

Distribution of Eastern Pygmy Possums (*Cercartetus nanus*) in the Ku-ring-gai LGA

Ku-ring-gai Council, WildThings and WildThings NSW.

1. Acknowledgements

Biodiversity conservation requires ongoing commitment and huge resource investment. In an environment with limited resources, the contributions by volunteers towards conservation is invaluable and I would like to acknowledge those people who have given up their time and offered their expertise to the Eastern Pygmy Possum Program. Special mention to WildThings NSW, 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 and all other WildThings NSW members who have contributed to the project in so many ways. A special mention to those who donated nest boxes to the program including Koko Kawaura and to Harry Leung for his help with the project, data management and mapping.

Report prepared by Jacob Sife, August 2016.

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 *Threatened Species Conservation Act 1995 (TSC Act)*.¹

One of the threatened species within the LGA is the Eastern Pygmy Possum (*Cercartetus nanus*) listed as Vulnerable under the NSW TSC 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. As such, little is known about the extent of the EPP within the LGA.

Ku-ring-gai Council in collaboration with WildThings NSW conducts a program aimed at defining the distribution 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 2015-2016.

This report summarises the key results from the program between August 2015 and July 2016 and makes recommendations for the direction for the project over the next 12-24 months.

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 (*Cercartetus nanus*).
 - 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 Possums (*Cercartetus nanus*)

The Eastern Pygmy Possum (EPP) is a small marsupial of the family *Burramyidae*. EPP are native to south-eastern Australia and distributed from southern Queensland to eastern South Australia and Tasmania. In NSW, EPP distribution extends along the eastern seaboard and as far west as 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 (OEH 2015).²

EPP weigh 15 - 43 grams and have a head to body length of 70 - 110 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.

EPP 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. EPP also feed on invertebrates and soft fruit.

Whilst young can be born whenever food sources are available, most births occur between late spring and early autumn. EPP enter periods of torpor especially in winter, with body curled, ears folded and internal temperature dropping to match their surroundings.³

² OEH (2016), *Eastern Pygmy Possum Profile*, <http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155>

³ Turner, J.M., Körtnier, 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. Monitoring

Presence or absence of EPP was 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 (refer Appendix A) 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 recorded on field sheets but have not been further considered in this report. Only direct observations (i.e. a photo/video of an EPP or an EPP observed in a nest box) have been recorded 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. Further, the number of nest boxes available to the program increased from 9 to 14 over the reporting period, and it is expected that a total of 22 nest boxes will be available by February 2017.

7. Limitations

EPP are difficult to observe and the project team have done an amazing job conducting monitoring and collecting data. By far the best method of finding EPP has been to focus a camera on a nectar laden *Banksia ericifolia* spike. This method however, has the obvious bias of directing survey effort towards habitat with *Banksia ericifolia* present and the results reported 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.

Components of the project related to field work and data collection continue to be refined and it is anticipated a far greater level of analysis will be possible over the next 12-24 months (provided that minor changes to the timing and method of data collection are implemented as section 10 of this report).

8. Results

Between August 2015 and July 2016 EPP monitoring was conducted at 49 sites across the LGA with EPP presence confirmed at 18. The sites with EPP were in the north and east of the LGA in reserves that directly adjoin either Garigal National Park or Ku-ring-gai Chase National Park. The distribution of monitoring sites and EPP records is provided in figure 1.

⁴ 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*, 2013, **40**, 470–481

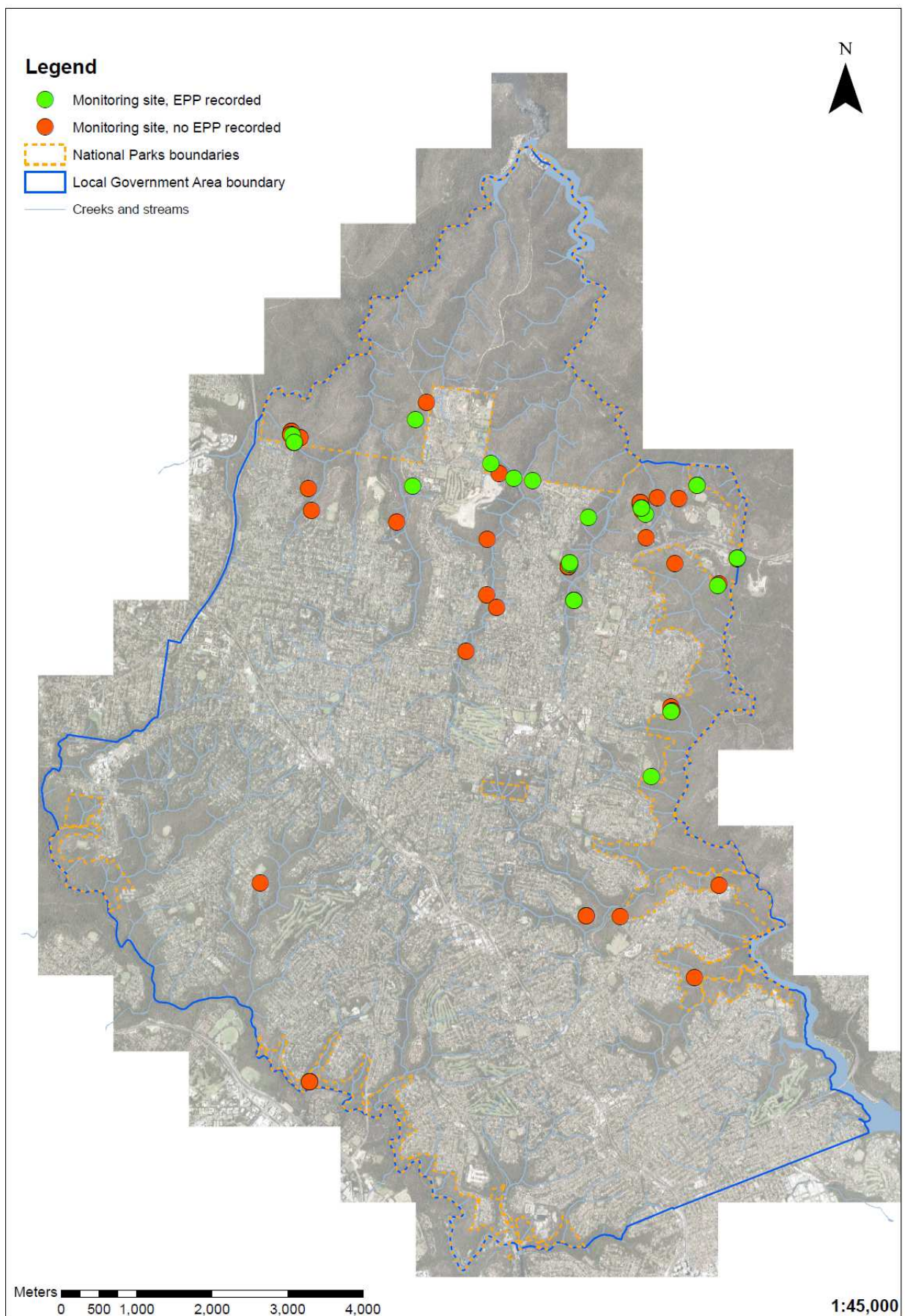


Figure 1 EPP observations between August 2015 and July 2016

During the reporting period (August 2015 and July 2016) there were a total of 108 monitoring events including both nest boxes (NB) and remote cameras (RC). EPP were observed in 25 (23%) of the monitoring events, with 11 coming from NB and 14 from RC.

There were 62 NB monitoring events which include events where a NB was monitored and also events where a remote camera was focused specifically on a NB. From these, 11 (18%) resulted in confirmed EPP presence.

Over the same period there were 46 RC monitoring events. An 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 46 RC monitoring events, EPP presence was confirmed in 14 (30%).

In some instances, NBs and RCs were left in the same place for multiple monitoring events, and as such, some sites were monitored on multiple occasions. Over the reporting period, monitoring for both NB and RC was conducted at 49 unique sites with 18 (39%) sites recording EPP presence.

Table 1 Nest Box and Remote Camera Monitoring Events, Sites, and Success rates

	Number of sites	Sites with EPP	Number of Events	Events with EPP
Nest Boxes	14	6 (43%)	62	11 (18%)
Remote Camera	35	12 (34%)	46	14 (30%)
Total	49	18 (39%)	108	25 (23%)

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

- Coastal Sandstone Heath-Mallee (Mallee)
- Coastal Upland Swamp (CUS Core)
- Coastal Upland Swamp transition (CUS buffer)
- Duffys Forest (DF)
- Sydney Sandstone Gully Forest (Gully)
- Sydney Sandstone Ridgetop Woodland (Woodland)

The associated vegetation community for each NB and RC site along with the number of sites with EPP recorded is presented in Figures 2 and 3.

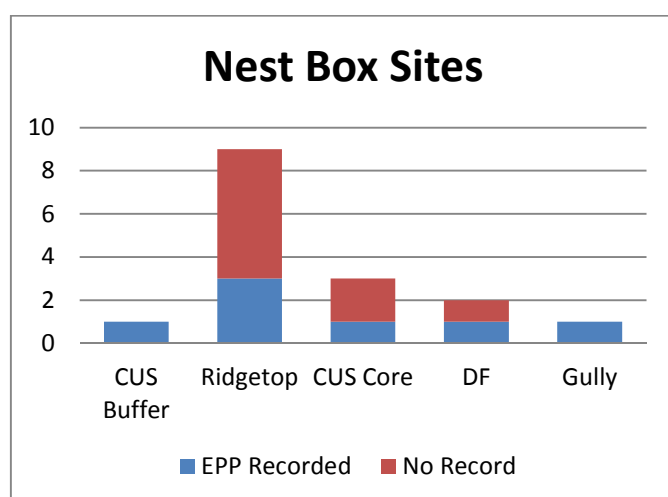


Figure 2 Number of NB monitoring sites located in each vegetation community and EPP presence. (Ku-ring-gai Council Mapping 2014)

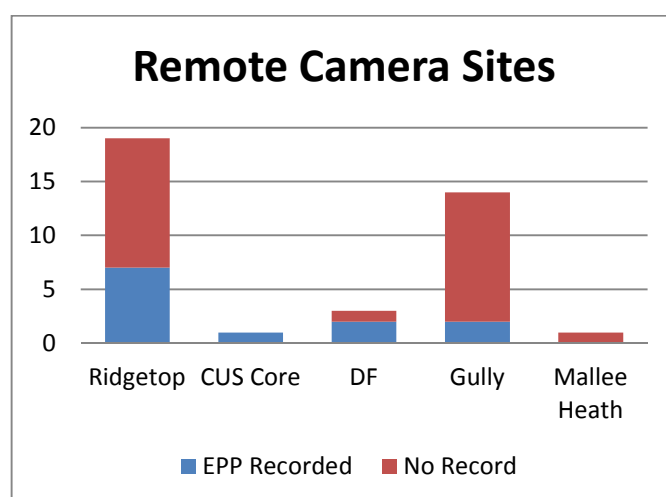


Figure 3 Number of RC monitoring sites located in each vegetation community and EPP presence. (Ku-ring-gai Council Mapping 2014)

Whilst the bulk of monitoring sites and EPP observations were within Sydney Sandstone Ridgetop Woodland, this is likely a function of bush tracks and *Banksia ericifolia* making these sites easier to access and survey rather than any indication of preferred habitat based on the existing data.

Coastal Upland Swamp and Duffy's Forest are listed as endangered ecological communities under the TSC Act. Coastal Upland Swamp is also listed as endangered under the federal Environment Protection and Biodiversity Conservation Act.

The 18 sites where EPP were recorded occur across 9 Council reserves. These are:

- Cowan Creek Reserve / Girl Scouts
- Douglas Reserve
- Ku-ring-gai Chase National Park
- Ku-ring-gai Chase National Park/ Lovers Jump Creek Reserve
- Ku-ring-gai Creek Reserve
- Ku-ring-gai Wildflower Garden
- Lovers Jump Creek Reserve
- Quarry (the green tip site), and
- Surgeon White Reserve

The areas or reserves where monitoring sites were located but EPP were not observed, included:

- Governor Phillip Reserve - East Gordon Park
- Rofe Park, and
- Lane Cove National Park

The 108 monitoring events and the 25 recorded EPP records from August 2015 to July 2016 are plotted in Figure 4 below and show a spike in monitoring effort in April and May, with all EPP records from December to July.

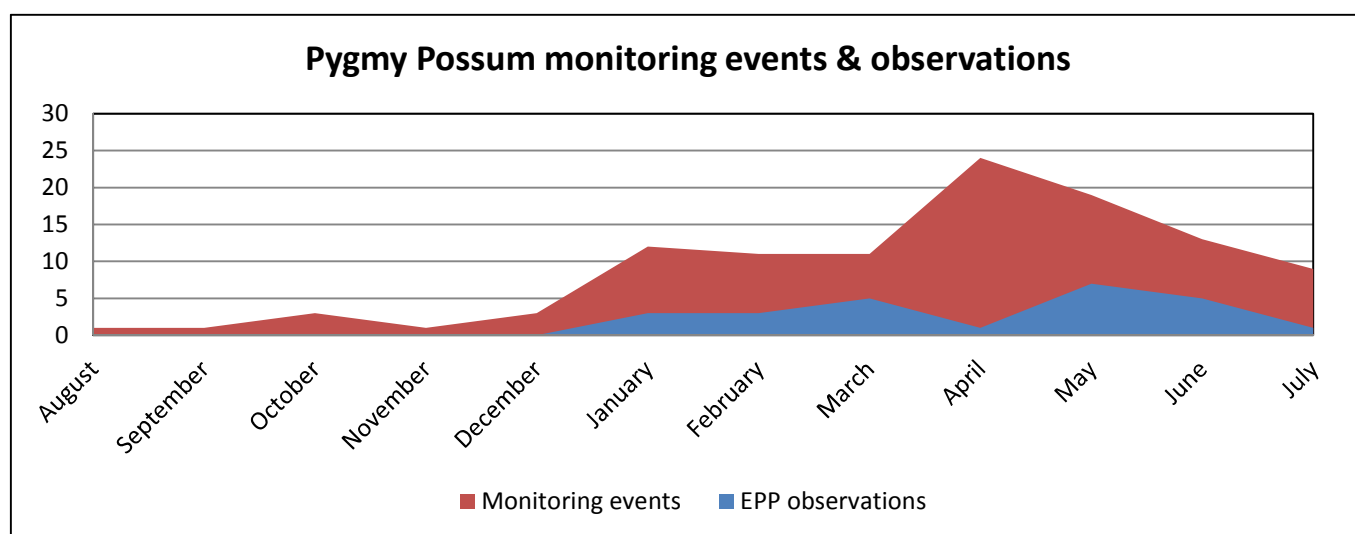


Figure 4 Monitoring events and EPP observations during the reporting period of August 2015 to July 2016, NB and RC monitoring combined.

Included within the 25 EPP observations were a number of breeding records, however these were not specifically recorded.

A NB within good quality Ridgetop Woodland habitat was observed to have multiple EPP on 12th February 2016 (Figure 5) and then a few hours later an RC captured multiple EPP leaving the same nest box on 12th March 2016 (Figure 6). Interestingly, a Rosenberg's Goanna (*Varanus Rosenbergi* listed as vulnerable under the TSC Act) was then captured on camera inspecting the nest box on the 12 of March. Despite further monitoring that NB has since remained unoccupied.



Figure 5 Multiple EPP observed in a NB on 12 February 2016



Figure 6 Multiple EPP observed leaving the same NB on 12 March 2016



Figure 7 *Varanus rosenbergi* observed inspecting the same NB on 12 March 2016

Along with observations of EPP, many other native and introduced species were recorded during the project period. This included Sugar Gliders, Brown Antechinus, Bush Rats, Ringtail Possums, Brushtail Possums, Feathertail Gliders, Swamp Wallaby, Eastern Spinebills, Brown Thornbills, Superb Fairywrens, White-browed Scrubwrens, Rainbow Lorikeet, Silvereye, Eastern Whipbird, Little Wattlebird, Grey Shrike-thrush, Australian Owlet-nightjar, Rosenbergs Goanna (Listed as Vulnerable under the TSC Act) and the introduced Red-fox and Black Rat.

A series of additional maps are provided in the Appendix B to this report.

9. Discussion

Between August 2015 and July 2016, the EPP project recorded EPP at 18 sites and this has contributed greatly to our understanding of the species distribution within the LGA. The results suggest that EPP are quite widespread, inhabiting the sandstone communities which adjoin large intact remnant habitat along the north and eastern boundaries of the LGA. The project focused on areas of bushland with *Banksia ericifolia* and whilst confirming presence in many of these reserves, the results cannot be used to exclude other areas as potential habitat.

The targeting of *Banksia ericifolia* spikes with RC (during the flowering period from around January to June) has proven a very effective survey method and will be a focus for future monitoring.

The project has benefited from the generosity of individuals and students in providing Nest Boxes. The use of these nest boxes as monitoring tools or their ability to supplement habitat is still being explored and recommendations to improve this process are provided in Section 10.

Sites where EPP were not observed included East Gordon Park. This site would appear to have appropriate habitat characteristics, including abundant *Banksia ericifolia*. However, the site is cut off from large remnant bushland by Eastern Arterial Road to the east and this fragmented landscape may prevent recolonisation, where EPP are excluded from that site by predation or some other mechanism. EPP are a known prey item for a number of species, including introduced predators⁵ and population numbers in bushland reserves likely experience natural fluxes. In this way, EPP are particularly vulnerable to habitat fragmentation as high predation and natural population flux may reduce numbers of EPP in a patch of bushland to unviable numbers and fragmentation may prevent recolonisation, causing local extinctions.

The EPP project has provided valuable insights into the distribution and management needs of EPP within the LGA.

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

In an effort to link this project to positive conservation outcomes, a list of streets adjoining the reserves where EPP were recorded was initially created by WildThings volunteer Bob Jones. This list will be refined using GIS and a community engagement strategy will be developed to encourage responsible pet ownership and improve awareness of EPP within the community.

10. Recommendations Moving Forward

The project has continued to be refined throughout the reporting period with constructive conversations between the project team and other stakeholders. As a result, the data recording sheets have undergone several iterations and will eventually be placed on Council's website for electronic data entry.

Following discussions with WildThings NSW, Council's WildThings administrators, Council staff and other experts, a list of recommendations were compiled for the project moving forward:

- Nest Boxes will be installed and left for a minimum of 12 months and monitored monthly.
- Between January and July, Remote Cameras will continue to be used to target *Banksia ericifolia* spikes.
- All remote camera monitoring events will be a standard period of 14 days (i.e. camera left in place for 14 days).
- From remote camera footage, the number of nights where EPP are observed out of the 14 will be recorded giving a metric for activity. All other native species observed will also be recorded.
- Instances of multiple EPP will be recorded to help identify periods and locations of breeding
- Data entry will be moved online utilising council's Request Management System.
- Nest boxes will continue to be numbered.
- When the opportunity arises, the project team will begin to collect attribute data (e.g. material, size, entrance size) for all Nest Boxes.
- All records to be uploaded to relevant databases quarterly as per data licence agreements (e.g. BioNet, BioBase, Atlas of Living Australia).

11. Conclusion

The EPP project has contributed to our understanding of the distribution of EPP within the LGA. The project success stems from the dedicated and enthusiastic volunteer base and will continue to be refined and improved over the coming years to allow for more robust analysis of data and to enhance ecological knowledge.

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

12. References

Law, Bradley; Chidel, M.; Britton, A. (1 March 2013). "High predation risk for a small mammal: the eastern pygmy-possum (*Cercartetus nanus*)". *Australian Mammalogy*. 2 35: 149–152

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OEH (2016), *Eastern Pygmy Possum Profile*,
<http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155>

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.

Bladon, R.V. & Dickman, C.R. (2002), "Effects of habitat fragmentation on the demography, movements and social organisation of the eastern pygmy-possum in northern New South Wales", *Wildlife Research*, vol. 29, no. 1, pp. 105-116

Beyer, G.L. & Goldingay, R.L. (2006), "The value of nest boxes in the research and management of Australian hollow-using arboreal marsupials", *Wildlife Research*, vol. 33, no. 3, pp. 161-174.

Tulloch, A.I., and Dickman, C.R. (2006) *Floristic and structural components of habitat use by the eastern pygmy-possum (Cercartetus nanus) in burnt and unburnt habitats. Wildlife Research* 33, 627–637.

Ku-ring-gai (2016), *Ku-ring-gai Biodiversity and Riparian Lands study v5*,
http://www.kmc.nsw.gov.au/Current_projects_priorities/Key_priorities/Environment_sustainability/Bushland_and_wildlife/Bush_management

Appendix A – Example field sheet

PYGMY POSSUM NEST BOX INSTALLATION & MONITORING FIELD DATA SHEET

Nest Box Installation & Removal			
Volunteers' initials: <i>BJ, KB, SV, MM, HL</i>		Nest Box number: <i>4</i>	
Select area from below, or if other, please specify (refer to map on page 3):			
Wildflower Garden <input type="checkbox"/>	Acorn <input type="checkbox"/>	Merrua <input type="checkbox"/>	Robbin Head <input type="checkbox"/>
Grosvenor <input type="checkbox"/>	HART <input type="checkbox"/>	Quarry <input type="checkbox"/>	Soldiers Memorial <input type="checkbox"/>
Warimoo <input type="checkbox"/>	McInbush <input type="checkbox"/>	Old Ship Oak <input type="checkbox"/>	Treeclippers Tip <input type="checkbox"/>
Pony Club <input type="checkbox"/>	Damley <input type="checkbox"/>	Bushranger <input type="checkbox"/>	Dam Track <input type="checkbox"/>
If other, please specify		<i>St Ives Showground</i>	
Installation date	Removal Date	GPS coordinates	
<i>30 Feb 2016</i>	<i>1/1</i>	Latitude:	Northings: <i>6269522</i>
		Longitude:	Easting: <i>331731</i>
Tree species the nest box is attached to	Diameter at breast height of tree the nest box is attached to	Height of nest box above ground	
<i>Corymbia gummifera</i>	<i>15 cm</i>	<i>83 cm</i>	
Types/density of natural nesting sites? (e.g. hollow bearing trees)			
<i>Tree hollows, bark, tree forks.</i>			
Comments (e.g. notable habitat features, scats, tracks, endangered species, flowering resources, rocky outcrops, water bodies, termite mounds)			
<i>Wallaby scats, bandicoot diggings, echinoida diggings</i>			
<i>woolstar mangroves, acacia white foliage, albaescensina distylis</i>			
<i>rosea sp. (yellow flowers, red flowers)</i>			

PYGMY POSSUM CAMERA INSTALLATION & MONITORING FIELD DATA SHEET

Camera Installation & Removal			
Volunteers' initials:		BJ, KB, SY, MM, HL	
Select area from below, or if other, please specify (refer to map on page 3):			
<input type="checkbox"/> Windflower Garden <input type="checkbox"/> Grosvenor <input type="checkbox"/> Warrimoo <input type="checkbox"/> Pony Club	<input type="checkbox"/> Acron <input type="checkbox"/> HART <input type="checkbox"/> McIntosh <input type="checkbox"/> Damley	<input type="checkbox"/> Marnus <input type="checkbox"/> Quarry <input type="checkbox"/> Old She Oak <input type="checkbox"/> Bushranger	<input type="checkbox"/> Eobbin Head <input type="checkbox"/> Soldiers Memorial <input type="checkbox"/> Treeclippers Tip <input type="checkbox"/> Darr Track
If other, please specify:		St Ives Showground	
Installation date	Removal date	GPS coordinates	
30 17 2016	1 1	Latitude:	Northing: 6267522
		Longitude	Easting: 331731
Plant species targeted by camera (e.g. <i>Banksia ericifolia</i>)	Height of camera subject (e.g. <i>Banksia flower</i>)	Types/densities of natural nesting sites present? (e.g. sparse/abundant hollow bearing trees)	
<i>Banksia ericifolia</i>	83 cm	Tree hollows, bark, tree forks	
Comments (e.g. notable habitat features, scats, tracks, endangered species, flowering resources)			
Wallaby scats, bandicoot diggings, echidna diggings			
<i>Wickisia pungens</i> , <i>acacia ulicifolia</i> , <i>allocasuarina distyla</i>			
<i>brassia</i> sp. (yellow flowers, red flowers)			

13. Appendix B – additional maps

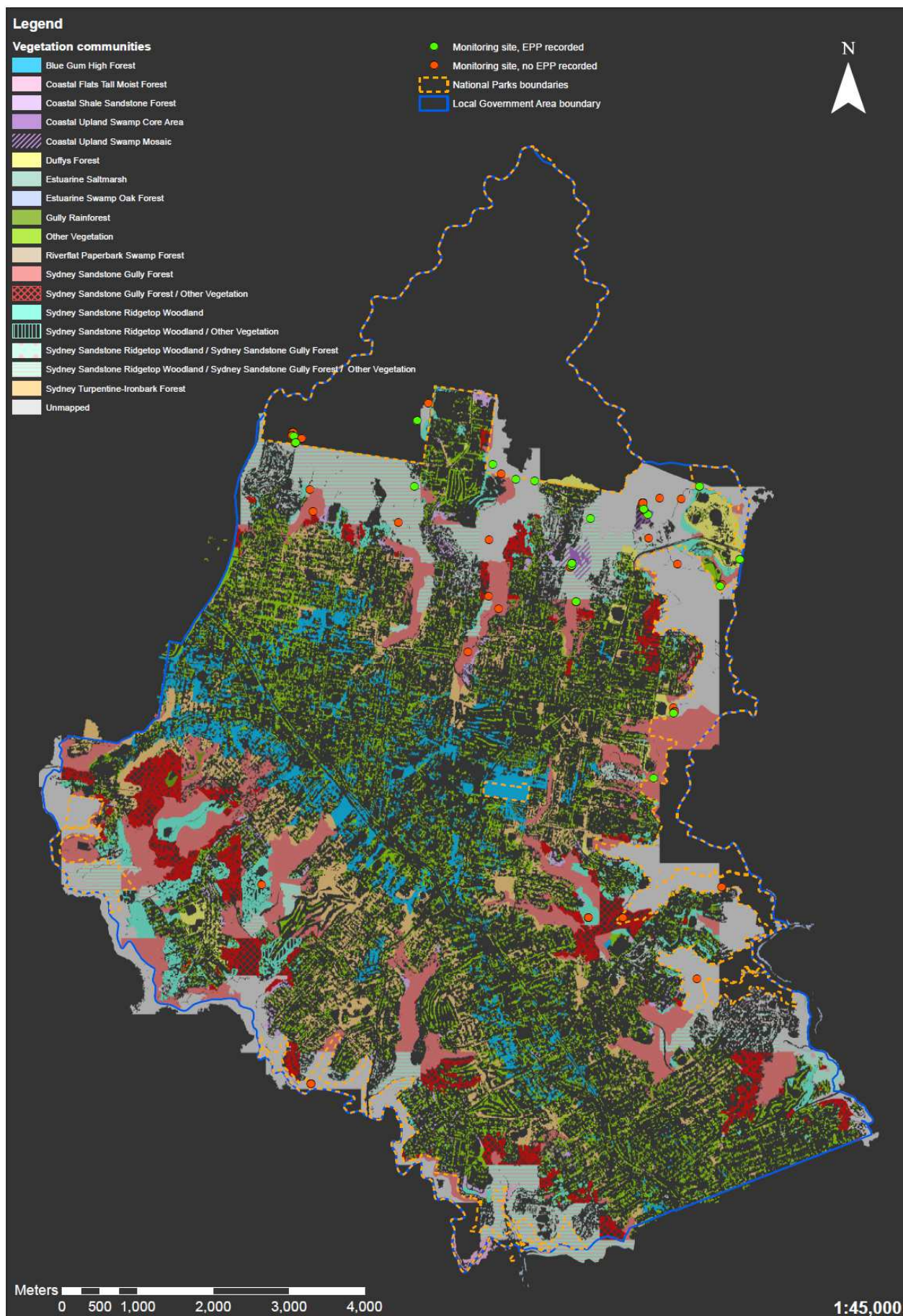


Figure 8 Map of the LGA with vegetation communities and EPP monitoring sites for the period August 2015 to July 2016.

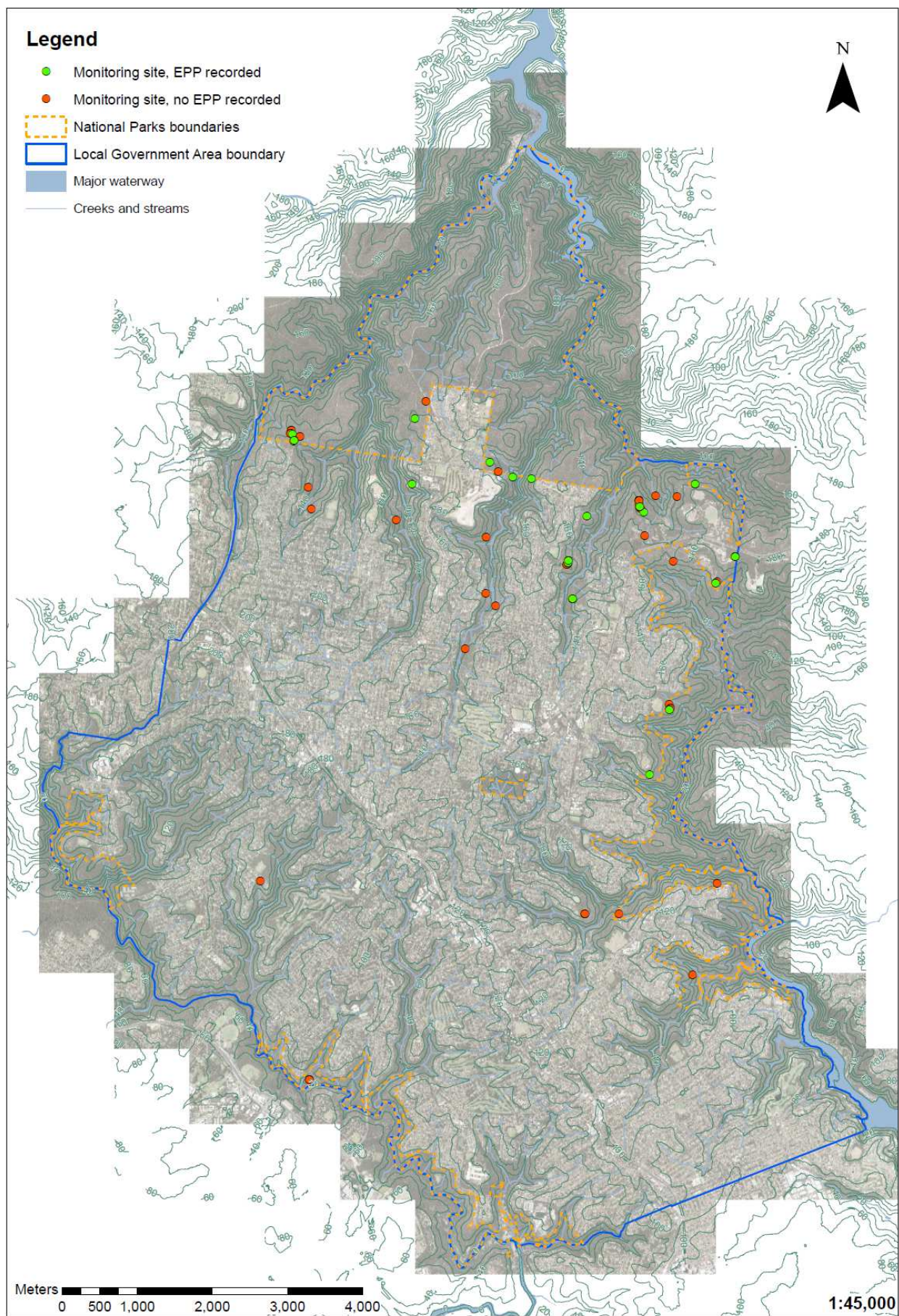


Figure 9 Map of the LGA with topographic lines and EPP monitoring sites for the period August 2015 to July 2016.

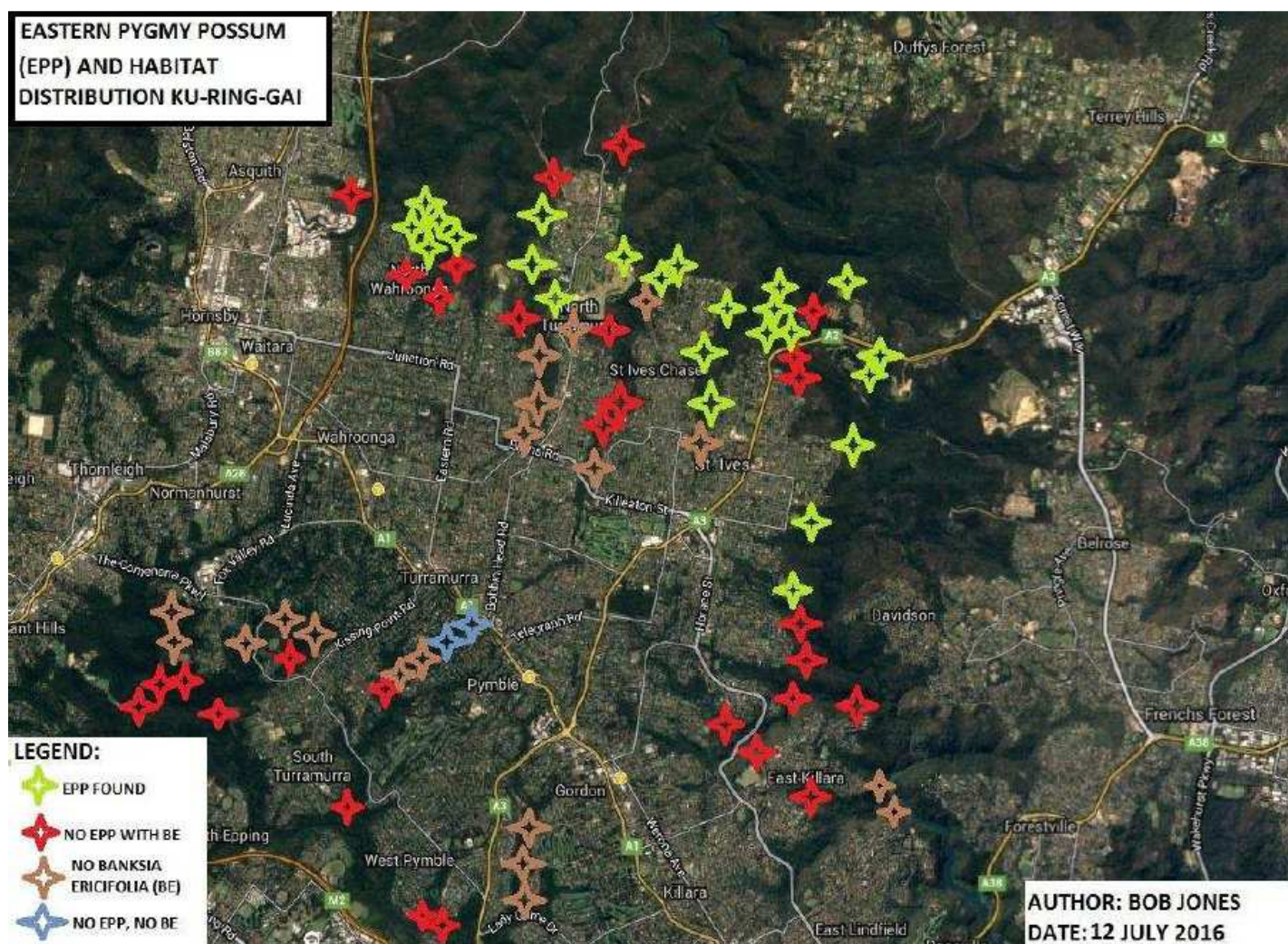


Figure 10 Map of EPP sightings generated by B. Jones. BE refers to *Banksia ericifolia*. Reporting period for this map from 2014 to 2016.