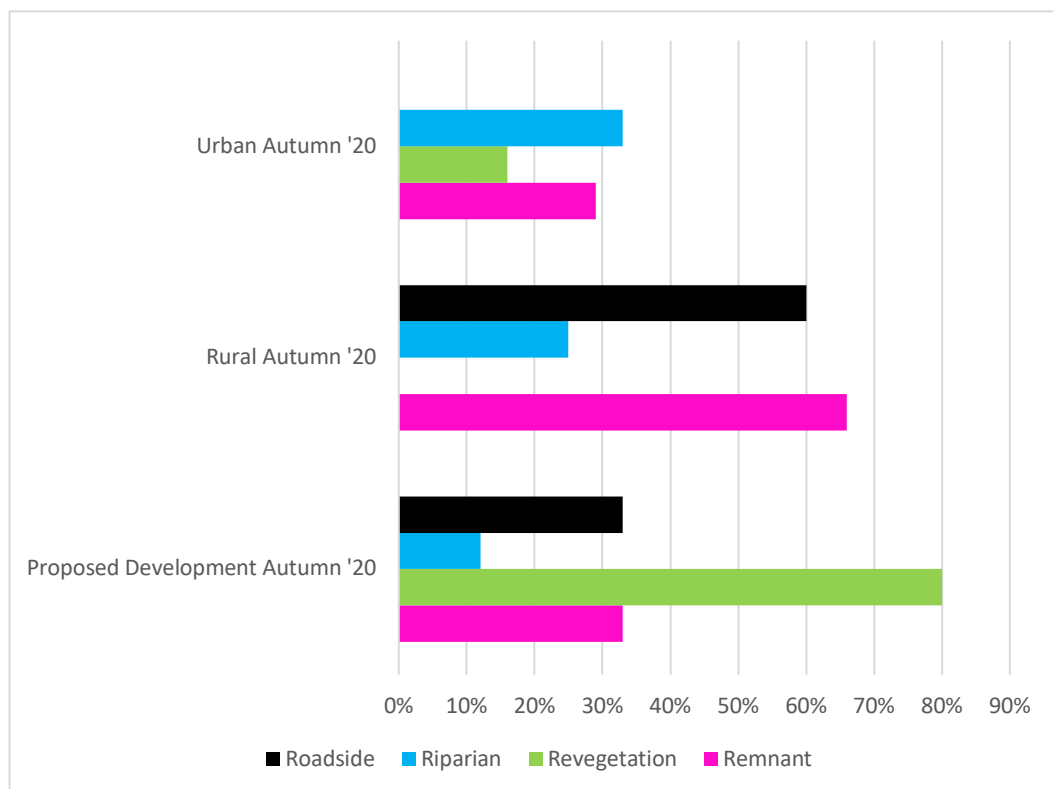


Figure 9: Squirrel Glider detection rates of each habitat type according to land use zone for the Autumn 2020 monitoring period in Thurgoona - Wirlinga

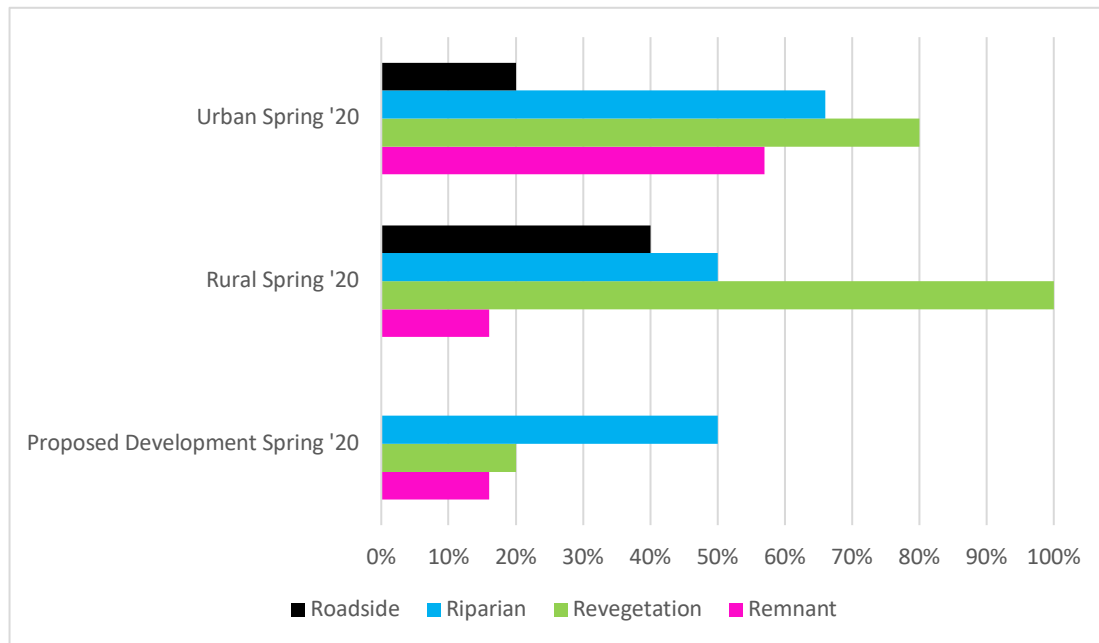


Figure 10: Squirrel Glider detection rates in each habitat type and land use zone during the Spring 2020 monitoring period in Thurgoona - Wirlinga.

Figures 9 and 10 show some variances, highlighted by revegetation sites in the rural land use zone going from a glider detection rate of 0% in Autumn 2020 to 100% in Spring 2020. But when you consider the home range and behaviour of the species as previously mentioned, along with the fact that these sites (revegetation habitat type in rural land use zone) consisted of only two sites in Autumn and one site in Spring, the result is unlikely to be significant

The actual number of glider detections has been tracked over each of the monitoring periods to give a visual representation of the habitat type in each land use zone where gliders are recorded (see Figure 11, next page). This data is more representative of species habitat use given that it now extends over three years (six monitoring periods), allowing for the identification of any geographical or seasonal trends. Since 2019 gliders have been most frequently detected in riparian sites within the proposed development land use zone. Similarly, gliders have been detected in remnants across all three land use zones during all survey periods, highlighting the importance of this habitat type for the species.



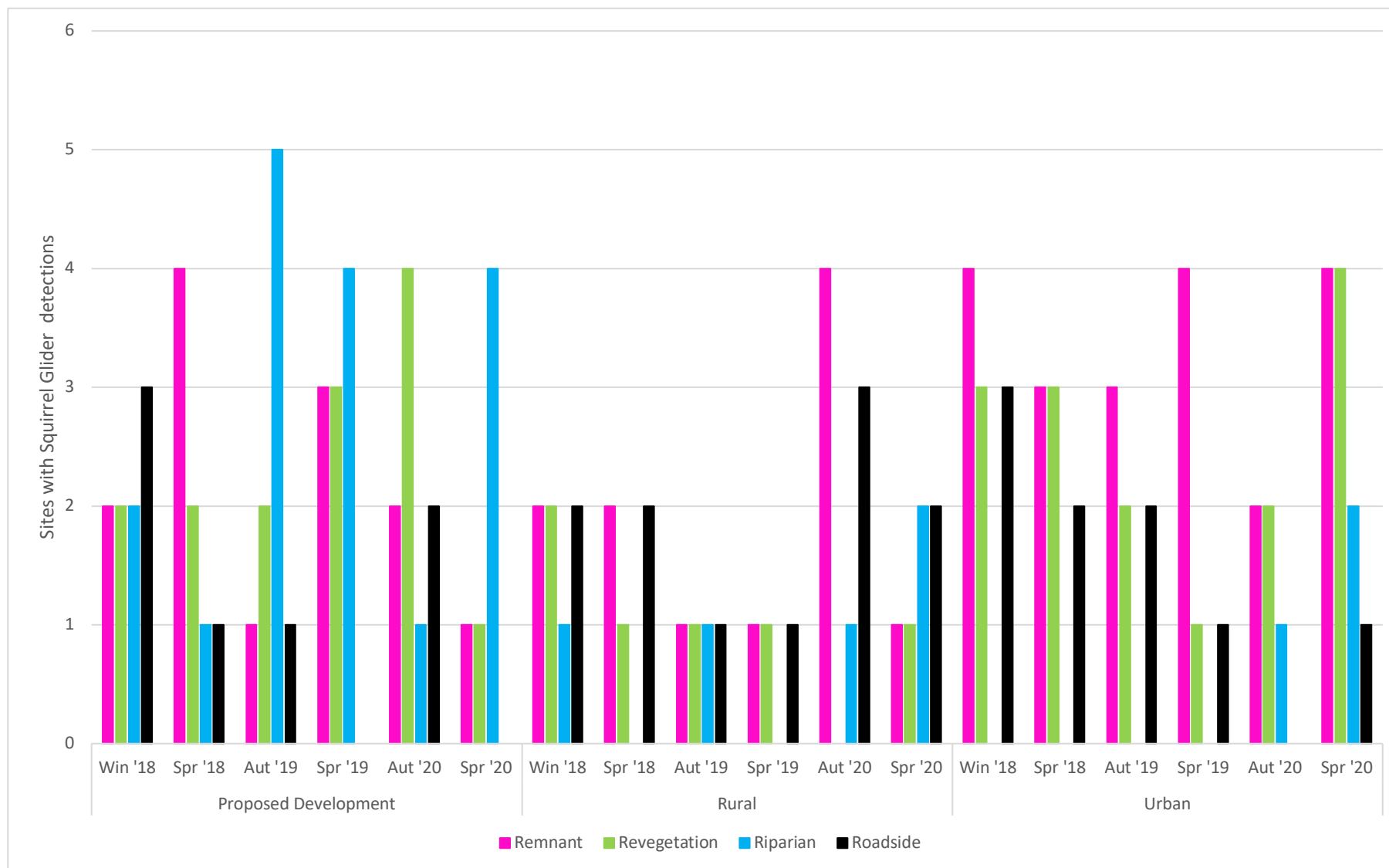


Figure 11: Total number of Squirrel Gliders detected across each monitoring period according to habitat type and land use zone in Thurgoona - Wirlinga

### 3.1.3 Trends in nightly detection rates

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, 19 of 63 sites in Spring 2019, 22 of 62 sites in Autumn 2020 and 23 of 60 sites in Spring 2020. Records (images and GPS location) from each of the sites detecting Squirrel Gliders in 2020 have been uploaded to [Albury Wodonga Nature Map](#).

The number of detection nights per site from across each monitoring period is displayed in Figure 13 (next page). Gliders were detected on a maximum of seven out of ten monitoring nights at some sites and as few as one night at others. So far, only one (Site 030) of the 69 total sites monitored have detected gliders across all survey efforts (Winter and Spring 2018, Autumn and Spring 2019 and Autumn and Spring 2020). There has been no substantial variation in the average number of detection nights at each site across the monitoring periods, ranging from two to three. This data may enable future monitoring at these sites to identify changes in population density, distribution and other characteristics.



Figure 12: Squirrel Glider (*Petaurus norfolcensis*) image taken by motion sensing camera

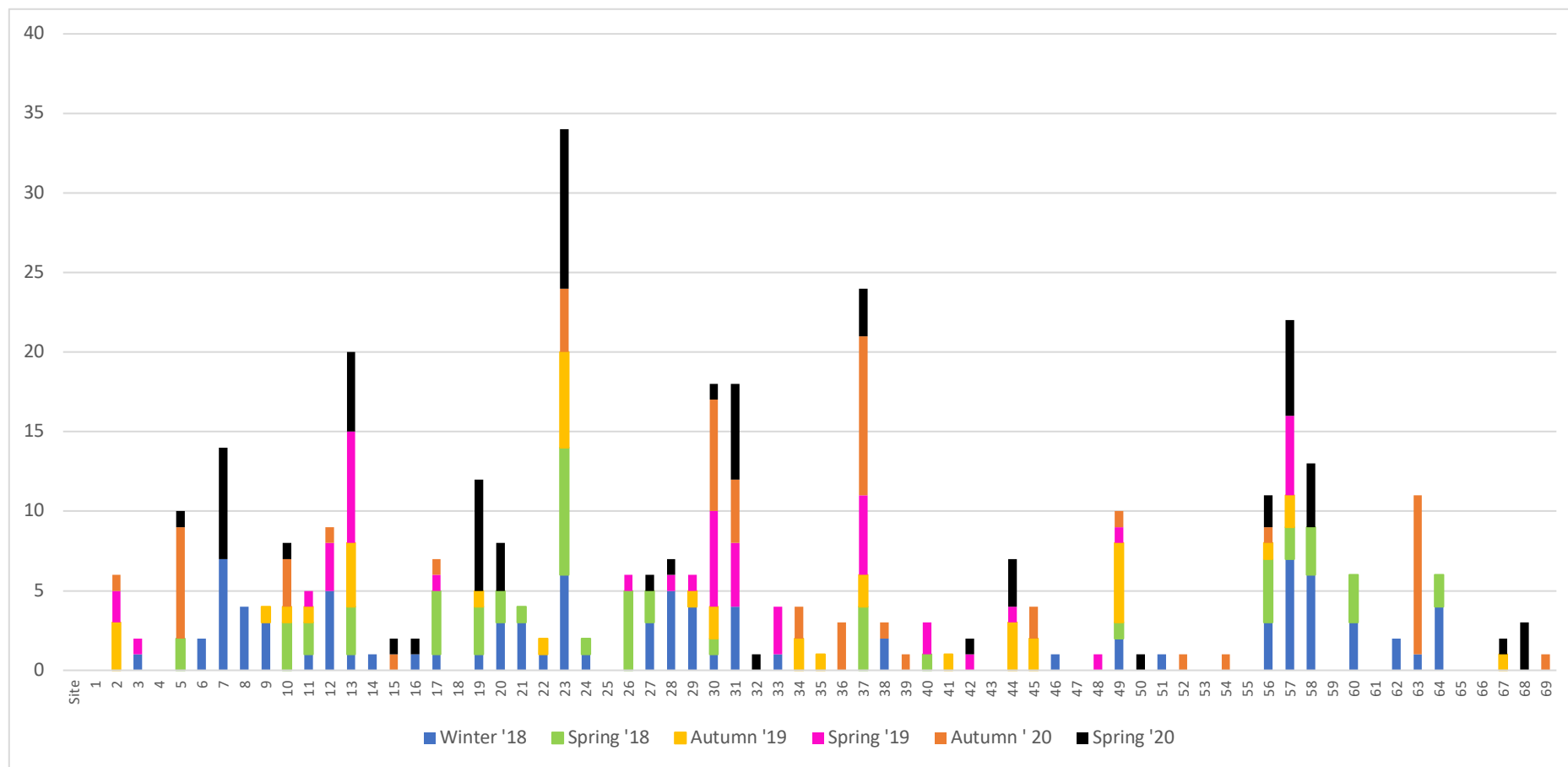


Figure 13: Total number of Squirrel Glider detection nights in each monitoring period (n=10-14nights) per site between 2018 and 2020 in Thurgoona Wirringa.




### 3.2 Victoria – Wodonga (Leneva – Baranduda)

#### 3.2.1 Survey effort and Squirrel Glider detection rate

Two monitoring periods occurred in the Wodonga study area in 2020, Winter and Spring. The survey effort in each period was 48 sites and 53 sites monitored respectively. They resulted in 13 glider detections in the Autumn monitoring period (detection rate of 27%) and 13 glider detections in the Spring monitoring period (detection rate of 25%). As this is the first year of monitoring within the Victorian study area, these detection rates will provide a baseline moving forward. Table 6 (below) shows the overall survey efforts and glider detection rates in the Wodonga study from this initial year of monitoring.






**Table 6: TSMP survey efforts and associated Squirrel Glider detection rates for initial year of monitoring in Wodonga study area (total *Petaurus sp.* in brackets)**

Monitoring Period	Sites Monitored	Sites with Squirrel Glider Detections	Detection Rate	Trend
Winter 2020	48	13 (16)	27% (33%)	
Spring 2020	53	13 (15)	25% (28%)	

#### 3.2.2 Trends in detection rates among habitat and land use types

In Winter 2020, gliders were detected in 40% of revegetation sites (n = 4), 38% of roadsides (n = 5), 23% of remnants (n = 3) and 8% of riparian sites (n = 1). In Spring, gliders were detected on in 40% of revegetation sites (n = 4), 28% of roadsides (n = 4), 13% of remnants (n = 2) and 21% of riparian sites (n = 3). Overall, these observations indicate a twofold decrease in detection rates in remnants between seasons, and slight decreases along roadsides and riparian areas between seasons. The glider detection rates per habitat type for each monitoring period are shown in Figure 14, page 21).

**Table 7: Detection rates according to habitat type in 2020**

Habitat	Winter		Spring		Trend
	Sites Monitored	Detection Rate	Sites Monitored	Detection Rate	
Remnant	13	23.08%	15	13.33%	
Revegetation	10	40.00%	10	40.00%	
Riparian	12	8.33%	14	21.43%	
Roadside	13	38.46%	14	28.57%	
All	48	27.08%	53	24.53%	

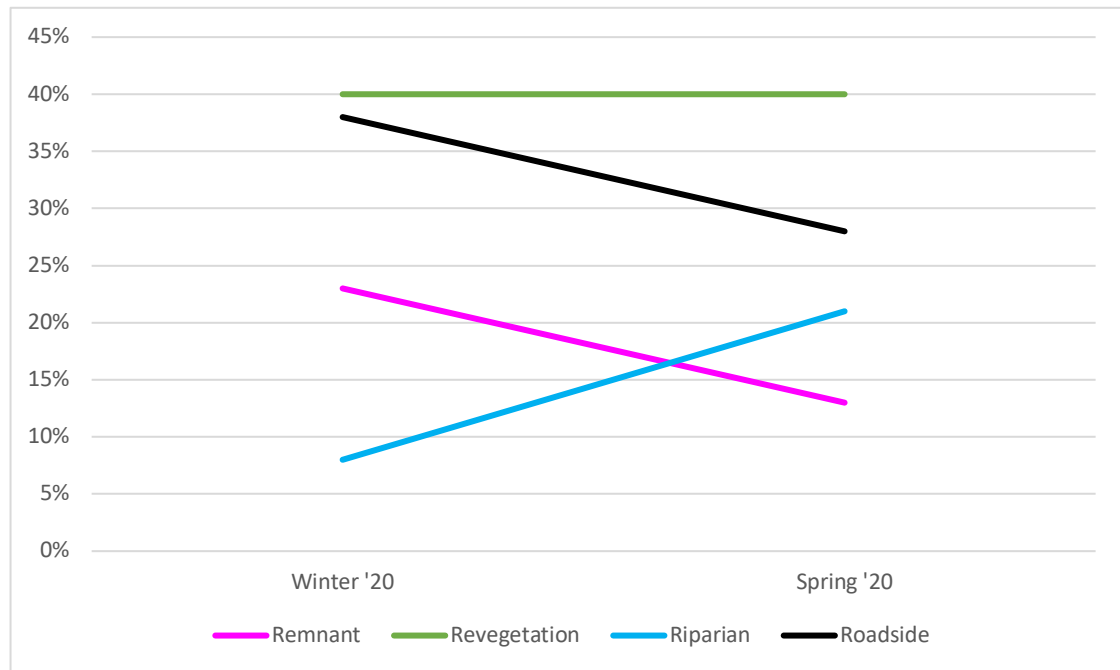


Figure 14: Squirrel Glider detection rates according to each habitat type across both monitoring periods in Wodonga

Figures 15 and 16 (next page) demonstrate the difference in detection rates at each habitat type and land use zone within the study period (2020 calendar year).

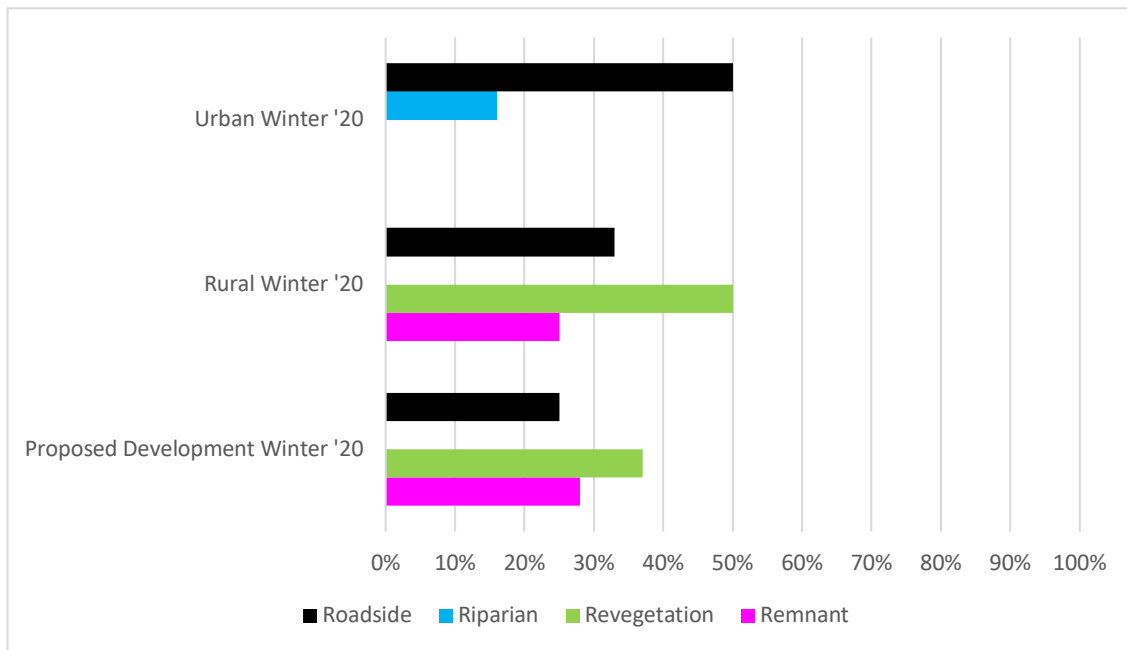


Figure 15: Squirrel Glider detection rates of each habitat type according to land use zone for the Winter 2020 monitoring period in Wodonga

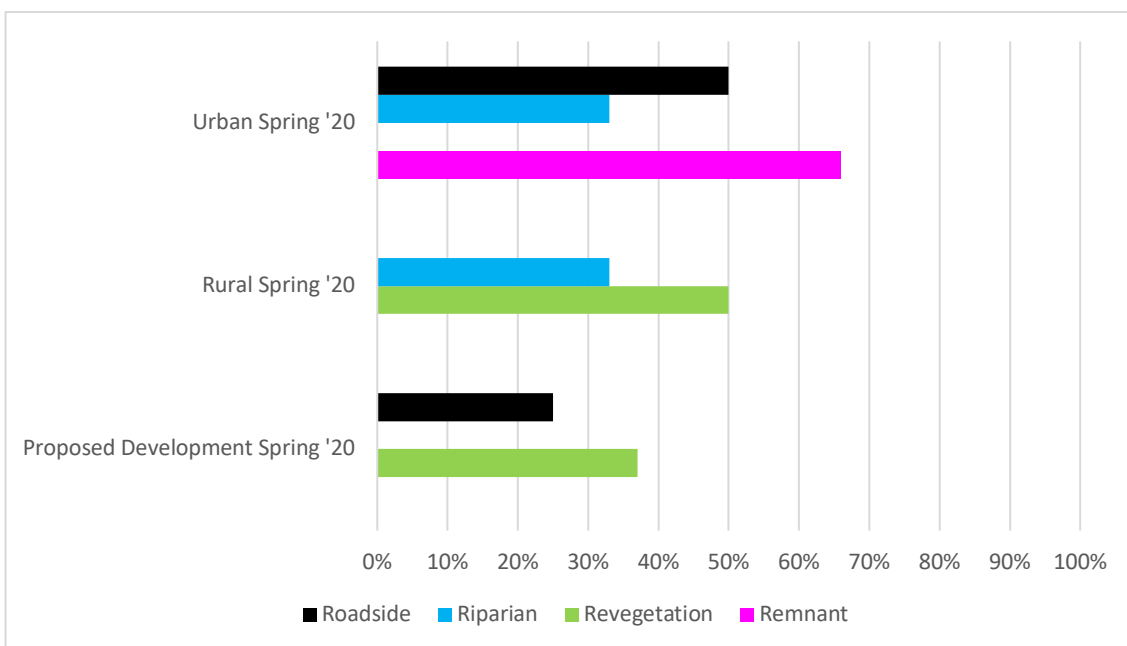


Figure 16: Squirrel Glider detection rates of each habitat type according to land use zone for the Spring 2020 monitoring period in Wodonga

Figures 15 and 16 show some variances, highlighted by remnant site detections occurring only in rural and proposed development zones in Winter and only urban zones in Spring. There are no urban revegetation sites in the study area. As discussed in Section 3.1.2, the data in these figures provides an indication of glider detections within the given year but it is difficult to discern any significant trends in their habitat preference or movement patterns.

As per the Thurgoona - Wirlinga study area (Section 3.1.2), the actual number of glider detections will be tracked over each of the monitoring periods to give a visual representation of the habitat type in each land use zone where gliders are recorded (Figure 17). This data is more representative of species habitat use given that it will account for multiple years' worth of data, allowing for the identification of any geographical or seasonal trends.

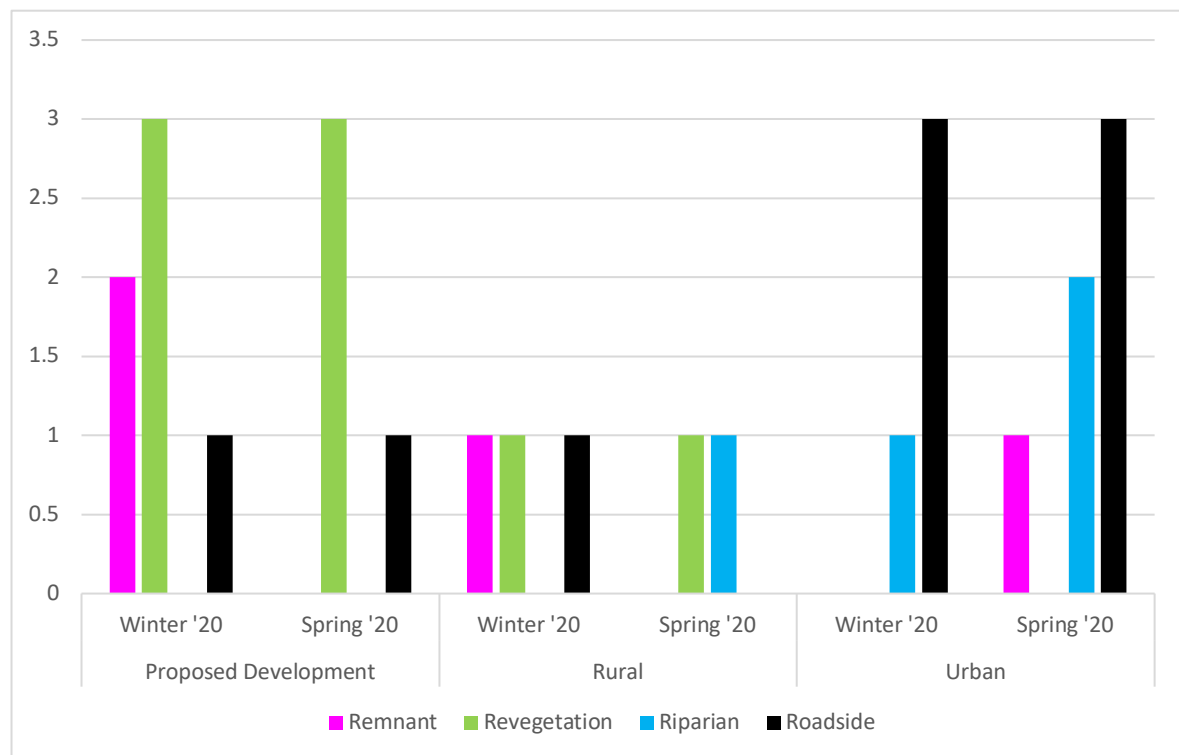


Figure 17: Squirrel Gliders detected across each monitoring period according to habitat type and land use zone in Wodonga

### 3.2.3 Trends in nightly detection rates

Positive identifications were recorded at 13 of the 48 sites monitored during Winter 2020 and 13 of the 53 sites monitored in Spring 2020. Records (images and GPS location) from each of the sites detecting Squirrel Gliders in 2020 have been uploaded to [Albury Wodonga Nature Map](#).

The number of detection nights per site from across each monitoring period is displayed in Figure 18 (next page). Gliders were detected on a maximum of ten monitoring nights at some sites and as few as one night at others. So far, only four of the 53 total sites monitored have detected gliders across each survey effort (Winter and Spring 2020). Whilst both the Winter and Spring 2020 surveys detected gliders at 13 sites, there was an increase in detection nights per site (average = 4) during Spring compared to Winter (average = <2). The increased activity in spring may be associated with breeding and denning behaviour. This data may enable future monitoring at these sites to identify changes in population density, distribution and other characteristics.



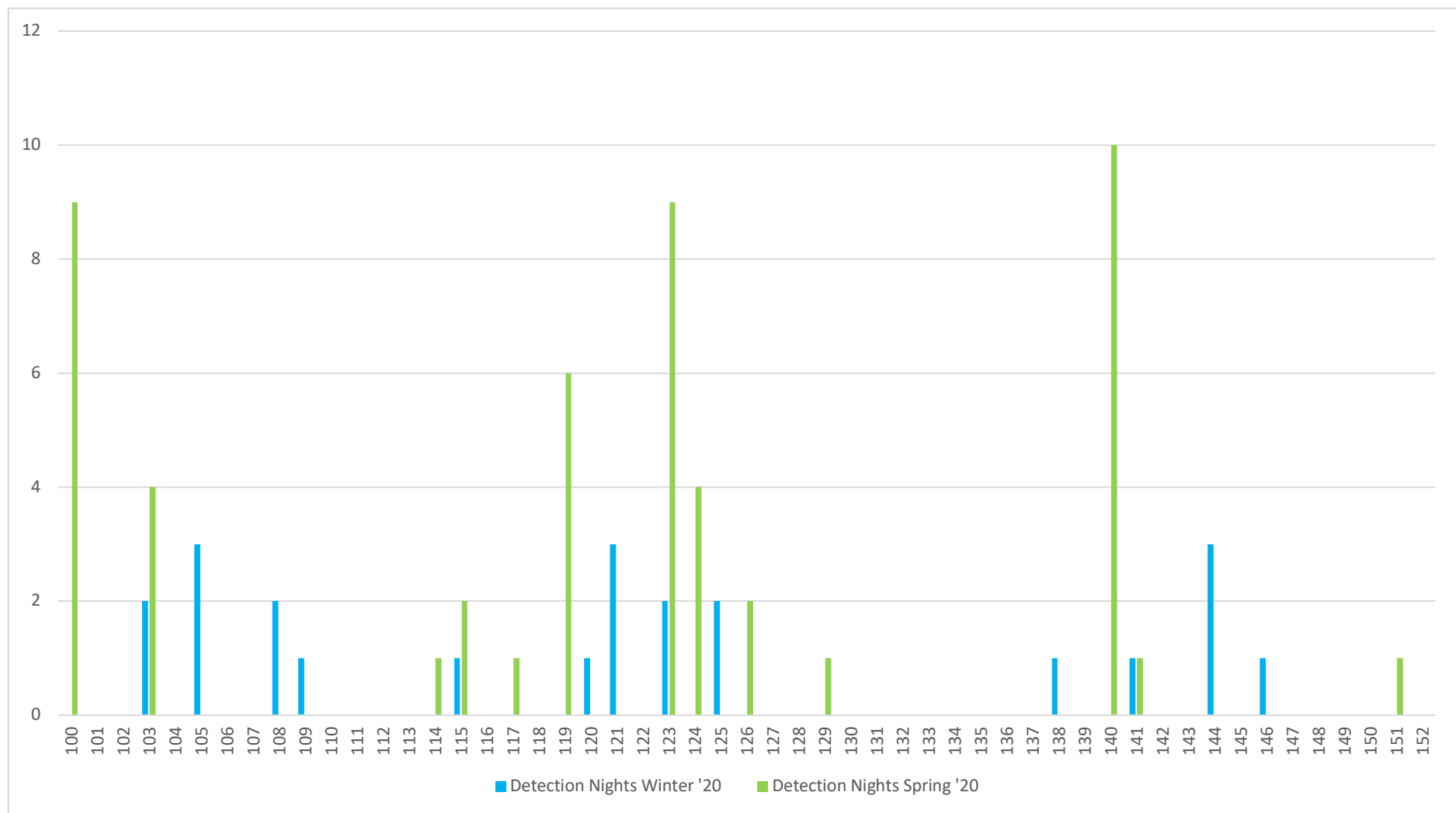


Figure 18: Total number of Squirrel Glider detection nights in each monitoring period (n = 10-14 nights) per site in 2020 in Wodonga

### 3.3 Other fauna species

Several other non-threatened fauna species were detected using the motion sensing cameras during the monitoring period, none of which are listed under Commonwealth or State threatened species legislation. Table 8 (below) identifies non-target species observations during the reporting period (2020 calendar year).

**Table 8: Non-target fauna species detected by cameras.**

Common Name	Scientific Name	Monitoring Period Detected			Applicable Sites
		Autumn '20	Winter '20	Spring '20	
Australian Magpie	<i>Cracticus tibicen</i>			✓	150
Australian Raven	<i>Corvus coronoides</i>			✓	009
Black Rat	<i>Rattus rattus</i>			✓	048
Common Blackbird*	<i>Turdus merula</i>			✓	105
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	✓	✓	✓	001, 013, 022, 031, 032, 033, 042, 044, 046, 050, 054, 055, 056, 057, 063, 067, 068, 069, 100, 101, 103, 104, 105, 106, 109, 118, 121, 122, 123, 124, 129, 141, 150
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>		✓	✓	044, 100, 108, 120, 121, 139, 142, 144
Dusky Woodswallow	<i>Artamus cyanopterus</i>			✓	113
Feathertail Glider	<i>Acrobates sp.</i>			✓	121
Red Wattlebird	<i>Anthochaera carunculata</i>			✓	102, 103
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>			✓	113
White-winged Chough	<i>Corcorax melanorhynchus</i>			✓	142

Notes: - Autumn '20 monitoring period relates to NSW study area only  
 - Winter '20 monitoring period relates to VIC study area only  
 - Sites 0-99 are in NSW and sites 100+ are in VIC  
 \*indicates introduced species

The Common Brushtail Possum (*Trichosurus vulpecula*) was the only non-threatened species detected in each of the three monitoring periods. The Australian Raven (*Corvus coronoides*), Black Rat (*Rattus rattus*) and Common Ringtail Possum (*Pseudocheirus peregrinus*) were also detected in the Thurgoona – Wirringa study area, however only in the Spring monitoring period. All other non-target species were detected in the Wodonga study area and predominantly in the Spring monitoring period. The Common Ringtail Possum (*P. peregrinus*) was the only non-threatened species to be detected in both monitoring periods.

### 3.4 Bird observations

Bird species observations were recorded at TSMP sites as described in Section 2.2. These observations revealed predominantly common species occupied sites across the study area, as per the species list in Table 9 (below). A single Brown Treecreeper (*Climacteris picumnus*) was observed at site 054 in the NSW study area. This species is listed as Vulnerable under the Threatened Species Conservation Act 1995 (NSW). A total of 50 bird species were recorded between March 2020 and December 2020, two of those being a non-native species (Common Starling and House sparrow).

**Table 9: Species list compiled from bird observations across the TSMP area in 2020**

Common Name	Scientific Name	Monitoring Period Detected			
		NSW Autumn	NSW Spring	Vic Winter	VIC Spring
Australian Magpie	<i>Cracticus tibicen</i>	✓	✓	✓	✓
Australian Pelican	<i>Pelecanus conspicillatus</i>	✓	✓		
Australian Raven	<i>Corvus coronoides</i>	✓	✓	✓	✓
Australian Reed Warbler	<i>Acrocephalus australis</i>		✓		✓
Australian White Ibis	<i>Threskiornis molucca</i>		✓		
Australian Wood Duck	<i>Chenonetta jubata</i>	✓	✓	✓	✓
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	✓	✓		✓
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>	✓			
Blue-winged Parrot	<i>Neophema chrysostoma</i>	✓			
Brown Falcon	<i>Falco berigora</i>	✓		✓	
Brown Treecreeper	<i>Climacteris picumnus</i>	✓			
Crested Pigeon	<i>Ocyphaps lophotes</i>	✓	✓	✓	✓
Crimson Rosella	<i>Platycercus elegans</i>	✓	✓	✓	✓
Common Starling *	<i>Sturnus vulgaris</i>		✓		
Dusky Woodswallow	<i>Artamus cyanopterus</i>				✓
Eastern Rosella	<i>Platycercus eximius</i>	✓	✓	✓	✓
Galah	<i>Eolophus roseicapillus</i>	✓	✓	✓	✓
Great Cormorant	<i>Phalacrocorax carbo</i>	✓			
Grey Butcherbird	<i>Cracticus torquatus</i>	✓	✓		
Grey Fantail	<i>Rhipidura albiscapa</i>	✓			✓
Grey Shrike-thrush	<i>Colluricincla harmonica</i>				✓

Common Name	Scientific Name	Monitoring Period Detected			
		NSW Autumn	NSW Spring	Vic Winter	VIC Spring
Grey Teal	<i>Anas gracilis</i>	✓			
House Sparrow*	<i>Passer domesticus</i>	✓	✓	✓	✓
King Parrot	<i>Alisterus scapularis</i>			✓	✓
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	✓	✓	✓	✓
Little Corella	<i>Cacatua sanguinea</i>	✓			
Magpie-lark	<i>Grallina cyanoleuca</i>	✓	✓	✓	✓
Masked Lapwing	<i>Vanellus miles</i>	✓		✓	✓
Nankeen Kestrel	<i>Falco cenchroides</i>			✓	✓
Noisy miner	<i>Manorina melanocephala</i>	✓	✓	✓	✓
Pacific Black Duck	<i>Anas superciliosa</i>	✓	✓	✓	✓
Pied Currawong	<i>Strepera graculina</i>	✓	✓	✓	✓
Pied Butcherbird	<i>Cracticus nigrogularis</i>		✓	✓	
Purple Swamp Hen	<i>Porphyrio porphyrio</i>	✓	✓		
Rainbow Lorikeet	<i>Trichoglossus moluccanus</i>	✓			✓
Red-browed Finch	<i>Neochima temporalis</i>	✓	✓		✓
Red-capped Robin	<i>Petroica goodenovii</i>	✓			
Red Wattlebird	<i>Anthochaera carunculata</i>	✓	✓	✓	✓
Red-rumped Parrot	<i>Psephotus haematonotus</i>	✓	✓	✓	✓
Restless Flycatcher	<i>Myiagra inquieta</i>			✓	✓
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>			✓	
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	✓	✓	✓	
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	✓	✓	✓	✓
Superb Fairy-wren	<i>Malurus cyaneus</i>	✓	✓	✓	✓
Welcome Swallow	<i>Hirundo neoxena</i>	✓	✓	✓	✓
White-browed Babbler	<i>Pomatostomus superciliosus</i>				✓
White-faced Heron	<i>Egretta novaehollandiae</i>	✓		✓	✓



Common Name	Scientific Name	Monitoring Period Detected			
		NSW Autumn	NSW Spring	Vic Winter	VIC Spring
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>			✓	✓
White-throated Treecreeper	<i>Cormobates leucophaea</i>				✓
White-winged Chough	<i>Corcorax melanorhamphos</i>	✓	✓	✓	✓
Willie Wagtail	<i>Rhipidura leucophrys</i>	✓	✓	✓	✓
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	✓			✓

\* indicates introduced species.

## 4. Discussion and Recommendations

The expansion of the threatened species monitoring program into the Wodonga Council local government area (LGA) provides an excellent opportunity to monitor and evaluate the distribution of threatened species at a landscape scale and aligns with the Regional Natural Environment Strategy collaboration between the two councils. The program significantly improves the knowledge on Squirrel Glider (*Petaurus norfolcensis*) distribution across the study area and provides robust data that can be used by various government and other stakeholders. Importantly, the program now provides the opportunity to detect other threatened species such as the Brush-tailed Phascogale (*Phascogale tapoatafa*) and Spotted-tailed Quoll (*Dasyurus maculatus*). Both species have historical records in the Wodonga LGA but have not been sighted for some time.

As identified in Sections 3.1.2 and 3.2.2 of this report, the data derived from the program provides improved insight into Squirrel Glider (and potentially other species) habitat use over time. That is, the more monitoring sites which are incorporated into the program and the more monitoring periods that are undertaken, the more likely we are to draw some significant findings into how glider populations are responding to the ever-changing landscapes in the study areas. Both study areas (Thurgoona – Wirlinga and Wodonga) are experiencing rapid urban growth which is and has the potential to reduce and fragment existing habitat. By monitoring glider presence and absence across multiple habitat types and land use zones over time, we can identify critical habitats, linkages, and management interventions to ensure the populations remain viable in the face of urbanisation.

Key to the success of the program in providing data that can inform wildlife and habitat management is ensuring that the program continues in a consistent manner (i.e. biannual Autumn and Spring surveys in both study areas) and expands to include additional sites. There has been a lack of rural sites in both study areas due to difficulties in contacting private landholders, however these sites should be a priority for inclusion in the program. The rural sites act as control sites for the urban and proposed development sites, as they provide an indication of how Squirrel Gliders are utilising the different habitat types without being subject to the pressures of clearing and encroachment associated with urban development.

DM Ecological conducted a landholder engagement exercise in December 2020 with the objective to contact landholders and secure support for monitoring on their rural private properties. This proved a successful exercise and should result in up to five additional rural sites being incorporated into each study area (Thurgoona – Wirlinga and Wodonga) moving forward.

Three monitoring sites in the Thurgoona - Wirlinga study area have now been cleared since the start of the program to make way for residential or commercial developments. One was cleared before the first monitoring period, the second (Site 014) was cleared prior to the Autumn 2019 monitoring period after detecting Squirrel Gliders in Winter 2018. Most recently, Site 030 was cleared during the Spring 2020 monitoring period with camera in-situ, after having recorded Squirrel Glider presence in the each of the preceding five monitoring

periods as well as the period in which it was cleared. (Figure 10, page 18). Ideally, the data provided by the monitoring program will be considered in the development application phase, particularly where population strongholds or keystone habitat (like site 030) have been identified. These sites should be a priority for retention and enhancement through revegetation and linkage works where required.

Critical to maintaining the population viability of Squirrel Gliders across the study areas is going to be the application of the records informing development applications and management interventions to minimise impact on the species and their key habitat patches. The records of Squirrel Gliders, as well as non-target arboreal species identified and recorded throughout the program have the potential to identify movement barriers and priority linkages within the landscape. Squirrel Gliders, Common Brushtail Possums, Common Ringtail Possums, Yellow-footed Antechinus and Feathertail Gliders have all been recorded through this program and these, along with historical records can give a good indication of distribution and abundance throughout the study area. Combining this data with known and potential movement pathway barriers should be used to inform revegetation of wildlife corridors, fauna bridges and glider poles where appropriate.

The Squirrel Glider population appears to be relatively stable in the Thurgoona - Wirringa study area with the most recent detection rate (Spring 2020) of 38% very near that of the initial detection rate (Winter 2018) of 40%. It has dropped as low as 30% in that time (Spring 2019). The fluctuations in overall detection rates are expected given the Squirrel Gliders mobility and propensity to change den sites often within their home range, combined with the monitoring sites being static (i.e., the same tree is monitored each monitoring period) meaning there is a strong probability of recording a false absence within a monitoring site, habitat type or even land use zone. Modelled distributions and occupancy should always be considered along with follow up targeted surveys before an absence is considered. From a planning perspective, the precautionary principle should apply to account for false absences.

Whilst the detection rates in the Wodonga study area were significantly lower (27% and 25%) in its inaugural year in the program, this is likely due to two factors:

- 1.) Less overall sites in the study area resulting in less chances to detect gliders, and
- 2.) The number of glider detections that could not be attributed to either Squirrel Glider or Krefft's Glider due to the lack of distinguishing features available in the captured images (e.g., Figure 5, page 11).

Whilst the former will be addressed as part of the program's operations (identifying and implementing additional monitoring sites) the latter may require some investment of time and resources. So far there are five sites in the VIC study area (101, 114, 119, 121 and 125) where it is possible Squirrel Gliders and Krefft's Gliders overlap and it was not possible to make a distinction between the two for some images. It is likely that if not certain that this will occur at other sites as the program continues. Whilst in the short term there may be a reduction in Squirrel Glider detection rates due to uncertainty in species differentiation, there lies an opportunity to both engage the community and contribute to science by developing an identification protocol. Particularly one which can increase identification certainty from remote camera images (i.e., black and white, lower resolution etc).

Albury Conservation Company was a panellist on the Squirrel Glider Survey Design and Monitoring Workshop at the 2020 Greater Glider and Squirrel Glider Symposium hosted by Biolinks Alliance (<https://youtu.be/eWo1C6y8vpY>) where an identification protocol was a topic of discussion. Ways that our program could contribute to this protocol include:

- 1.) Follow up spotlighting at sites with identification issues (as noted above). This could be done by wildlife ecologists implementing the program, by citizen scientists via the [Albury Wodonga Nature Map](#) or even a combination of the two by an ecologist lead community event. The aim would be to spotlight, photograph and identify gliders in the area and upload the data to Albury Wodonga Nature Map and ALA so that there are recent reliable records to use when analysing motion sensor camera images.
- 2.) Installing a scale bar (i.e. a 100 mm strip of metal) in the target area of the tree to assist in determining the size of the glider in the photo, which can be a good indicator between species. It could not be solely relied upon due to the likelihood of encountering both adults and sub-adults in both species.

- 3.) Undertaking trapping surveys at selected sites to accurately identify captured individuals and upload these records through Albury Wodonga Nature Map and ALA. Whilst this method would likely provide the most certain distinction between species it would also bear the highest financial costs and have longer lead times associated with containing the relevant licenses, permits and ethics approvals for each trapping survey

Considering the above points, follow up spotlight surveys at the nominated sites would provide the most cost-effective way to add increased certainty to species identification in the study area, at least initially. The flexibility to set it up as an [Albury Wodonga Nature Map](#) citizen science project or host it as an ecologist lead community event also presents a great opportunity to engage the local community in the program. This approach aligns with the initial strategic objectives of the program, “Engage the community in the protection and enhancement of Squirrel Glider populations by providing avenues to participate in monitoring and restoration works”.

## 4.1 Summary of key recommendations

1. Implementation of the Albury Wodonga Threatened Species Monitoring Program should be continued across the major urban growth areas of Albury (Thurgoona / Wirlinga) and Wodonga (Leneva / Baranduda). This will continue to improve knowledge of threatened species and identify critical habitats, linkages, and management interventions to ensure the populations remain viable in the face of urbanisation.
2. The Albury Wodonga Threatened Species Monitoring Program should continue to be supported by Albury City and Wodonga Council as it closely aligns with the Regional Natural Environment Strategy (RNES), and meets many of the listed actions in the RNES Action Plan (2020-24).
3. The Albury Wodonga Threatened Species Monitoring Program should continue to explore opportunities to:
  - expand the current list of sites being monitored
  - include additional species being targeted
  - engage interested community groups, key stakeholders, researchers and other individuals.
4. The Albury Wodonga Threatened Species Monitoring Program should conduct follow-up surveys in the Wodonga study area to identify Squirrel Glider and/ or Krefft’s Glider presence and contribute to a species identification protocol.

## 5. Acknowledgments

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- Wodonga Council for their access to council land including Wodonga Retained Environment Network (WREN) lands.
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- Users of [Albury Wodonga Nature Map](#) whose records have added considerably to local wildlife knowledge, including our target species.

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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