




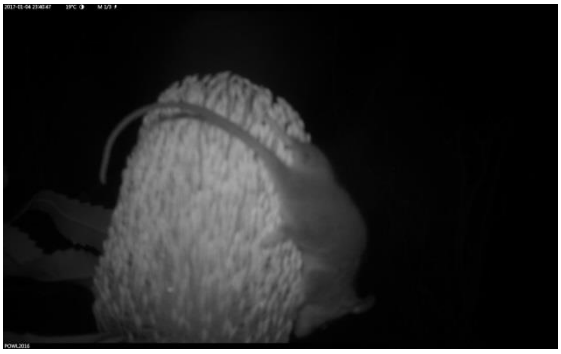

Ku·ring·gai Council

SERVIENDO GUBERNO

Ku-ring-gai Council Eastern Pygmy-Possum Program Report 2016-2017

Ku-ring-gai Council and WildThings NSW

1. Acknowledgements

The Eastern Pygmy-possum Program is part of Ku-ring-gai Council's biodiversity monitoring program. The EPP has been running for over two years in collaboration with volunteers from WildThings NSW.

Council recognise the significant contributions by WildThings NSW volunteers who have dedicated their time and knowledge to the program. In particular, Bob Jones for his ongoing commitment to every aspect of this program, Simon Van Der Veen, Inge Buchanan, Mike Davies, Chris Hayward, Kathy Bradfield, Nicholas Yu, Aly Ross, WildThings NSW president Chris Smallbone and all other WildThings NSW members who have contributed to the project in so many ways. Special mention also to those who have donated nest boxes to the program. Council received additional assistance from Macquarie University students for the collection of Nest Box attribute data.

This report has been prepared by Chelsea Hankin, Jacob Sife and Jessica Leck, December 2017.

2. Introduction

The Ku-ring-gai Local Government Area (LGA) with its varied habitats and high rainfall is an area rich with biodiversity. The vegetation communities within the LGA support over 700 native plants and over 300 vertebrate species, including many species listed as threatened under the *Biodiversity Conservation Act 2016* (BC Act, previously *Threatened Species Conservation Act 1995*).[1]

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

Ku-ring-gai Council in collaboration with WildThings NSW conducts a monitoring program aimed at defining the distribution, abundance and habitat preferences of EPP within the LGA. The program utilises remote cameras and nest boxes and is conducted under Scientific Licence number 100881. The program is aligned with task N2.1.1 of Council's Delivery Program 2013 – 2017 and Operational Plan 2017-2018.

This report summarises the key results from the program between August 2016 and July 2017, and provides recommendations for the future direction of the project.

3. Project team

The Eastern Pygmy-possum Program is a collaborative project between Ku-ring-gai Council and community volunteers from the WildThings NSW.

Council's Natural Areas Team conducts biodiversity survey and monitoring programs within the LGA whilst working closely with community groups, research institutions and other departments to build knowledge regarding the biodiversity within the LGA and continually improve management.

Council's WildThings program aims to create positive relationships between people and wildlife and has a history of very successful programs including Pool to Pond, and the native beehive project.

WildThings NSW is a community group that volunteers to help Council with their WildThings program while holding their own meetings, events and activities.

[1] Ku-ring-gai Municipal Council (2016), Ku-ring-gai Biodiversity and Riparian Lands study v5

4. Project aim

The aims of the EPP Program as detailed within the *'Eastern Pygmy Possum Program and Recovery Plan for Ku-ring-gai Municipality - Final 2015 Version*' are:

- Improve our understanding of the:
  - distribution and abundance of EPP; and
  - habitat preference of EPP.
- Providing supplementary habitat for EPP in areas where appropriate hollows are scarce.
- Effectively engaging the community and decision makers in biodiversity conservation.
- Promoting 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.

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

Eastern Pygmy-possums are small 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 rainforest, sclerophyll forest, woodland and heath, but in most areas, where woodlands and heath are present they appear to be preferred habitat.[2]

Eastern Pygmy-possums weigh 15 - 43 grams and have a head to body length of 70 - 110 millimetres and 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 and move pollen around as they feed. In this way they are important pollinators of heathland plants. Eastern Pygmy-possum also feed on 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 (OEH 2016). Whilst young can be born whenever food sources are available, most births occur between late spring and early autumn. Eastern Pygmy-possums enter periods of torpor especially in winter, with body curled, ears folded and internal temperature dropping to match their surroundings.[3]

[2] *OEH (2017), Eastern Pygmy Possum Profile, http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155*
[3] *Turner, J.M., Körtner, 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, vol. 162, no. 3, pp. 274-280.*

6. Methods

Monitoring was conducted at 70 sites throughout the LGA between August 2016 and July 2017, with presence or absence of EPP determined via remote cameras and/or monitoring of nest boxes. Remote cameras were generally focused at spikes of *Banksia ericifolia* with pungent smell or visible nectar. 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.[4]

When a cameras footage was checked, or when a nest box was inspected, a field sheet was completed and this represented a monitoring event. In some cases, nest boxes or cameras were left in place following monitoring events and as such, a single site may have multiple monitoring events. Both 'events' and 'sites' are reported here. For presence/absence data, observations from cameras and nest boxes were combined and treated equally. Indirect observations such as fresh nesting material in nest boxes were also recorded, though only direct observations (i.e. a photo/video of an EPP or an EPP observed in a nest box) have been reported as indicating presence.

The period of time cameras or nest boxes were left in place varied between 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. Where possible, cameras were left out for a period of 14 nights in order to gain an activity measure.

The number of nest boxes in the program increased from 14 to 25 over the reporting period, and it is expected that a total of 40 nest boxes will be installed by the end of 2018.

Attribute data for each nest box was collected in a research partnership with Macquarie University students between April and May 2017.

7. Limitations

The number of sites (70) represents each monitoring point (ie. every place a camera or nest box was installed). In some cases, monitoring sites were within close proximity to each other. Some of these sites have been grouped together to represent a monitoring location to inform presence/absence data for areas or reserves (Table 1). Thirteen of the 45 camera sites were considered to be independent based on the distance between cameras. A total of 18 sites (remote camera and nest box sites combined) were considered to be unique based on a distance greater than their home range.

Much of the survey effort was directed towards *Banksia ericifolia* and this introduced a level of bias and the results reported here must be understood in this context.

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

8. Results

Distribution of EPP throughout the LGA

Eastern Pygmy-possum were detected at 8 of 25 (32%) nest box sites and 5 of 13 (38%) camera sites throughout the LGA between August 2016 and July 2017. The distribution of monitoring sites and EPP records is provided in Figure 1.

[4] *Law B, Chidel M, Britton A, and BrassilA 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*, 2013, **40**, 470–481

All EPP observations were recorded in the north of the LGA with connectivity to either Ku-ring-gai National Park or Garigal National Park. Despite increased survey effort since the previous monitoring period, EPP remain undetected in the south west of the LGA (reserves with connectivity to Lane Cove National Park). Four new reserves were monitored for Eastern Pygmy-possum during the 2016-2017 period with one (McIntosh Park) having EPP presence recorded. There was continued presence of EPP at all reserves monitored in 2015-2016 except for Douglas Street Reserve (Acron Oval). These results are provided in Table 1.

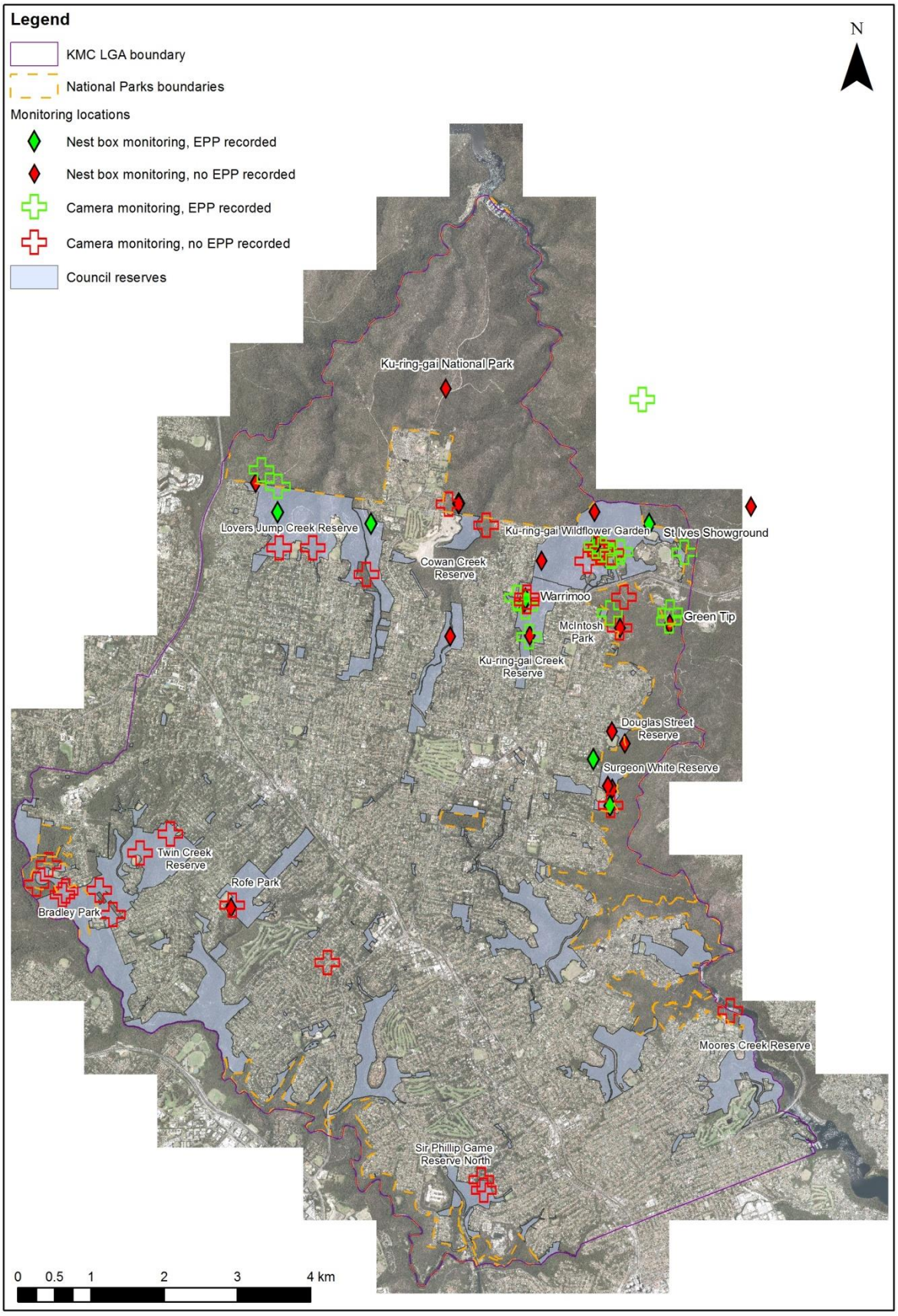

Figure 1 Eastern Pygmy-possum observations between August 2016 and July 2017

Table 1. Distribution of EPP observations throughout the LGA

Area/reserve name	Presence in 2015-2016	Presence in 2016-2017
North of LGA (Ku-ring-gai NP)		
Cowan Creek Reserve	Yes	Yes
Ku-ring-gai Chase National Park	Yes	Yes
Ku-ring-gai Creek Reserve	Yes	Yes
Ku-ring-gai Wildflower Garden	Yes	Yes
Lovers Jump Creek Reserve	Yes	Yes
St Ives Showground	Yes	Yes
Warrimoo	Yes	Yes
North-east of LGA (Garigal NP)		
Douglas Street Reserve (Acron Oval)	Yes	No
Green Tip	Yes	Yes
McIntosh Park	Not surveyed	Yes
Moores Creek Reserve	Not surveyed	No
Surgeon White Reserve	Yes	Yes
South west of LGA (Lane Cove NP)		
Bradley Park	No	No
Rofe Park	No	No
Sir Phillip Game Reserve North	Not surveyed	No
Twin Creek Reserve	Not surveyed	No

During the monitoring period (August 2016 to July 2017) there were a total of 273 monitoring events including both nest boxes (NB) and remote cameras (RC). Eastern Pygmy-possum were observed in 25 (9%) of the monitoring events, comprising 11 NB (4.8%) and 14 (31%) RC observations. Eastern Pygmy-possum were detected at 8 of the 18 (44%) sites considered to be unique (RC and NB combined) based on the home range of EPP. The results of the 228 NB and 45 RC monitoring events are summarised in Table 2 and plotted in Figure 2.

A RC monitoring event is considered a single event regardless of how many days the RC was in place or on how many nights an EPP was observed over the monitoring event. From the 45 RC monitoring events, EPP presence was confirmed in 14 (31%).

Table 2. Nest box and remote camera monitoring events and success rates

	Number of sites	Sites with EPP	Number of Events	Events with EPP
Nest Boxes	25	8 (32%)	228	11 (4.8%)
Remote Camera	13	5 (38%)	45	14 (31%)
Unique sites* (NB and RC combined)	18	8 (44%)		
total events			273	25 (9%)

*Unique sites were sites, or clumps of sites that were within EPP home range. I.e. some sites in very close proximity were combined into a unique site.

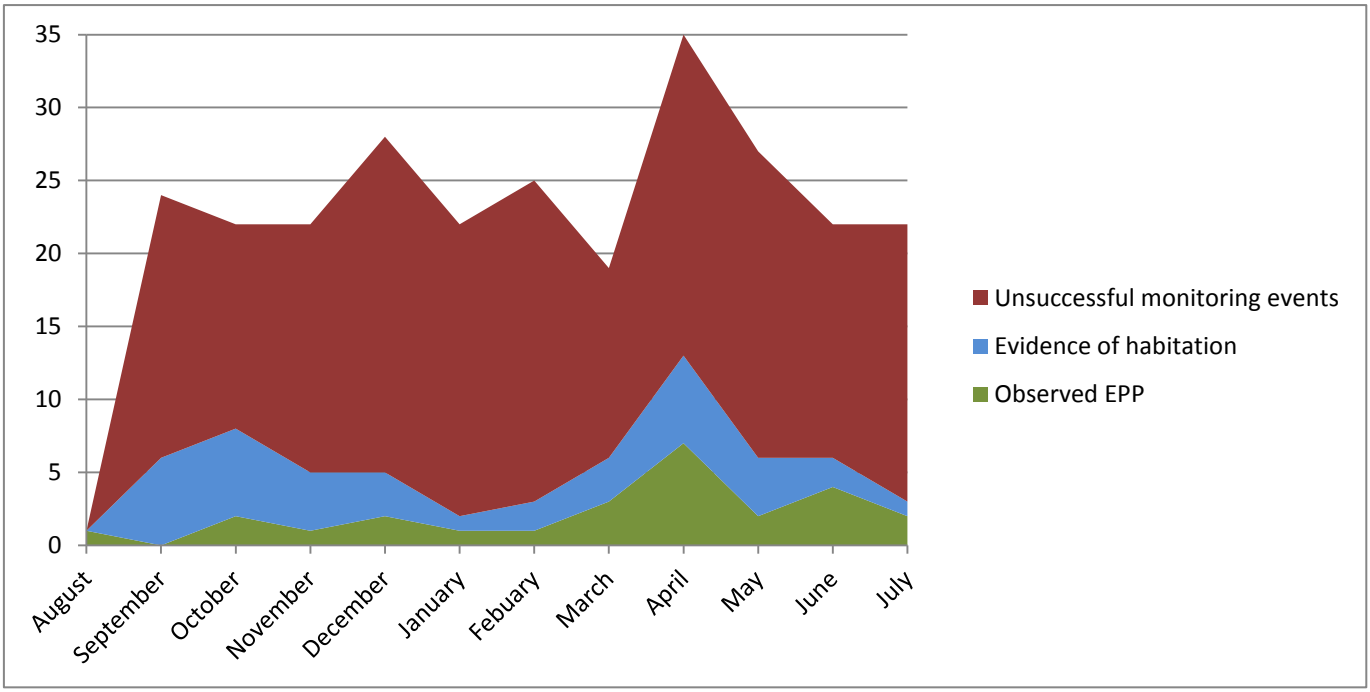

Figure 2. Monitoring events and EPP observations during the monitoring period of August 2016 to July 2017, NB and RC monitoring combined

Vegetation communities surveyed

NB and RC sites were located in a range of vegetation communities, including:

- Coastal Upland Swamp Core (CUS C)
- Coastal Upland Swamp Buffer (CUS B)
- Duffys Forest (DF)
- Sydney Sandstone Gully Forest (GF)
- Sydney Sandstone Ridgetop Woodland (W)

The associated vegetation community for each NB and RC site along with the number of sites with EPP recorded is presented in Figure 3 and Figure 4 respectively.

Eastern Pygmy-possum were observed in the Sydney Sandstone Ridgetop Woodland, Sydney Sandstone Gully Forest and Coastal Upland Swamp communities (both core and buffer). Coastal Upland Swamp is listed as an endangered ecological community under the state BC Act and federal Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Multiple EPP were recorded using NB1 (Surgeon White Reserve, Sydney Sandstone Gully Forest), NB9 (Ku-ring-gai NP, Coastal Upland Swamp Core) and NB7 (Lovers Jump Creek Reserve, Coastal Upland Swamp Core), indicating successful breeding in these areas. A photographic record of nest development throughout the seasons is provided in Appendix 1. Attribute data for each nest boxes is provided in Appendix 2.

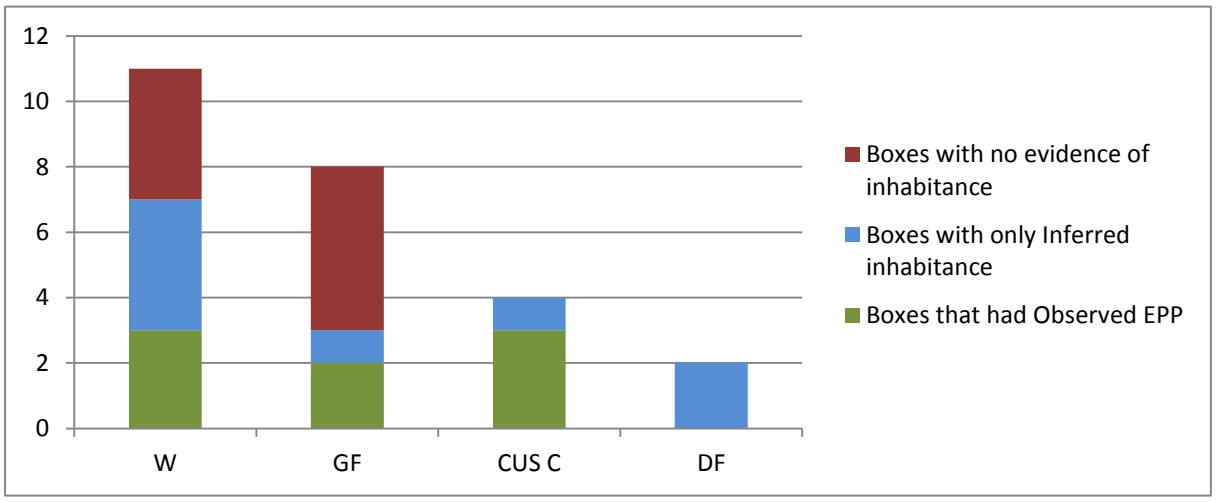

Figure 3 Number of NB monitoring sites located in each vegetation community and EPP presence (Ku-ring-gai Council Mapping 2014)

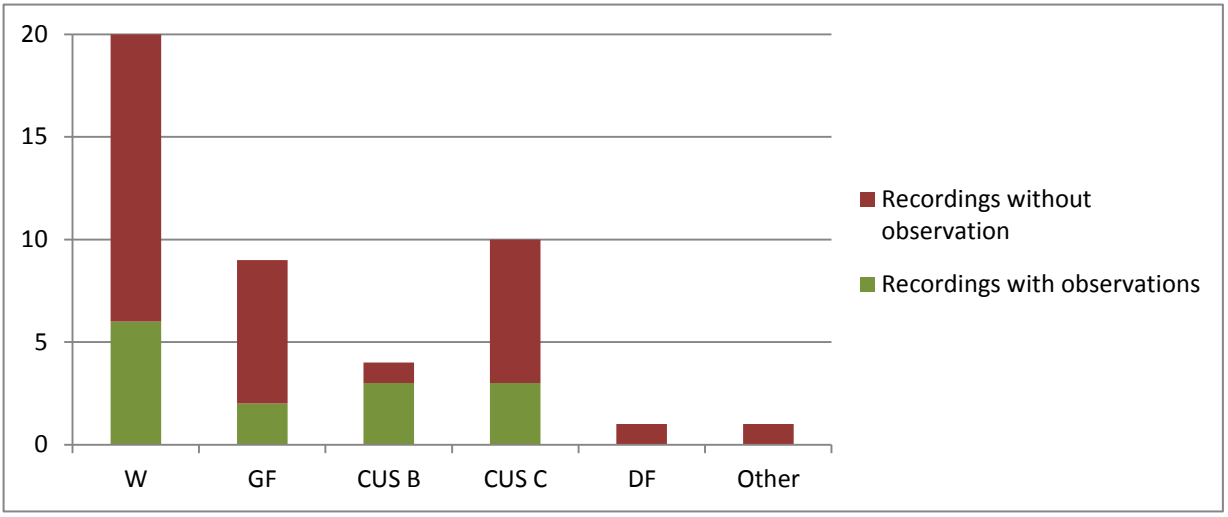

Figure 4 Number of RC monitoring sites located in each vegetation community and EPP presence (Ku-ring-gai Council Mapping 2014)

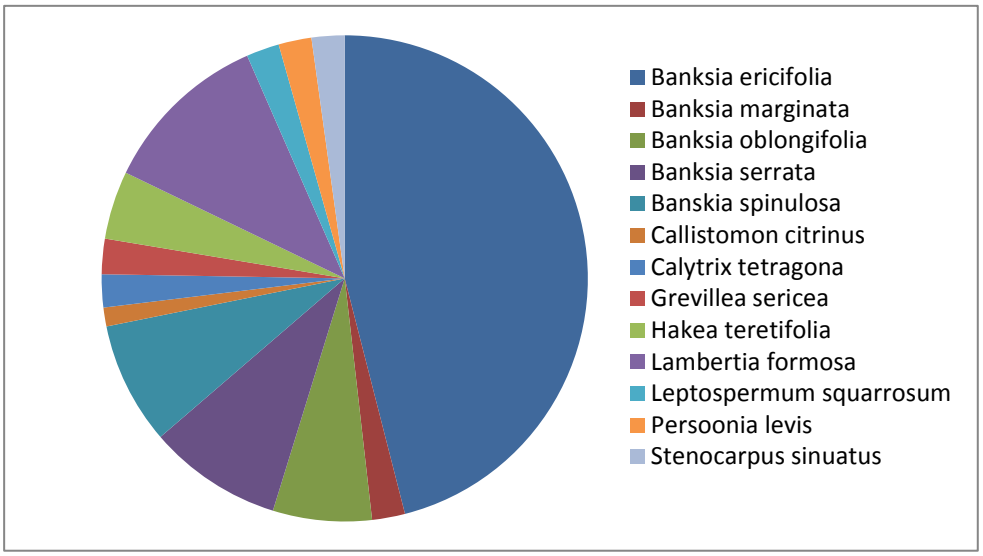

Figure 5 Survey effort – flora species targeted by remote cameras

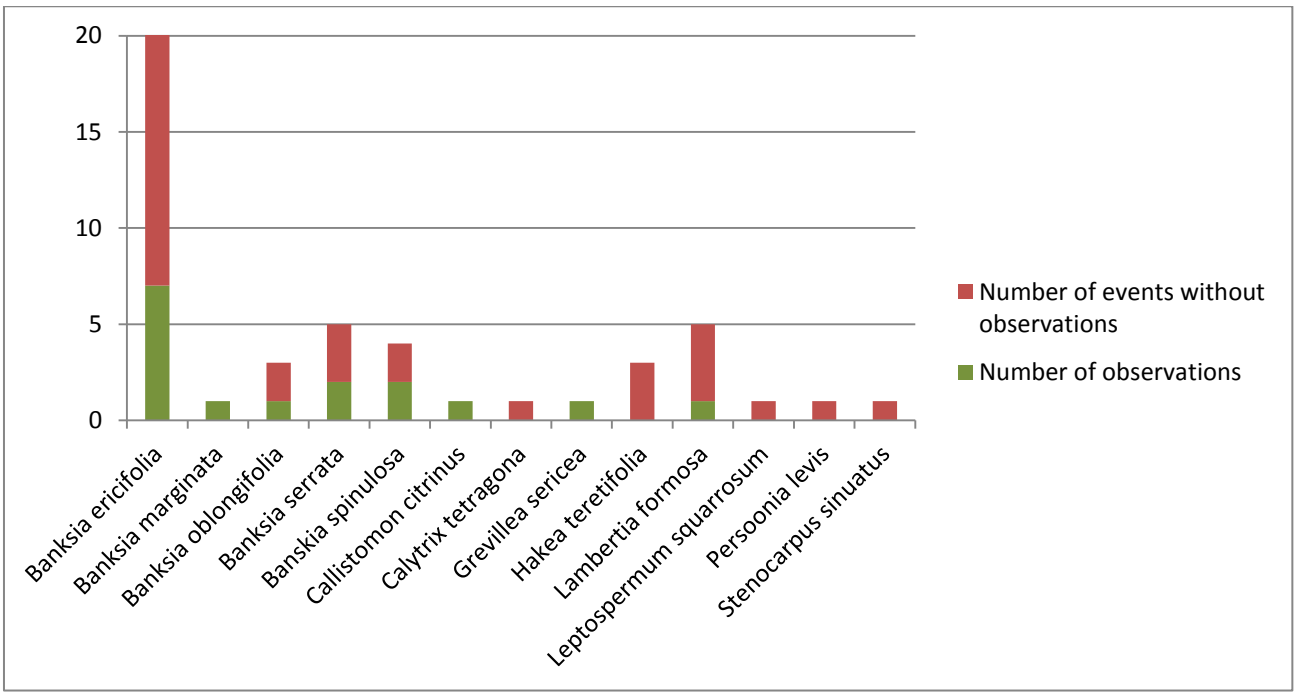

Figure 6. Success rate of flora species detecting EPP

Foraging behaviour

Remote cameras were predominantly focused on *Banksia ericifolia* spikes, making up almost half of the total RC survey effort (Figure 5) contributing 30% of all captured EPP activity (Figure 6). A number of other flora species targeted had a high success rate in detecting EPP, including *Banksia marginata, Banksia oblongifolia, Banksia serrata* and *Grevillea sericea*, however, caution must be applied when interpreting these results given the uneven distribution of survey effort (eg. *Banksia spinulosa* had a 50% success rate based on only four monitoring events).

At RC sites, the number of nights with EPP recorded was noted and this can be represented as a percentage. For example if a camera was focused on a particular flower for 14 nights and photos of EPP were taken on 4 of the 14 nights, then the activity measure is 4/14 or 28%. This measure of EPP activity via remote cameras revealed activity “hotspots” in the north of the LGA, with the highest activity occurring at the Ku-ring-gai Wildflower Gardens, St Ives Showground and Warrimoo (**Error! Reference source not found.**). Flora species with EPP activity rates equal or greater than 50% included *Grevillea sericea, Banksia ericifolia, Banksia oblongifolia* and *Banksia marginata.* Peak activity coincided with the flowering period for each of these species.

Fire history in the LGA and EPP presence/absence

During this monitoring period there were nine fires recorded in the LGA (including controlled burns and wild fires). Fire history in the LGA and observed EPP presence in the 2016-2017 monitoring period is displayed on Figure 8. A number of concerns were raised about the impact of fire on EPP. This is something which will be considered further, however, the figure below indicates that the relationship between EPP and fire is complex with some areas recently burnt having EPP recorded in close proximity (eg. Wildflower Gardens and St Ives Showground) though no directly burnt area was monitored as part of this program.

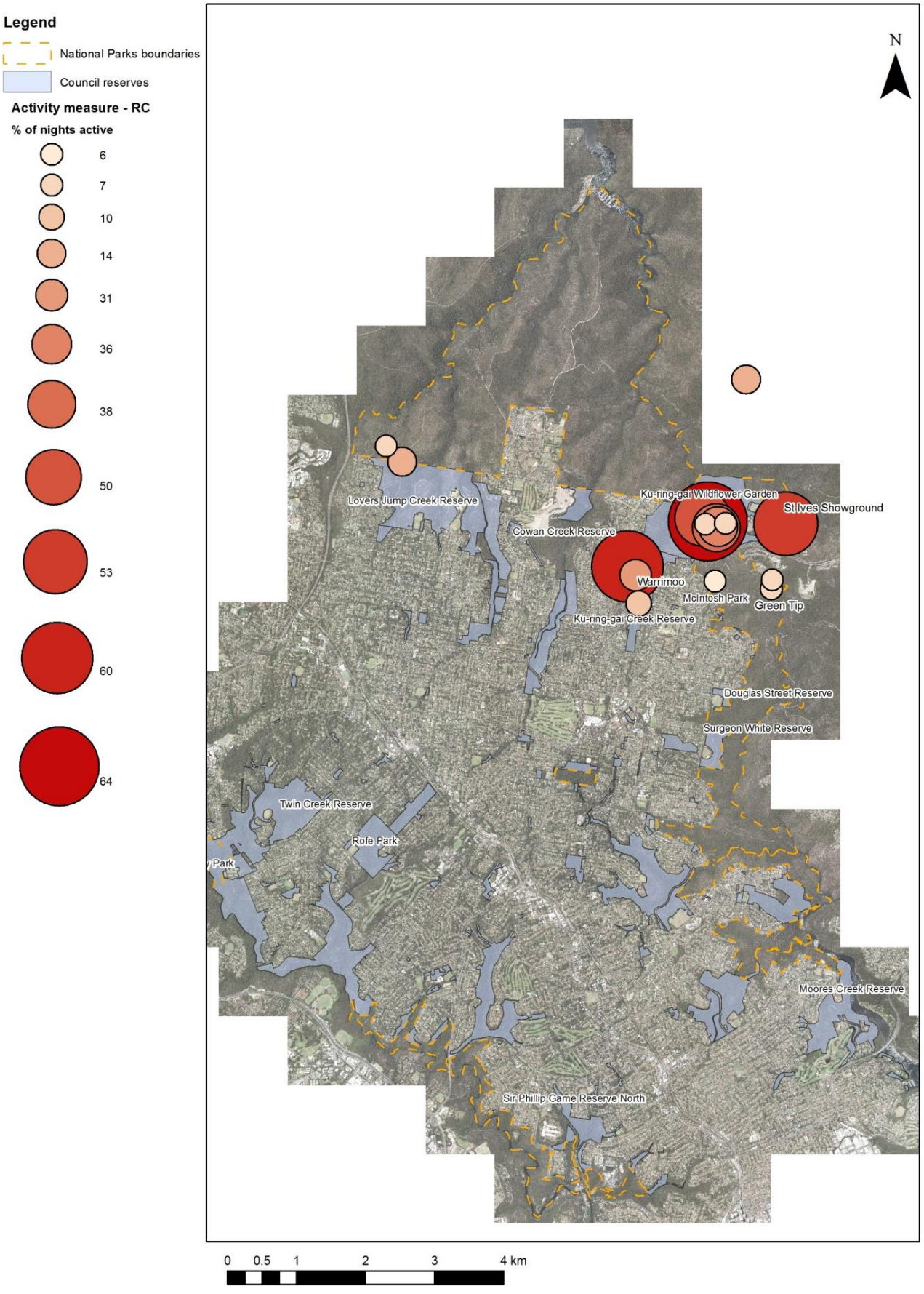

Figure 7. Activity measure using remote cameras

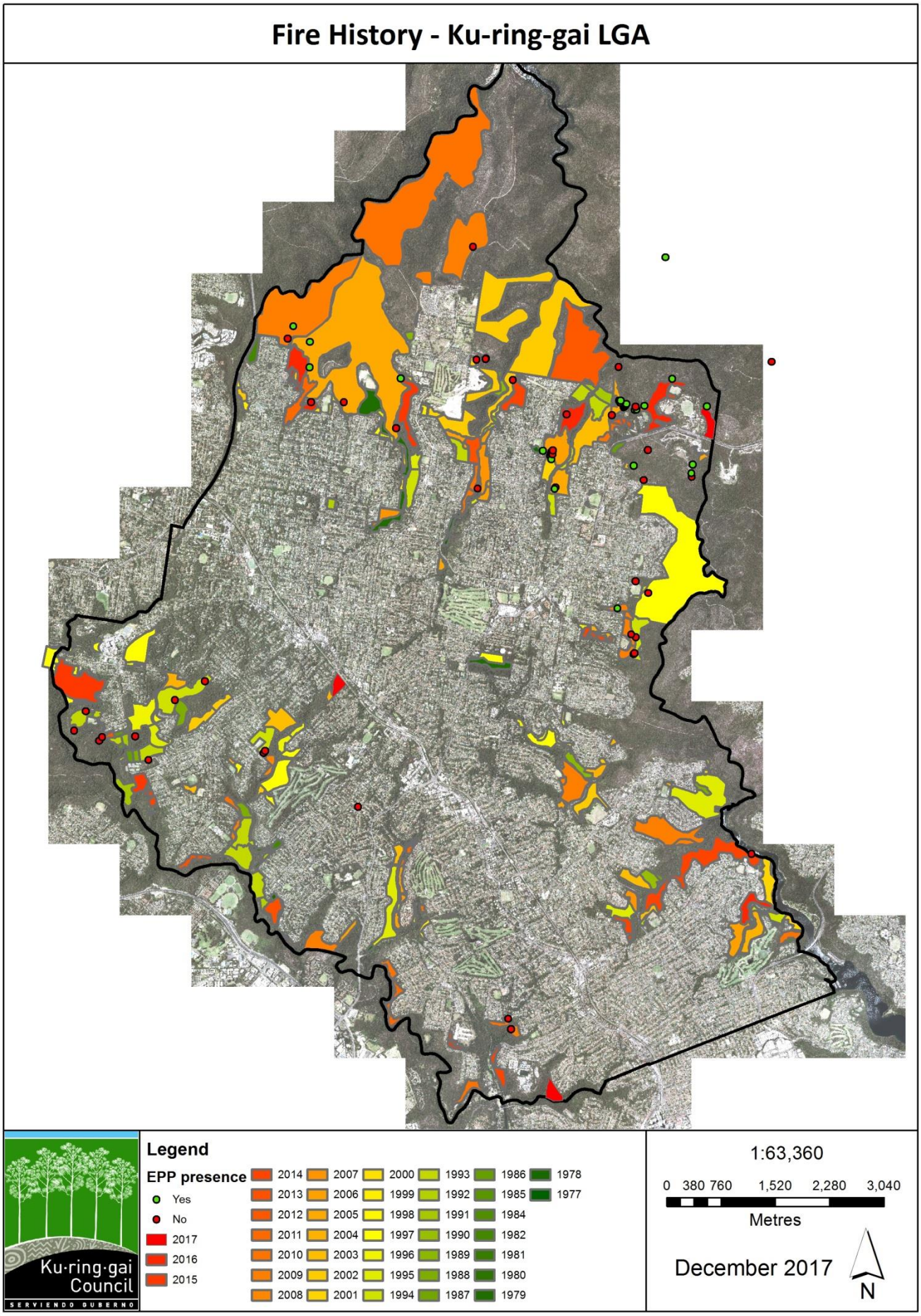

Figure 8. EPP presence/absence overlaid on Fire history

Other species observations

A range of other native species were detected during surveys, including 14 bird species and 6 mammals (Table 3). One introduced species was recorded (Black Rat). Occasionally invertebrates (ants and spiders) were found in the nest boxes.

Table 3. Other species detected during EPP monitoring

Scientific name	Common name	BC Act[a]	EPBC Act[b]
Birds			
Acanthiza lineata	Striated Thornbill		
Acanthiza pusilla	Brown Thornbill		
Acanthorhynchus tenuirostris	Eastern Spinebill		
Anthochaera chrysoptera	Little Wattlebird		
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo		
Lichenostomus chrysops	Yellow-faced Honeyeater		
Malurus cyaneus	Superb Fairy-wren		
Meliphaga lewinii	Lewin's Honeyeater		
Ninox boobook	Southern Boobook		
Ninox strenua	Powerful Owl[#]	Vulnerable	-
Phylidonyris niger	White-cheeked Honeyeater		
Phylidonyris novaehollandiae	New Holland honeyeater		
Sericornis frontalis	White-browed Scrubwren		
Zosterops lateralis	Silvereye		
Mammals			
Acrobates pygmaeus	Feathertail Glider		
Antechinus stuartii	Brown Antechinus		
Petaurus breviceps	Sugar Glider		
Pteropus poliocephalus	Grey-headed Flying-Fox	Vulnerable	Vulnerable
Rattus fuscipes	Bush Rat		
Rattus rattus	Black Rat*		
Wallabia bicolor	Swamp Wallaby		

*Introduced species
[#]Heard call only
[a]Threatened species listed under the NSW Biodiversity Conservation Act 2016
[b]Threatened species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999

9. Discussion

Eastern Pygmy-possum were detected at 8 of 18 (44%) of the unique sites monitored throughout the LGA in the monitoring period. The results indicate EPP are widespread in the north of the LGA with connectivity to either Ku-ring-gai National Park or Garigal National Park. Eastern Pygmy-possum were predominantly found inhabiting sandstone communities which adjoin large intact remnant habitat, though interestingly they were also found to persist in relatively narrow corridors of vegetation at Ku-ring-gai Creek Reserve (reserve of <300m width).

Eastern Pygmy-possum were not detected at Douglas Street Reserve where they have been previously observed. This site has excellent potential habitat (Duffy's Forest) with abundant flowering resources including *Banksia*. This site will continue to be monitored.

Although the measure of activity via remote cameras was useful in detecting both favoured flora species and "hotspots" for EPP, the data is limitted by placement, flower or target selection and number of nights recorded. While there was a hotspot of activity recorded at the Ku-ring-gai Wildflower Gardens, this is also where the majority of cameras were placed. The collection and reporting of this data is also time consuming. This activity measure will no longer be collected.

Factors threatening the survival of the Eastern Pygmy-possum include isolated sub-populations with little opportunity for dispersal, habitat loss and fragmentation, inappropriate fire regimes that remove nectar-producing understorey plants, the loss of nest sites due to land clearing, and predation by foxes

and cats (OEH 2017). 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. The impact of fire on EPP in the LGA will continue to be investigated in consultation with Council's fire and bushland management team.

Eastern Pygmy-possum are a known prey item for a number of species, including introduced predators.[5] As part of Council's fauna monitoring program, Council are conducting a "Cat Tracker Project" in collaboration with research institutions and other land managers. This project will provide opportunities to engage and educate about responsible pet ownership and improve awareness of EPP where residents are in close proximity to reserves where EPP have been recorded.

Additionally, Council will investigate links between EPP presence or absence and ongoing fox control.

10. Recommendations Moving Forward

The EPP monitoring program has been a successful collaboration with WildThings NSW volunteers for two years, during which time the program has expanded with valuable contributions of knowledge, time and resources from the monitoring team. The program will continue in 2018 with a number of changes to improve the efficiency of the program:

- Monitoring of nest boxes will be reduced from monthly to quarterly to minimise disturbance to EPP. This is in response to concerns raised by Council and other stakeholders about the frequency of disturbance to EPP. Additionally, this change to quarterly monitoring will reduce the time commitment of those people involved in the program
- The use of cameras as a monitoring tool targeting nectar producing plants will no longer be part of the volunteer component of the program. Cameras may be made available on request for monitoring within proximity of an assigned nest box for a specific site.
- For 2018 monitoring, data will be collected through a data collection application, which can be accessed via smart phones or internet browser. This is an integrated system where photos, GPS coordinates and additional information can be automatically contributed to Council's database. This will ensure Council receives all required data, whilst streamlining the process for volunteers.
- All records will continue to be uploaded to relevant databases quarterly as per data licence agreements (e.g. BioNet, BioBase, Atlas of Living Australia).

11. Conclusion

There has been continued presence of EPP in the north of the LGA including evidence of successful breeding. The EPP monitoring program has contributed greatly to our understanding of the distribution and habitat preferences of EPP within the LGA. The program success stems from the dedicated and enthusiastic volunteer base and will continue to be refined over the coming years to improve the efficiency of the program and to enhance ecological knowledge.

If you would like to find out more about the project, please contact Jacob Sife, Natural Areas Program Leader, on (02) 9424 0819 or Jsife@kmc.nsw.gov.au.

[5] *Law, Bradley; Chidel, M.; Britton, A. (2013). "High predation risk for a small mammal: the eastern pygmy-possum (Cercartetus nanus)". Australian Mammalogy. 2 35: 149–152*

12. References

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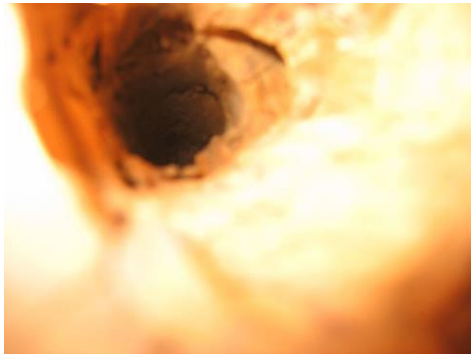
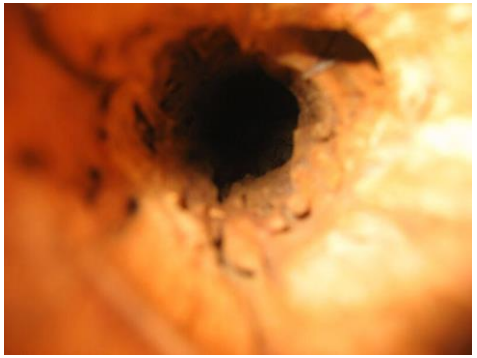
Appendix 1 – Nest development throughout the seasons

Box	Spring	Summer	Autumn	Winter
1				
2				
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Box	Spring	Summer	Autumn	Winter
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Box	Spring	Summer	Autumn	Winter
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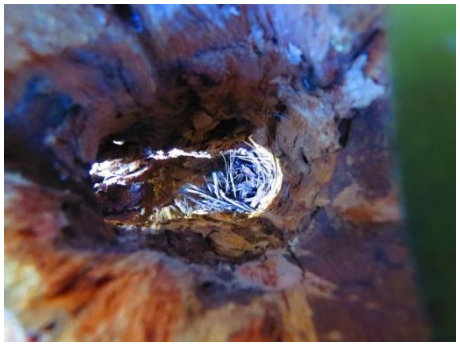
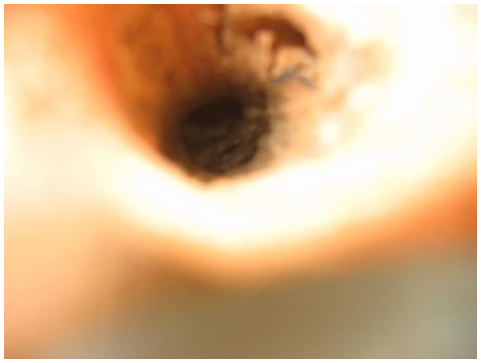
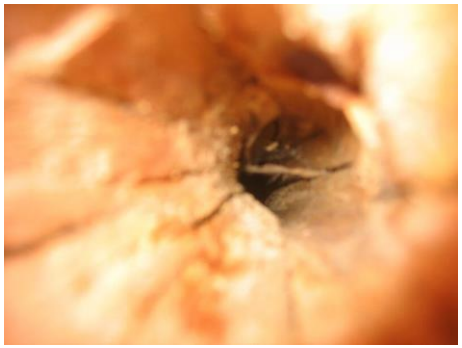
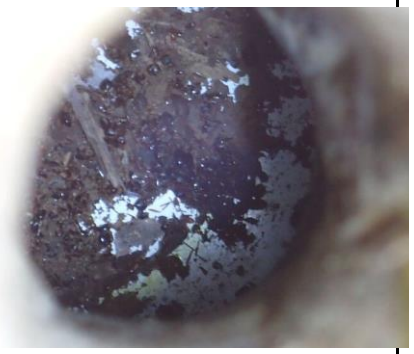
8				
9				

Box	Spring	Summer	Autumn	Winter
10				
11				
12				

Box	Spring	Summer	Autumn	Winter
13				
14				
15				

Box	Spring	Summer	Autumn	Winter
16				
17				
18				

Box	Spring	Summer	Autumn	Winter
19				
20				
21				

Box	Spring	Summer	Autumn	Winter
22				
23				
24				

Box	Spring	Summer	Autumn	Winter
25				

Appendix 2 – Next box attribute data

SITE	HABITATION	HEIGHT (cm)	DIAMETER OF ENTRY (cm)	LENGTH OF BOX (cm)	LOWEST WALL WIDTH	HIGHEST WALL WIDTH	CIRCUMFERENCE (cm)	RADIUS (cm)	VOLUME (cm3)	NESTING MATERIAL
NB1	Yes	89	3	18	3	5	33	5.25	1559	Yes
NB2	No	72	5	34	2	3	38	3	961	No
NB3	No	64	3.4	33	1	2	43	5.5	3136	Yes
NB4	Yes	52	4.5	35	2	3	42	3.5	1347	Yes
NB5	No	132	3.5	37	1	4	43	4	1860	Yes
NB6	Yes	77	3.5	37	2	2	25	4	1860	Yes
NB7	No	63	3	31	1.8	6	54	4.5	1972	No
NB8	No	74	4.6	39.5	2.9	4.6	55	4	1985	Yes
NB9										
NB10	No	56	3	35.5	2	2.5	42	5	2788	Yes
NB11	No	51	3	19.5	2	4.5	42	2.5	383	No
NB12	No	89	7	37	1	3.5	38	3	1046	Yes
NB13	No	61	3.5	31	1	3	45	4.95	2386	No
NB14										
NB15	No	80	2.5	30	1.5	2	41	3.75	1325	No
NB16										
NB17	No	183	2.5	28	2.4	3	33	2.15	407	No
NB18	No	75	2.5	32.5	1	2.5	29	2.1	450	Yes
NB19	No	52	2	33	0.5	1	30	3.75	1458	No
NB20	No	43	2.5	33	1	1.4	31	3.25	1095	Yes
NB21	No	81	3.5	29	3	3	41	3	820	No
NB22										
NB23	No	70	3	34	2	2	43	3.5	1308	Yes
NB24	No	90	5.5	37.5	3.5	4	44	5.75	3895	No
NB25	No	67	3	27	1.7	3.5	37	3.5	1039	Yes