



Eastern Pygmy-Possum Program Report 2021

Ku-ring-gai Council



1. Acknowledgements

The Eastern Pygmy-possum Program relies on the input of a team of 14 volunteers to monitor nest boxes located throughout the Ku-ring-gai Local Government Area (LGA). This long-term threatened species monitoring program has been running for over seven years, during which time it has expanded and adapted to improve outcomes and efficiency. Council recognises the significant contribution by our team of volunteers even during the uncertain periods of COVID-19. Additionally, we are grateful to members of Ku-ring-gai Men's Shed for continuing to design and produce innovative nest boxes that are fundamental for the program to operate and expand.

2. Introduction

The Ku-ring-gai LGA is bound by Ku-ring-gai Chase National Park to the north, Garigal National Park to the east, Lane Cove National Park to the west and spans three major catchments (Middle Harbour, Lane Cove River and Cowan Creek). Ku-ring-gai's natural areas are associated with 24 vegetation communities, which provide habitat for more than 700 native plant species and over 300 vertebrate species, including many species listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

One of the threatened species occurring in Ku-ring-gai is the Eastern Pygmy-possum (*Cercartetus nanus*) listed as Vulnerable under the BC Act. The Eastern Pygmy-possum (EPP) is a small nocturnal marsupial, known to inhabit multiple vegetation types from heath to rainforest and is rarely observed outside formal surveys.

The Eastern Pygmy-possum Program is part of Ku-ring-gai Council's ongoing biodiversity monitoring program. The key aims of the EPP monitoring program are to:

- Improve our understanding of the:
 - distribution and abundance of EPP; and
 - habitat preference of EPP.
- Provide supplementary habitat for EPP in areas where appropriate hollows are scarce.
- Effectively engage the community and decision makers in biodiversity conservation.
- Promote better management of habitat, and the consideration of EPP in development, or other management/bushland management activities.
- Displaying best practice and providing guidance for other projects.

The program utilises remote cameras and nest boxes and is conducted under Scientific Licence number 100881. The program supports the objectives of Council's Biodiversity Policy (2021) and Fauna Management Policy (2021), and is aligned with tasks N2.1.1 and N2.1.2 of Council's Delivery Program 2018-2022 and Operational Plan 2021-2022.

This report summarises the key results from the program for the 2021 calendar year, and provides recommendations for the future direction of the project.

3. Eastern Pygmy-possum (*Cercartetus nanus*)

Eastern Pygmy-possums are small diprotodont marsupials of the family *Burramyidae*. Eastern Pygmy-possum are native to south-eastern Australia, distributed from southern Queensland to eastern South Australia and Tasmania including Flinders and King Islands. In NSW, EPP distribution extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. EPP are associated with a broad range of habitats including temperate rainforest, sclerophyll forest, woodland and heath, but in most areas, where woodlands and heath are present they appear to be preferred habitat.

Eastern Pygmy-possums weigh 15 - 43 grams and have a head to body length of 70 - 110 millimetres with a tail length between 75 - 105 millimetres. They are light-brown on top, white underneath with an almost naked, prehensile tail. They have big, forward-facing ears, long whiskers, and large, bulging eyes.

Eastern Pygmy-possum feed primarily on nectar and pollen collected from banksias, eucalypts and bottlebrushes, making them important pollinators of heathland plants. When flowering is scarce, they supplement their diet with arthropods and soft fruit. Eastern Pygmy-possums shelter in a spherical nest of bark and leaves in a tree hollow or cranny. They appear to be mainly solitary, each individual using several nests, with males having non-exclusive home ranges of about 0.68 hectares and females about 0.35 hectares.² Whilst young can be born whenever food sources are available, locally, it appears there are two main breeding events in June-September and another in November-February (Cassie Thompson, pers. comm.). Eastern Pygmy-possums can enter periods of torpor to reduce energy expenditure, particularly in winter, with their body curled, ears folded and internal temperature dropping to match their surroundings.¹

Factors threatening the survival of the Eastern Pygmy-possum include habitat loss and fragmentation leading to isolated sub-populations with little opportunity for dispersal, inappropriate fire regimes that remove nectar-producing understorey plants, the loss of nest sites due to land clearing, and predation by foxes and cats². Fires may include prescribed burns (hazard reduction and ecological burns) or wild fires. Within the LGA, prescribed burns for either ecological or hazard reduction purposes are generally restricted in their frequency (depending on the vegetation type and proximity to residential areas), intensity and size (to ensure fauna connectivity of habitat to unburnt areas), however in some circumstances actions determined necessary to protect life and property are unavoidable.

4. Methods

Nest boxes were placed in areas with a dense mid storey including species from the Proteaceae family and with general heathy character where highest observation rates were expected.³ Monitoring was conducted at all nest box locations throughout the LGA, with presence or absence of EPP determined via direct nest box checks and/or remote cameras (focused on the nest box).

In September 2021, two nest boxes were relocated due to hazard reduction burn activities in the immediate vicinity of the boxes. Both boxes were checked before their removal, and placed in adjacent bushland that was clear from the burn as well as any smoke hazards. These boxes have been temporarily left in the new locations whilst the burn area regenerates.

Nest box checks were conducted quarterly within the first week of the monitoring month, ie. 1st-7th March, June, September and December, to be repeated annually to ensure consistency of the data. Indirect observations such as fresh nesting material in nest boxes were also recorded as evidence of habitation,

¹ Turner, J.M., Körtnner, G., Warnecke, L. & Geiser, F. (2012) Summer and winter torpor use by a free-ranging marsupial, *Comparative biochemistry and physiology. Part A, Molecular & integrative physiology*, **162** (3), 274-280.

² DPIE (2020) Eastern Pygmy Possum Profile, accessed online:

<http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155>

³ Law, B., Chidel, M., Britton, A. & Brassil, A. T. (2012) Response of Eastern pygmy-possums, *Cercartetus nanus*, to selective logging in New South Wales: home range, habitat selection and den use, *Wildlife Research*, **40**, 470-481

though only direct observations (i.e. a photo/video of an EPP or an EPP directly observed in a nest box) have been reported as indicating presence. Where fresh nesting material was found, if available, a camera would be installed at the nest box in attempt to capture remote footage to confirm EPP presence. Additionally, if an EPP was observed during the check a camera would be placed facing the nest box to observe their behaviour and activity.

The period of time cameras were left in place varied between monitoring events based on numerous factors related to staff or volunteer availability, the success or failure of the monitoring location, weather, security of cameras and controlled burning, but generally were left for a minimum period of four weeks. In the event that a camera failed to trigger, or there was a technical error, it would be reinstalled at the site.

Other species sighted or heard during nest box inspections or in remote camera footage were also recorded.

Nest box maintenance

During the December nest box checks, notes on the condition and quality of nest boxes were recorded. This was added to a maintenance list and four boxes are intended to be replaced or repaired during the March 2022 monitoring period. There were noticeable signs of damp and mould in multiple boxes which was most likely due to an extremely wet Spring and Summer period.



Image 1. Example of new nest box installation with hose fitting to protect the host tree

5. Limitations

At various times throughout the year, some nest boxes were impacted by ant colonies, either requiring the lid to be left open for a short period to encourage dispersal, or significantly damaged boxes required replacing. In some cases, this may have impacted the detectability of EPP where the box was uninhabitable.

Where multiple nest boxes are considered to be within a typical home range for EPP⁴, or located within a single reserve, the nest boxes have been grouped into 'unique' sites to inform presence/absence data (Table 1).

As is the case for all fauna monitoring, presence is confirmed by direct observation while absence is not confirmed through the lack of observation.

6. Results

Distribution of EPP throughout the LGA

Eastern Pygmy-possums were detected at 20 of 38 (52%) monitoring sites in the 2021 calendar year. The distribution of nest boxes and EPP records is provided in Figure 1. Of the unique sites/reserves in the LGA (Table 1), Eastern Pygmy-possum were detected at 8 of the 15 reserves (57%), a few which that did not have evidence of presence in 2020. The peak detection of EPP activity, either via nest box checks, camera detection or 'signs of visitation' occurred during Summer (Figure 3).

The northern and eastern reserves in the LGA continues to act as a stronghold for Eastern Pygmy-possums. These reserves have connectivity to Ku-ring-gai National Park and Garigal National Park, and since monitoring commenced in 2015 there has been ongoing presence in this area. In 2021, EPP were detected at three of five reserves surveyed in the east of the LGA and all five of the reserves to the north. EPP were not detected at McIntosh Park and Old She Oak Reserve where they have previously been recorded, however camera monitoring did not occur in these reserves, so presence was only determined by observation at the time of inspection. Ku-ring-gai Creek Reserve/ Warrimoo, Ku-ring-gai Wildflower Garden and Green Tip continue to have the highest activity, with all having recorded presence since monitoring commenced in 2015.

The three reserves in the south west of the LGA continue to be surveyed as part of the program. However, no EPP have been detected in this area of the LGA to date. A comparison of presence/absence data since for all six years of monitoring is summarised in Table 1.

⁴ Harris, J. M., Goldingay, R. L., Broome, L., Craven, P. & Maloney, K. S. (2007) Aspects of the Ecology of the Eastern Pygmy-Possum *Cercartetus Nanus* at Jervis Bay, New South Wales. *Australian Mammalogy* 29 (1), 39–46

Table 1. Distribution of EPP observations throughout the LGA, 2015-2021

Area/reserve name	Presence 2015-2016	Presence 2016-2017	Presence 2017-2018	Presence 2019	Presence 2020	Presence 2021
North of LGA (connectivity to Ku-ring-gai NP)						
Cowan Creek Reserve	Yes	Yes	Yes	Yes	No*	Yes
Ku-ring-gai Creek Reserve/ Warrimoo	Yes	Yes	Yes	Yes	Yes	Yes
Ku-ring-gai Wildflower Garden	Yes	Yes	Yes	Yes	Yes	Yes
Lovers Jump Creek Reserve	Yes	Yes	No*	Yes	Yes	Yes
St Ives Showground	Yes	Yes	No	Yes	No	Yes
East of LGA (connectivity to Garigal NP)						
Douglas Street Reserve (Acron Oval)	Yes	No	Yes	No	No	Yes
Green Tip	Yes	Yes	No	Yes	Yes	Yes
McIntosh Park	Not surveyed	Yes	No**	No	Yes	No
Old She Oak Reserve	Not surveyed	Not surveyed	No	No	Yes	No
Surgeon White Reserve	Yes	Yes	Yes	Yes	Yes	Yes
South west of LGA (Lane Cove NP)						
Bradley Park	No	No	No	No	No	No
Rofe Park	No	No	No	No	No	No
Sir Phillip Game Reserve North	Not surveyed	No	Not surveyed	Not surveyed	Not surveyed	Not surveyed
Twin Creek Reserve	Not surveyed	No	Not surveyed	Not surveyed	Not surveyed	Not surveyed
Blackbutt Creek Reserve	Not surveyed	Not surveyed	No	No	No	No

*NSW Atlas records show EPP presence north of the monitoring site

**Nest box was removed due to risk of hazard burns in the area, inactive between March and June 2018

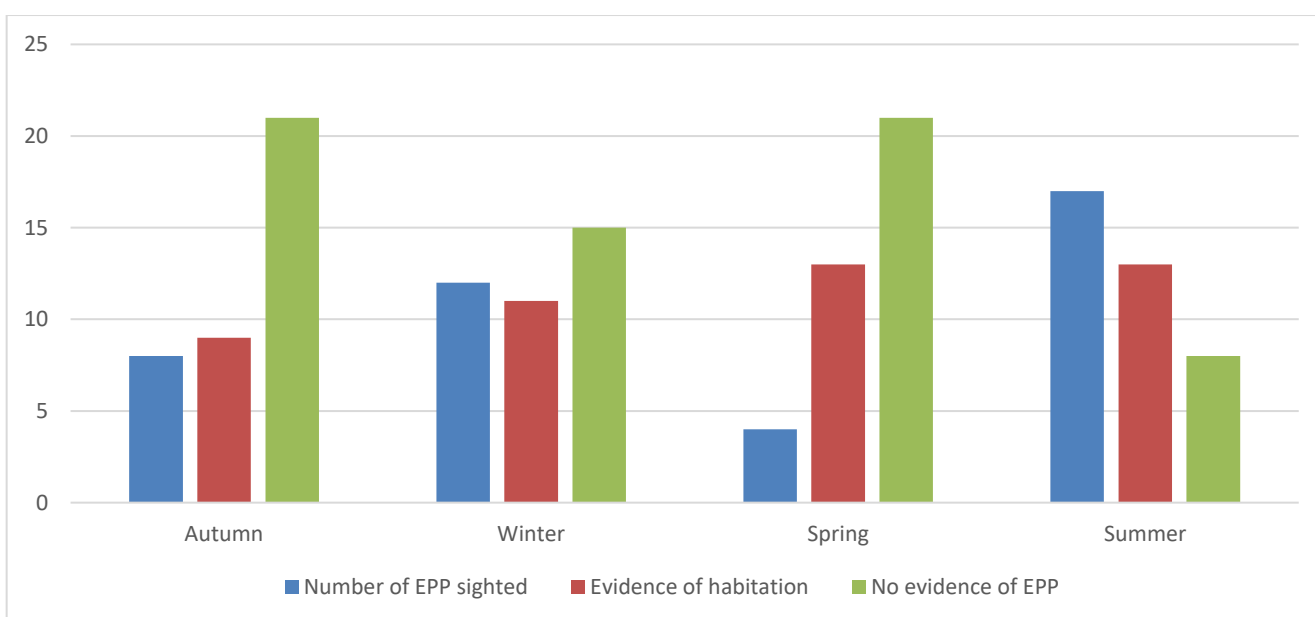


Figure 2. Results of 2021 monitoring (camera records and nest box observations combined)

Vegetation communities surveyed

Monitoring sites were located in a range of vegetation communities, including:

- Coastal Upland Swamp*
- Duffys Forest**
- Sydney Sandstone Gully Forest
- Sydney Sandstone Ridgetop Woodland

*Endangered ecological community under the state BC Act 2016.

** Endangered ecological community under the state BC Act 2016 and federal EPBC Act 1999.

Eastern Pygmy-possums were recorded in all vegetation communities other than Duffys Forest. Key flora species successful in capturing foraging EPP via remote cameras were *Banksia ericifolia* and *Banksia serrata*.

Breeding records

A successful breeding event was observed at Surgeon White Reserve, with at least two juveniles and an adult female photographed during the winter monitoring event. Sub-adult EPPs were also recorded via remote camera footage at the Wildflower Gardens, Warrimoo, and Green Tip which indicates that there have also been successful breeding events in these areas. Appendix 1 provides a photographic record of nest development throughout the seasons.

In addition to Eastern Pygmy-possums, the successful breeding of antechinus at the Ku-ring-gai Wildflower Gardens was observed during the 2021 program.

Other species observations

A range of other native species were detected during surveys, including 18 bird species, eight mammals and one reptile (Table 2). Invertebrates (mostly ants and spiders) were often found utilising the nest boxes. A gallery of remote camera footage and other species observations is provided on the following page.

Table 2. Other species detected during EPP monitoring

Scientific name	Common name	Observation type
<i>Birds</i>		
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	Camera monitoring – near nest box
<i>Alectura lathamii</i>	Australian Brushturkey	Camera monitoring – near nest box
<i>Anthochaera phrygia</i>	Regent Honeyeater	Camera monitoring – near nest box
<i>Cormobates leucophaea</i>	White-throated Tree Creeper	Camera monitoring – near nest box
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	Camera monitoring – near nest box
<i>Eopsaltria australis</i>	Eastern Yellow Robin	Camera monitoring – near nest box
<i>Gymnorhina tibicen</i>	Australian Magpie	Camera monitoring – near nest box
<i>Zosterops lateralis</i>	Silvereye	Camera monitoring – near nest box
<i>Mammals</i>		
<i>Acrobates pygmaeus</i>	Feathertail Glider	Camera monitoring – near nest box
<i>Antechinus stuartii</i>	Brown Antechinus	Camera monitoring – utilising nest box
<i>Petaurus breviceps</i>	Sugar Glider	Camera monitoring – near nest box
<i>Rattus sp.</i>	Rat	Camera monitoring – near nest box
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	Camera monitoring – walking past nest box
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	Camera monitoring – near nest box
<i>Wallabia bicolor</i>	Swamp Wallaby	Camera monitoring – foraging on ground
<i>Perameles nasuta</i>	Long-nosed Bandicoot	Camera monitoring – near nest box
<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	Camera monitoring – near nest box
<i>Reptiles</i>		
<i>Varanus varius</i>	Lace Monitor	Camera monitoring – near nest box



(f)



Figure 3. Gallery of remote camera footage and other species observations during 2021: (a) Eastern Yellow Robin, (b) Lace monitor, (c) Southern Boobook, (d) Eastern Pygmy-possum, (e) Ring-tail Possum, (f) Brown Antechinus

7. Discussion and recommendations

There was an increase in the number of EPP observed 2021 in comparison to 2020. Bushland reserves with large intact remnant vegetation adjoining Ku-ring-gai Chase National Park and Garigal National Park remain a stronghold for the population of Eastern Pygmy-possums in the Ku-ring-gai LGA. There was a total of 87 indicators of presence in 2021 – this includes camera monitoring, direct observation, and evidence of use in the nest box. EPP activity was predominantly detected through camera monitoring and peaked in Summer. High levels of detection in Summer may be attributed to fauna seeking opportunistic shelter due to increased rainfall from the La Niña phenomenon.

A hazard reduction burn is planned for the northern side of the Green Tip (adjoining Garigal National Park). In anticipation of this, two nest boxes were relocated from the proposed burn area to areas nearby that had suitable flowering banksias. Prior to relocation one of these boxes consistently recorded high levels of EPP activity, however in the new location has had zero evidence of use. This new location is no more than 150 metres from the previous site, yet due to the moist environment lower in the valley it is an uninviting habitat. This reiterates the importance of carefully selecting locations for nest box installation, and that absence from a box does not necessarily indicate absence from the surrounding area.

Additionally, the importance of camera footage in providing valuable distribution data has been reiterated during the 2021 monitoring program. There were numerous instances during the monitoring event where remote cameras recorded EPP occupying a nest box the day before the quarterly nest box check. However, when the physical check occurred the following day the possum was not present, and in certain scenarios there was minimal evidence of habitation (e.g. fresh nesting material recently brought into the box). Without this supplementary camera footage, the dataset would be skewed, and therefore not adequately represent the distribution and abundance of EPP in the LGA.

The EPP monitoring program will continue in 2022 with implementation of the following:

- Monitoring of nest boxes will continue on a quarterly basis (March, June, September and December 2021), with the adjustment that where there is clear evidence of recent EPP activity, a second visit within a couple of days of the initial nest box inspection may be undertaken. This second visit is optional only, depending on the volunteer's availability.
- Council staff will continue the use of remote cameras at nest box sites to capture EPP activity outside of the quarterly monitoring events. Cameras may be made available on request by volunteers for monitoring within proximity of an assigned nest box for a specific site.
- Nest boxes impacted by ant colonies will continue to be monitored for deterioration and replaced or relocated if necessary.
- Data will continue to be collected via Council's data collection application, accessed via smart phones or internet browser.
- All records will continue to be uploaded to relevant databases quarterly as per data licence agreements.
- Council will investigate undertaking an occupancy analysis given the long term dataset which will provide valuable insight into the abundance and population of EPP in KRG

In addition to this the following actions will be implemented:

- Replacement of nest boxes that have suffered damage from damp and mould
- Relocation of nest boxes that are in areas of high pedestrian activity (e.g. Rofe Park)
- Installation of nest boxes in National Parks as per agreement with the National Parks and Wildlife Service

8. Conclusion

In comparison to previous years, the 2021 Eastern Pygmy-possum monitoring demonstrated some of the highest levels of EPP activity in the Ku-ring-gai LGA. The results reiterated that bushland reserves with connectivity to Ku-ring-gai Chase National Park and Garigal National Park to the north and east of the LGA remain a stronghold for the population of Eastern Pygmy-possums in Ku-ring-gai, with continued evidence of successful breeding events. This long-term monitoring program continues to provide valuable insights into the distribution and ecology of pygmy-possums, as well as highlighting the unique diversity of other pollinators and native fauna in Ku-ring-gai. The program has benefited from the team of volunteers involved, providing local knowledge and increasing community awareness of this unique threatened species.

If you would like to find out more about the program, please contact Council's Natural Areas Officer, on (02) 9424 0000 or naturalareas@kmc.nsw.gov.au.

9. References

DPIE (2022) Eastern Pygmy Possum Profile, accessed online:

<http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155>

DPIE (2020) NSW BioNet. Atlas of NSW Wildlife. Accessed online: <https://www.environment.nsw.gov.au/>





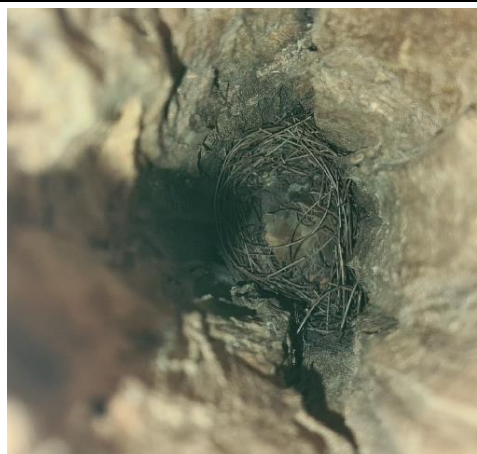


Harris, J. M., Goldingay, R. L., Broome, L., Craven, P. and Maloney, K. S. (2007) Aspects of the Ecology of the Eastern Pygmy-Possum *Cercartetus Nanus* at Jervis Bay, New South Wales. *Australian Mammalogy*, **29** (1), 39–46.

Law, B., Chidel, M., Britton, A. and Brassil, A. T. (2012) Response of Eastern pygmy-possums, *Cercartetus nanus*, to selective logging in New South Wales: home range, habitat selection and den use, *Wildlife Research*, **40**, 470–481.

Turner, J. M., Körtner, G., Warnecke, L. and Geiser, F. (2012) Summer and winter torpor use by a free-ranging marsupial, *Comparative biochemistry and physiology*, **162** (3), 274-280.

Appendix 1 – Nest box monitoring photos





NB1: Ku-ring-gai Wildflower Gardens			
March 2021	June 2021	September 2021	December 2021
			
NB2: Cowan Creek Reserve			
March 2021	June 2021	September 2021	December 2021
	Monitoring event but no photo		

NB3: Lovers Jump Creek Reserve			
March 2021	June 2021	September 2021	December 2021
		Monitoring event but no photo	
NB4: St Ives Showground			
March 2021	June 2021	September 2021	December 2021
			

NB5: Ku-ring-gai Creek Reserve (Warrimoo)

March 2021	June 2021	September 2021	December 2021
			

NB6: Ku-ring-gai Creek Reserve (Warrimoo)

March 2021	June 2021	September 2021	December 2021
			

NB7: Ku-ring-gai Creek Reserve (Warrimoo)

March 2021



June 2021



September 2021



December 2021



NB8: Ku-ring-gai Wildflower Garden

March 2021



June 2021







September 2021










December 2021



NB 9: Ku-ring-gai Wildflower Garden			
March 2021	June 2021	September 2021	December 2021
			

NB 10: Douglas Street Reserve			
March 2021	June 2021	September 2021	December 2021
			

NB 11: Douglas Street Reserve			
March 2021	June 2021	September 2021	December 2021
			

NB 12: Ku-ring-gai Creek Reserve			
March 2021	June 2021	September 2021	December 2021
			

NB 13: Rofe Park

March 2021	June 2021	September 2021	December 2021
			

NB 14: Lovers Jump Creek Reserve

March 2021	June 2021	September 2021	December 2021
			

NB 15: Lovers Jump Creek Reserve

March 2021	June 2021	September 2021	December 2021
			

NB 16: St Ives Green Tip

March 2021	June 2021	September 2021	December 2021
		Monitoring event but no photo	Monitoring event but no photo

NB 17: Lovers Jump Creek Reserve

March 2021	June 2021	September 2021	December 2021
			

NB 18: Ku-ring-gai Creek Reserve

March 2021	June 2021	September 2021	December 2021
			




NB 19: Cowan Creek Reserve

March 2021	June 2021	September 2021	December 2021
		<p data-bbox="1079 231 1536 292">Nest box not monitored due to COVID lockdown</p>	





NB 20: Lovers Jump Creek Reserve

March 2021	June 2021	September 2021	December 2021
			

NB 21: Cowan Creek Reserve

March 2021	June 2021	September 2021	December 2021
	Monitoring event but no photo		



NB 22: Surgeon White Reserve

March 2021	June 2021	September 2021	December 2021
			

NB 23: Surgeon White Reserve

March 2021	June 2021	September 2021	December 2021
 A photograph of a bird's nest in a hole, constructed from a dense pile of dry, brown sticks and twigs.	 A photograph of the same nest in June 2021, showing a similar construction of sticks and twigs.	 A photograph of the nest in September 2021, with the twigs appearing slightly more compact.	 A photograph of the nest in December 2021, showing a well-developed structure of twigs.

NB 24: Surgeon White Reserve

March 2021	June 2021	September 2021	December 2021
 A photograph of a bird's nest in a hole, constructed from large, flat, reddish-brown dried leaves.	 A photograph of the same nest in June 2021, showing the large dried leaves.	 A photograph of the nest in September 2021, with the leaves appearing more layered.	 A photograph of the nest in December 2021, showing a well-developed structure of large dried leaves.

NB 25: McIntosh Park

March 2021	June 2021	September 2021	December 2021
			

NB 27: Old She Oak Reserve








March 2021	June 2021	September 2021	December 2021
			

NB 28: Ku-ring-gai Wildflower Garden

March 2021	June 2021	September 2021	December 2021
			

NB 29: Lovers Jump Creek Reserve

March 2021	June 2021	September 2021	December 2021
			

NB 30: HART			
March 2021	June 2021	September 2021	December 2021
			
NB 31: Green Tip			
March 2021	June 2021	September 2021	December 2021
		Monitoring event but no photo	





NB 32: Green Tip

March 2021	June 2021	September 2021	December 2021
		Nest box fell from tree	

NB 33: Blackbutt Reserve

March 2021	June 2021	September 2021	December 2021
			

NB 34: Step track

March 2021	June 2021	September 2021	December 2021
			

NB 35: Darri track

March 2021	June 2021	September 2021	December 2021
			

NB 36: Surgeon White Reserve

March 2021



June 2021



September 2021



December 2021



NB 37: Bungaroo Track

March 2021



June 2021





September 2021



December 2021



NB 38: Warrimoo			
March 2021	June 2021	September 2021	December 2021
	Monitoring event but no photo	Monitoring event but no photo	Monitoring event but no photo
NB 39: Cowan Creek Reserve			
March 2021	June 2021	September 2021	December 2021
	Monitoring event but no photo	