

# MOUNT EMERALD WIND FARM – NORTHERN QUOLL MONITORING PROGRAM



## SUMMARY OF RESULTS: JULY 2018

Site	No. individual quolls detected (naïve occupancy) <sup>1</sup>		Quoll population estimate (se) <sup>2</sup>		Modelled occupancy (se) <sup>3</sup>		Modelled detection probability (se) <sup>4</sup>		Overall trend in quoll population between sampling occasions
	July 2017	July 2018	July 2017	July 2018	July 2017	July 2018	July 2017	July 2018	
Mt Emerald Site 1	9 (0.3824)	2 (0.0556)	32.6 (17.9)	Insufficient spatial recapture data	0.7319 (0.2628)	0.0556*	0.0523 (0.0215)	0.0046 (0.0032)	All abundance metrics downwards
Mt Emerald Site 2	8 (0.3056)	11 (0.4118)	Insufficient spatial recapture data	34.9 (14.7)	0.4841 (0.1591)	0.6407 (0.1763)	0.0739 (0.0269)	0.0735 (0.0233)	All abundance metrics upwards or no change
Davies Ck Site, Davies Ck NP	22 (0.4722)	30 (0.6286)	Insufficient spatial recapture data	85.2 (18.8)	0.8164 (0.2212)	0.7586 (0.1121)	0.0619 (0.0199)	0.1184 (0.0214)	All abundance metrics upwards or no change
Tinaroo Ck Site, Dinden NP	26 (0.5556)	NA	62 (18.06)	Not accessible for sampling	0.6295 (0.0992)	NA	0.1418 (0.0235)	NA	NA
Upper Walsh River Site	1 (0.0286)	2 (0.0556)	Insufficient spatial recapture data	Insufficient spatial recapture data	0.0286*	0.0556*	0.0021 (0.0021)	NA	No change
Brooklyn Sanctuary <sup>5</sup>	17 (0.3333)	26 (0.7714)	60.5 (25.02)	64.6 (14.4)	0.4625 (0.1304)	0.7714*	0.0903 (0.0278)	0.0898 (0.0129)	All metric upwards or unchanged

**Table 1. Three metrics of quoll abundance and detection probability values for six quoll monitoring sites monitored during July 2018.**

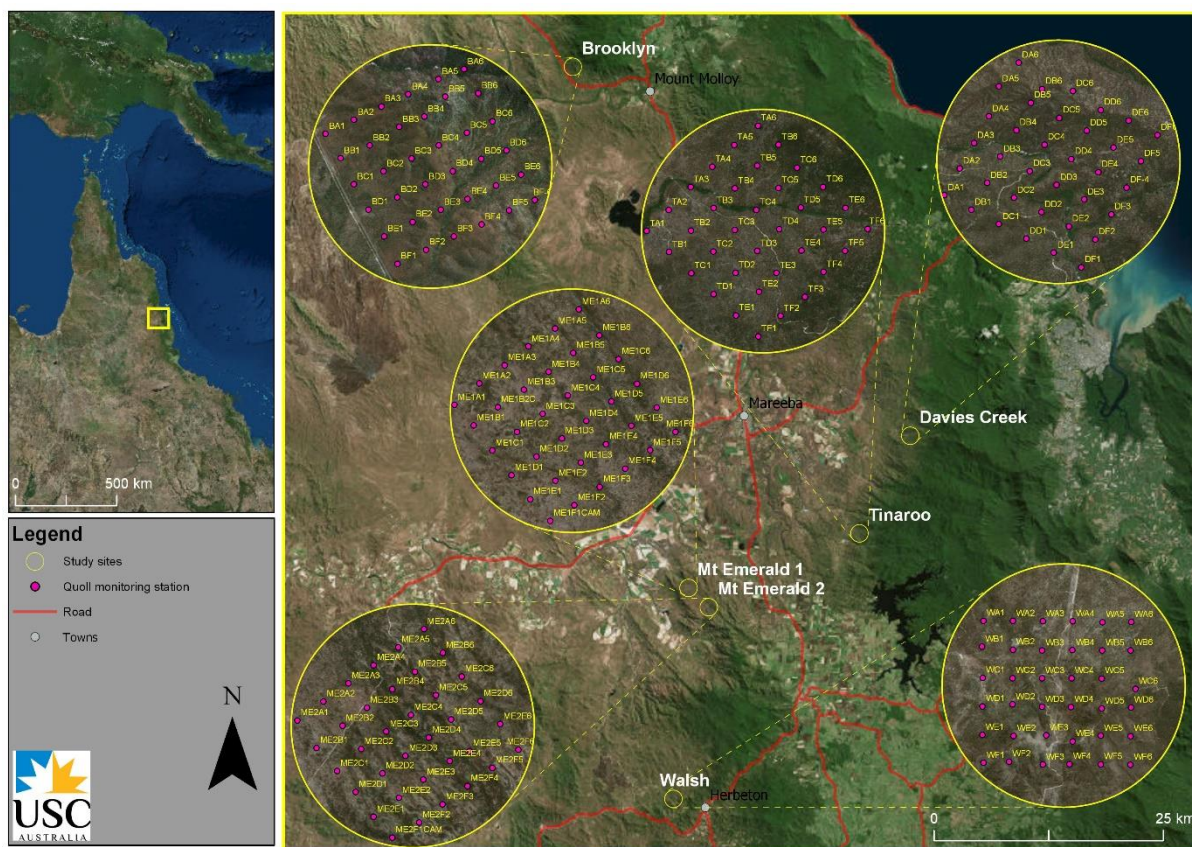
**NOTES.**<sup>1</sup> naïve occupancy is proportion of sites at which quolls were detected, <sup>2</sup> population estimated using spatially explicit capture-recapture modelling (Efford 2016); <sup>3</sup> Occupancy is the proportion of sites (in this case the 36 trail camera monitoring points within each monitoring grid), at which quolls are estimated to occur, given the modelled uncertainty in detecting quolls when they occur at a point. Modelled using Presence software (Hines 2006); <sup>4</sup> Detection probability is the modelled probability of detecting a quoll on each detection opportunity when it is present at a site. Modelled using Presence software (Hines 2006); <sup>5</sup> The Brooklyn site replaced the Biboorah site from July 2017 onwards; \* Naïve occupancy used in this case as insufficient detections were made for occupancy modelling.

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Trail cameras were used to collect capture-recapture and site occupancy data on five populations of northern quoll *Dasyurus hallucatus* (Fig 1) during July 2018. Access to one site “Tinaroo” continues to be denied since February 2018 due to changes to Queensland Government permitting which provides for veto of permit applications by Native Title holders. We therefore only surveyed five of the six sites intended for long-term monitoring.

Seventy-one individual quolls were detected (Table 1) during the approximately 3000 camera trap days of this survey occasion. Population estimates were able to be generated using spatial mark-recapture modelling (Efford 2016), at two of the sites due to low numbers of spatial recaptures from the remaining three sites. Occupancy estimates were able to be generated at four of the five sites (Table 1), also due to the low numbers of captures at one site (Walsh).



**Fig. 1.** Indicative locations of the six monitoring grids (purple circles) used to monitor Northern Quoll populations in the northern Atherton Tablelands from July 2017 onwards. Monitoring site names in white text. Local place names in black text. Note that Site Tinaroo was not utilised during July 2018 due to permits being denied for this area. Basemap: GoogleEarth Pro 9 December 2017.

The number of quoll individuals detected on each of our approximately 3km<sup>2</sup> sites ranged from 2 to 30 (Table 1, Appendix A). The numbers from the Mt Emerald sites are at the lower end of this range (Table 1). Of the three sites for which population sized could be estimated, the Mount Emerald 2 site had the lowest population size, although the absolute counts was lowest at the “Walsh” control site.

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### **Changes in quoll populations between July 2017 and July 2018**

The July 2018 monitoring session marks the second occasion during this project where we have comparable repeat monitoring data from the same season in different years (comparable with July 2017). This is important as quoll abundance, activity and detection probability are likely to vary with seasonal life history stages. Quoll populations increased or remained stable on all control sites and the Mt Emerald 2 site in July 2018 compared to July 2017. Quoll numbers were significantly decreased on “Mt Emerald 1” site in 2018 compared to July 2017.

### **Vegetation Monitoring**

Partial Biocondition Monitoring was undertaken at all Biocondition plots (Fig 2) during the July round of survey (summarised raw data included as a separate attachment to this document “Master Biocon\_summary\_to\_July2018.xlsx”). In keeping with standard Biocondition monitoring protocols, if no obvious disturbance such as storm, fire or construction damage is observed at a site, then only ground, shrub and canopy cover measurements are redone. The incidence of large woody debris, trees counts are only repeated at a site when there is obvious cause to do so. Biocondition plots are situated at every second camera trapping station on each site. These habitat monitoring plots do not suggest any disproportionate change in key vegetation parameters at the Mt Emerald sites (although there are obviously localised impacts from construction of wind turbines and road infrastructure through the site)(Appendix B) although they do reveal a decline in ground cover from February to July 2018, in line with changes in this parameter at all other sites.

### **Summary of impacts of Mt Emerald windfarm on quoll populations**

There continues to be no clear overall trend towards disproportionate declines in quoll numbers on the Mt Emerald windfarm site. Although quoll numbers on each of the two impact sites have fluctuated, these fluctuations are within the range of such changes experienced at the control sites. Quolls continue to be present on Mt Emerald windfarm monitoring sites 1 and 2. Our next report (on the October 2018 data) will provide a clearer picture on the long-term trends in quoll populations at these and our control sites.

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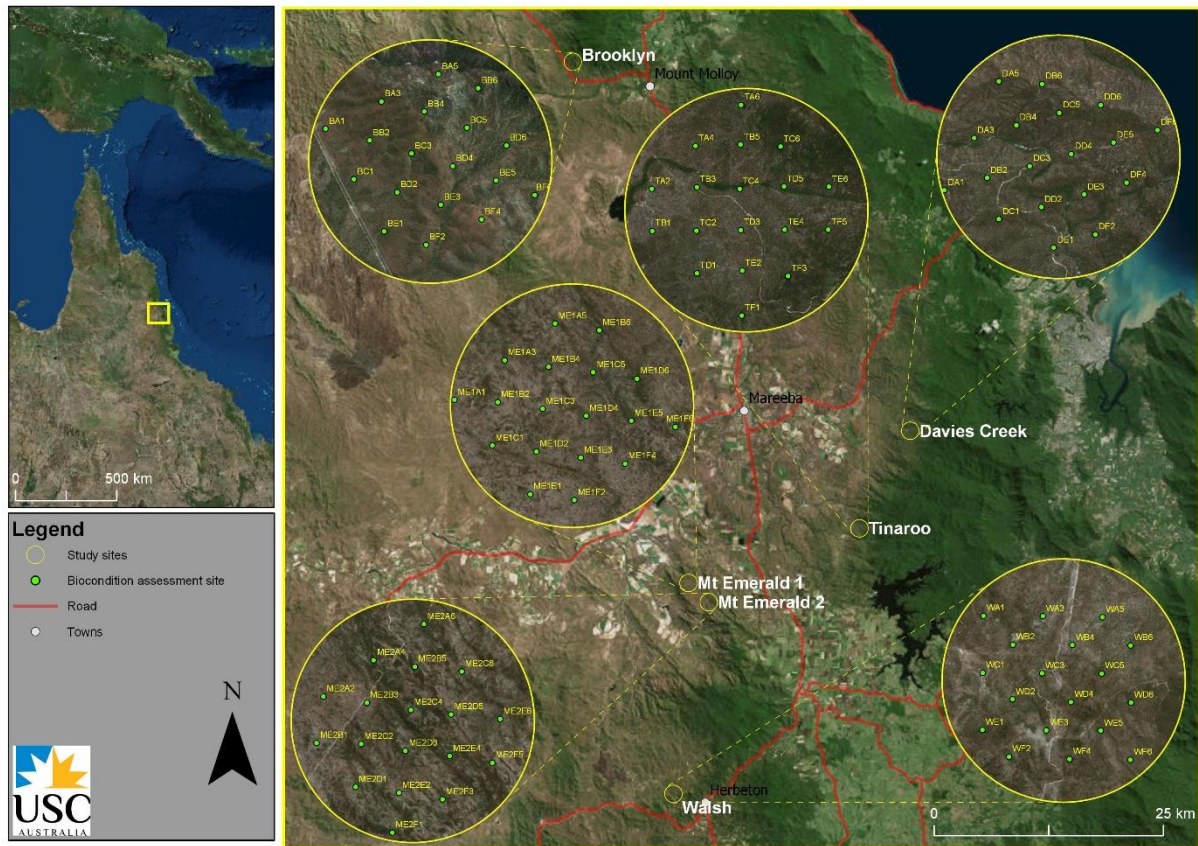
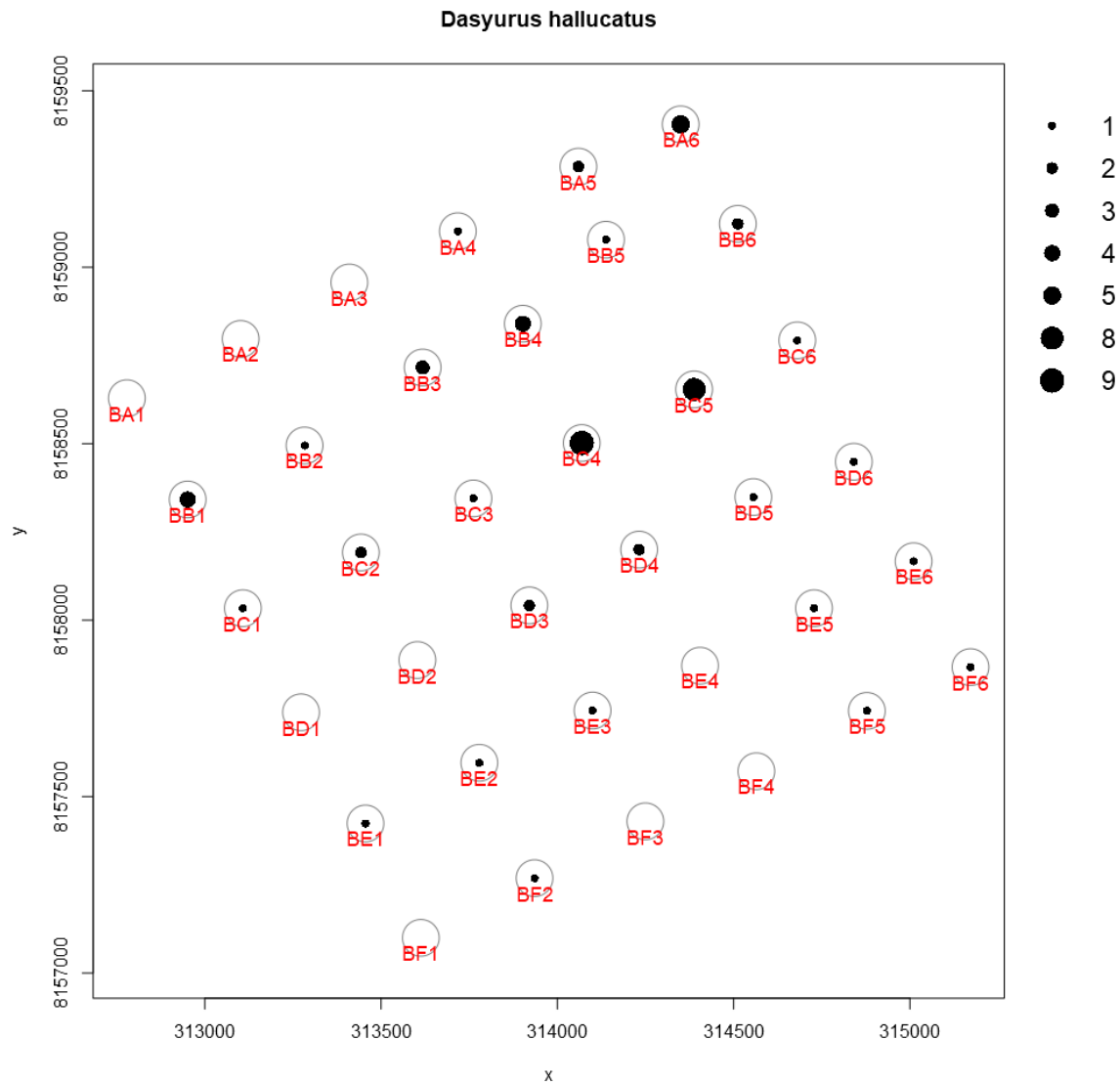


Fig. 2. Indicative locations of the six Biocondition monitoring grids (green circles) used to monitor habitat Biocondition in the northern Atherton Tablelands from July 2017 onwards. Monitoring site names in white text. Local place names in black text. Note that Site Tinaroo was not utilised during July 2018 due to permits being denied for this area. Basemap: GoogleEarth Pro 9 December 2017.

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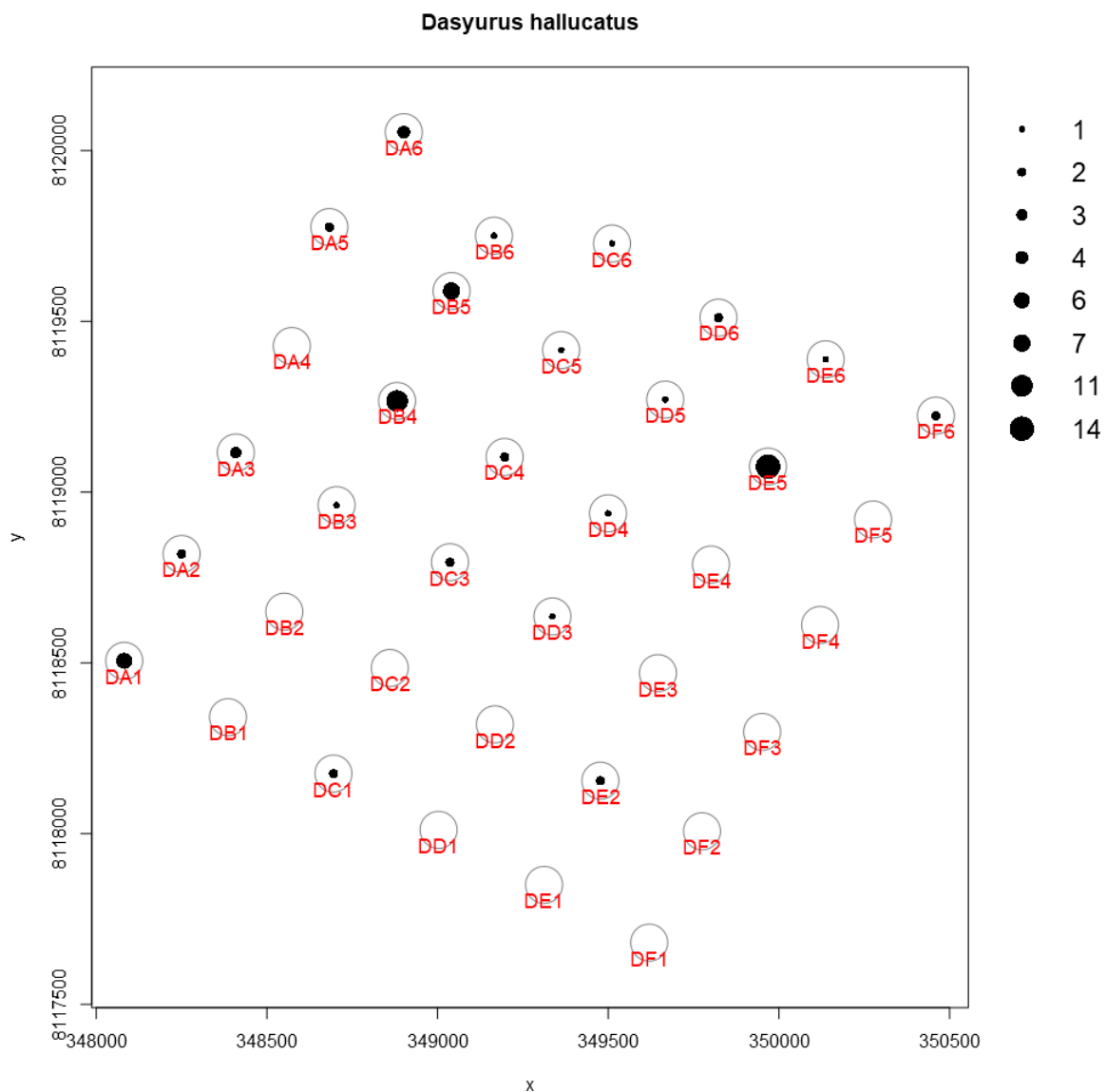
### APPENDIX A. The distribution and abundance of northern quolls from each of the five quoll monitoring sites used in this project.



**Fig. A1.** The distribution of quolls, and the number of detections at each camera trap station during July 2018 monitoring at Site "Brooklyn". The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package "camtrapR". Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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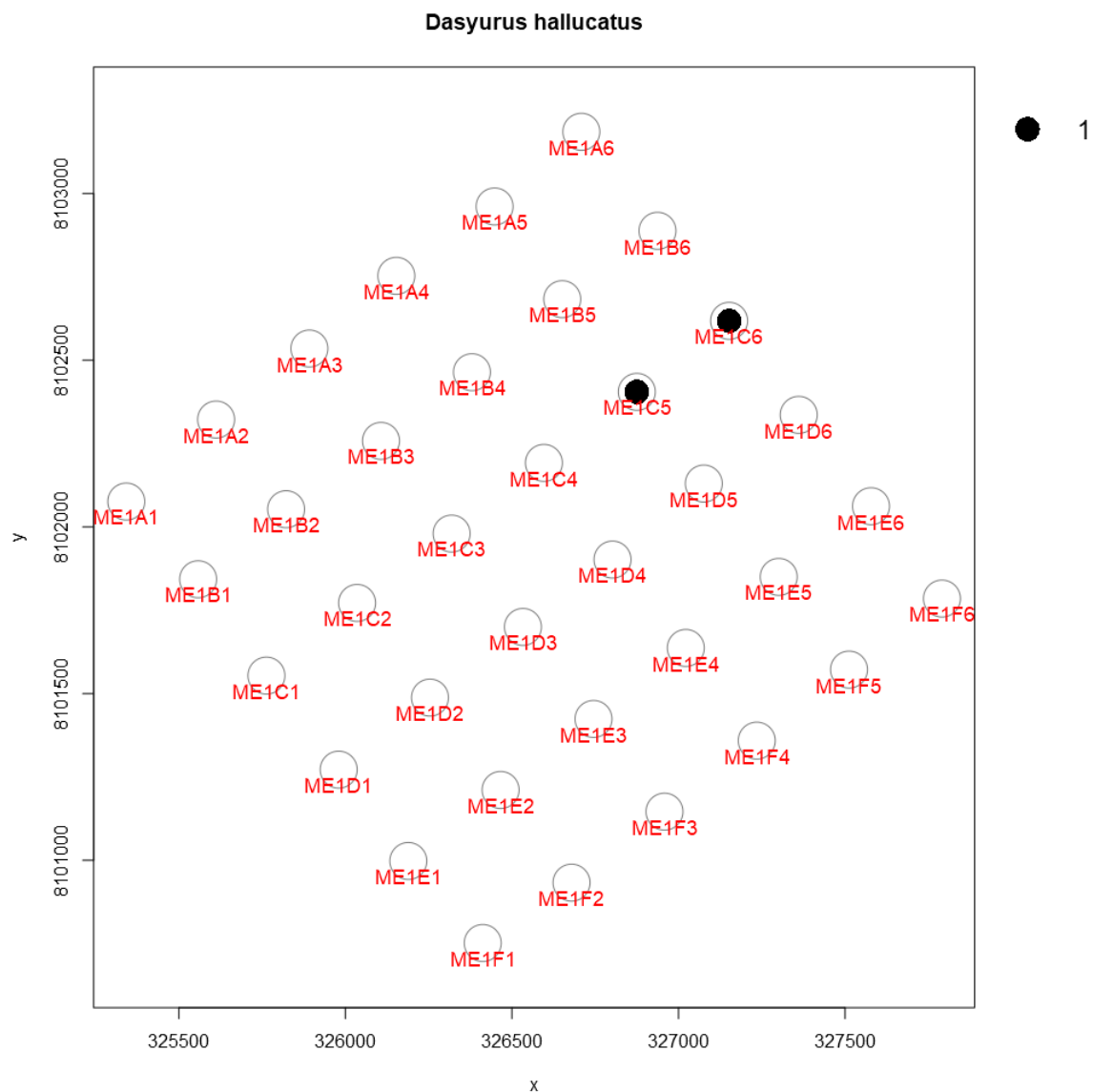
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**Fig. A2.** The distribution of quolls, and the number of detections at each camera trap station during July 2018 monitoring at Site “Davies Creek”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR”. Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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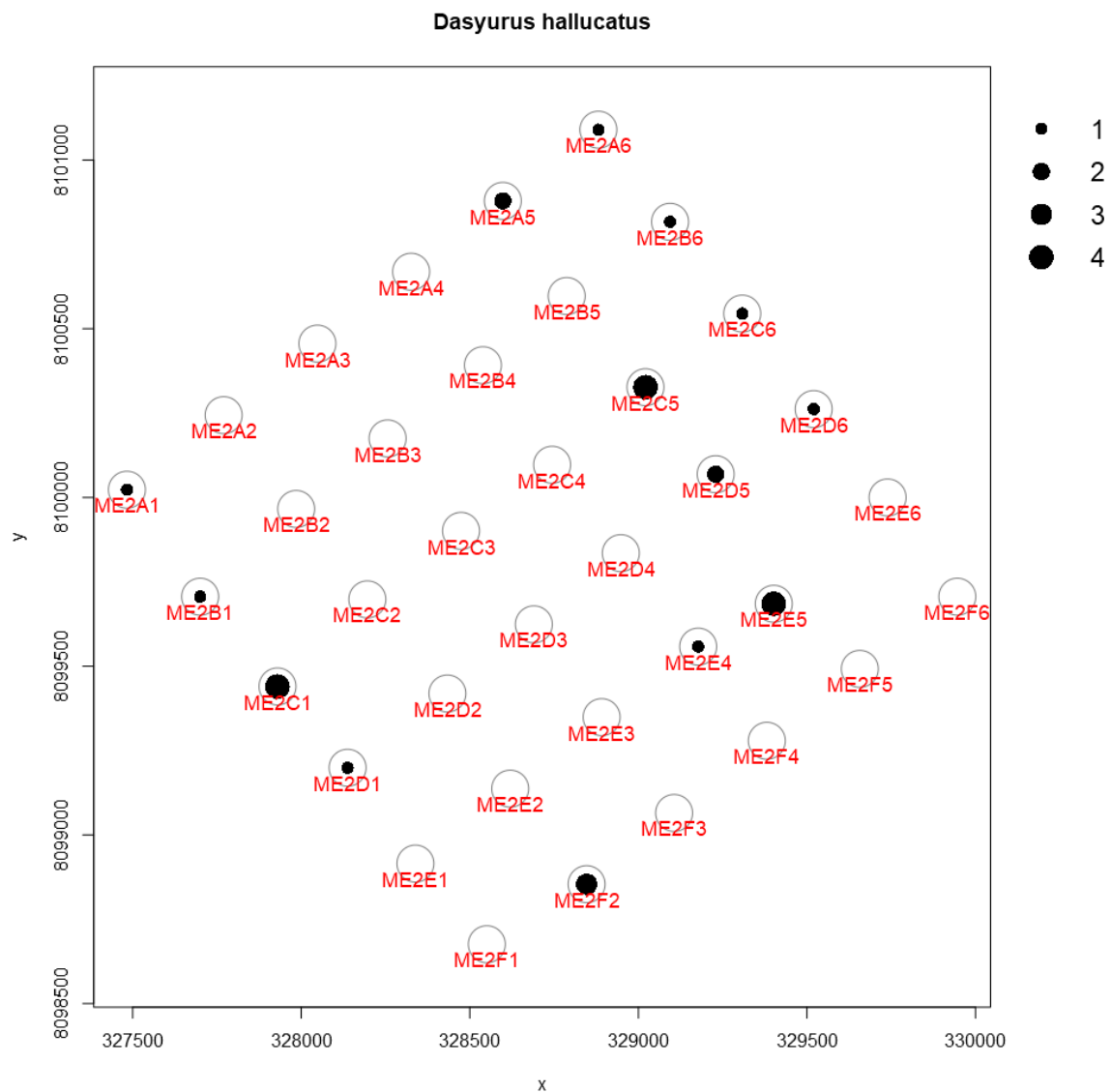
## SUMMARY OF RESULTS: JULY 2018



**Fig. A3.** The distribution of quolls, and the number of detections at each camera trap station during July 2018 monitoring at Site “Mt Emerald 1”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR”. Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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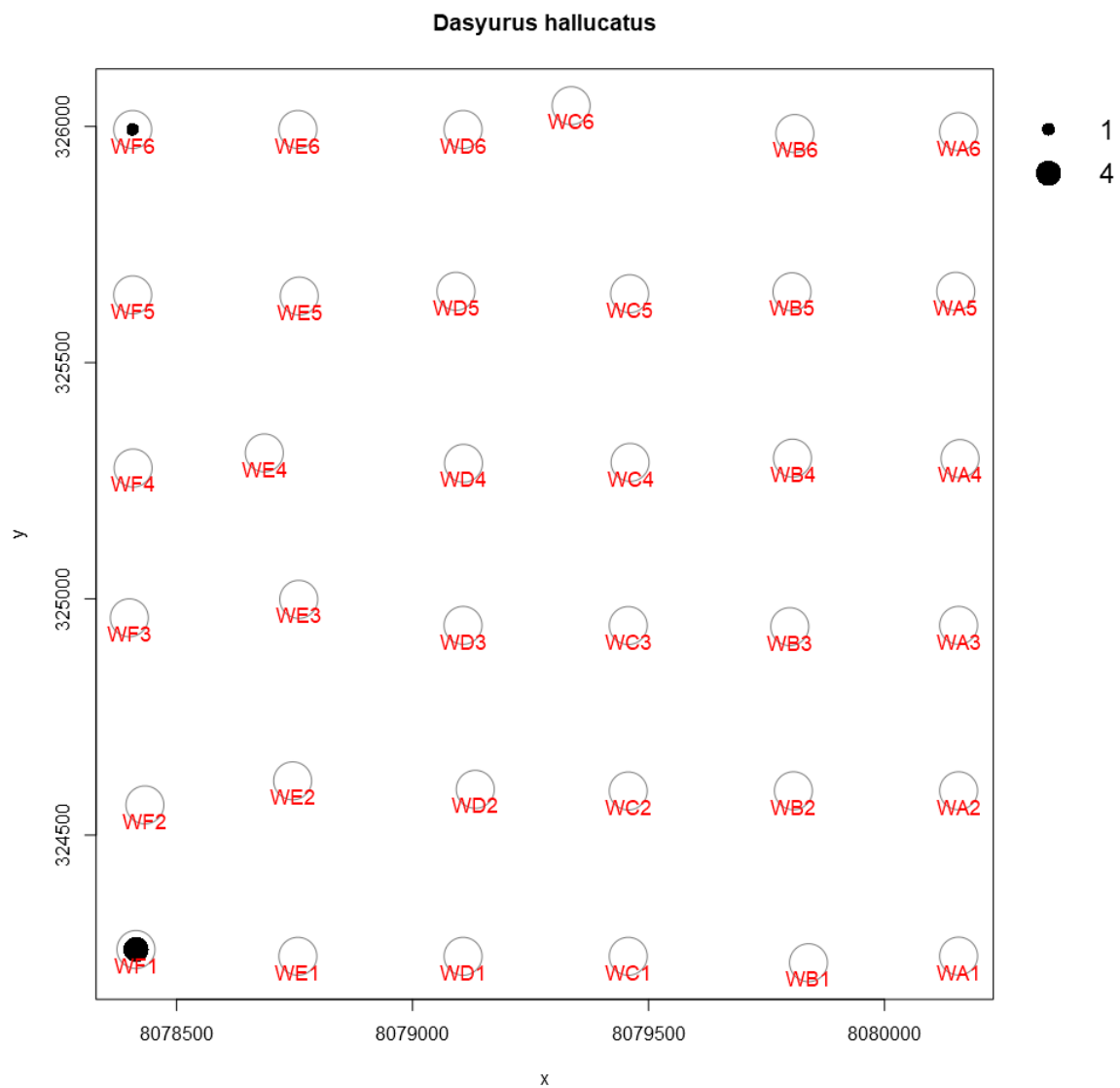


**Fig. A4.** The distribution of quolls, and the number of detections at each camera trap station during July 2018 monitoring at Site “Mt Emerald 2”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR”. Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.



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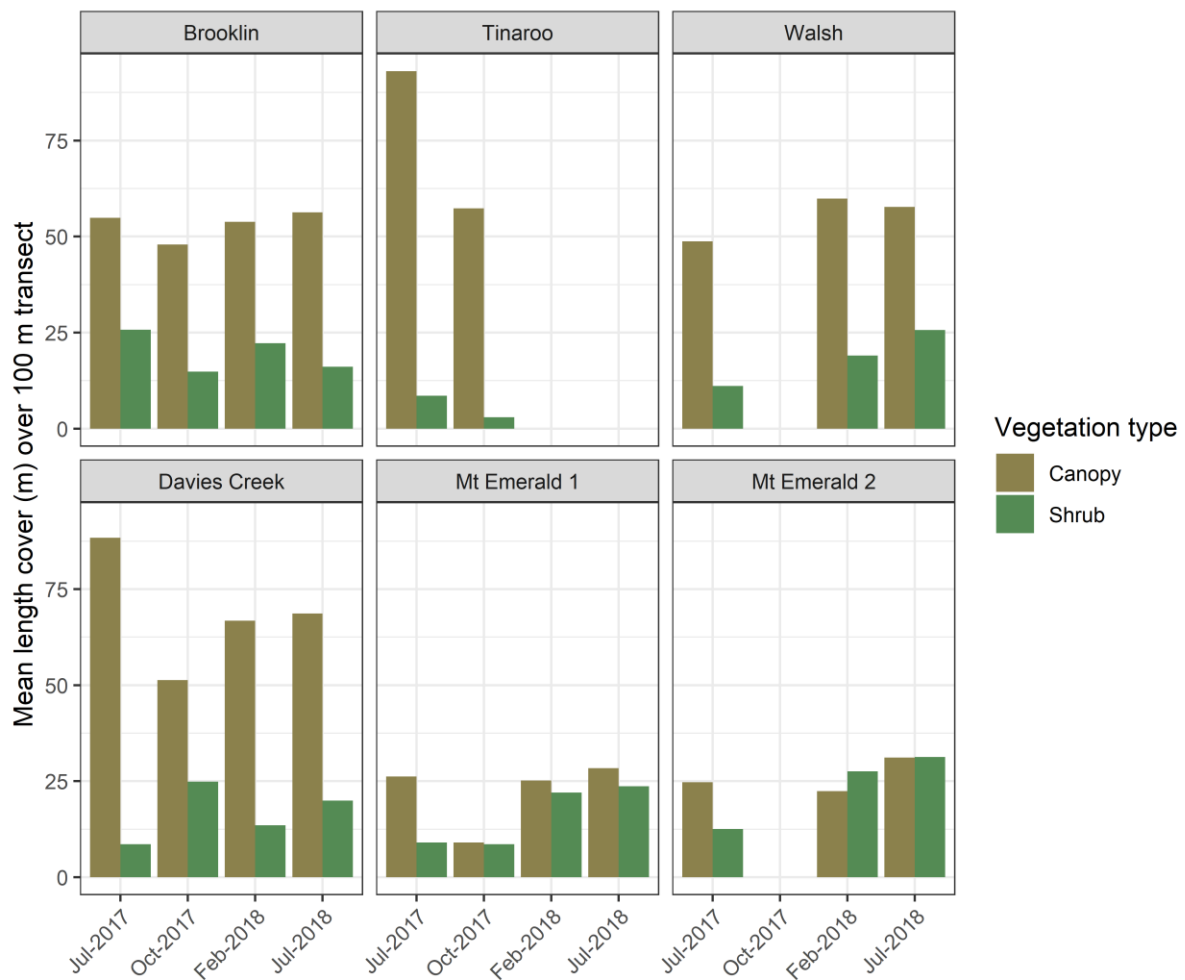


**Fig. A5.** The distribution of quolls, and the number of detections at each camera trap station during July 2018 monitoring at Site “Walsh River”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR”. Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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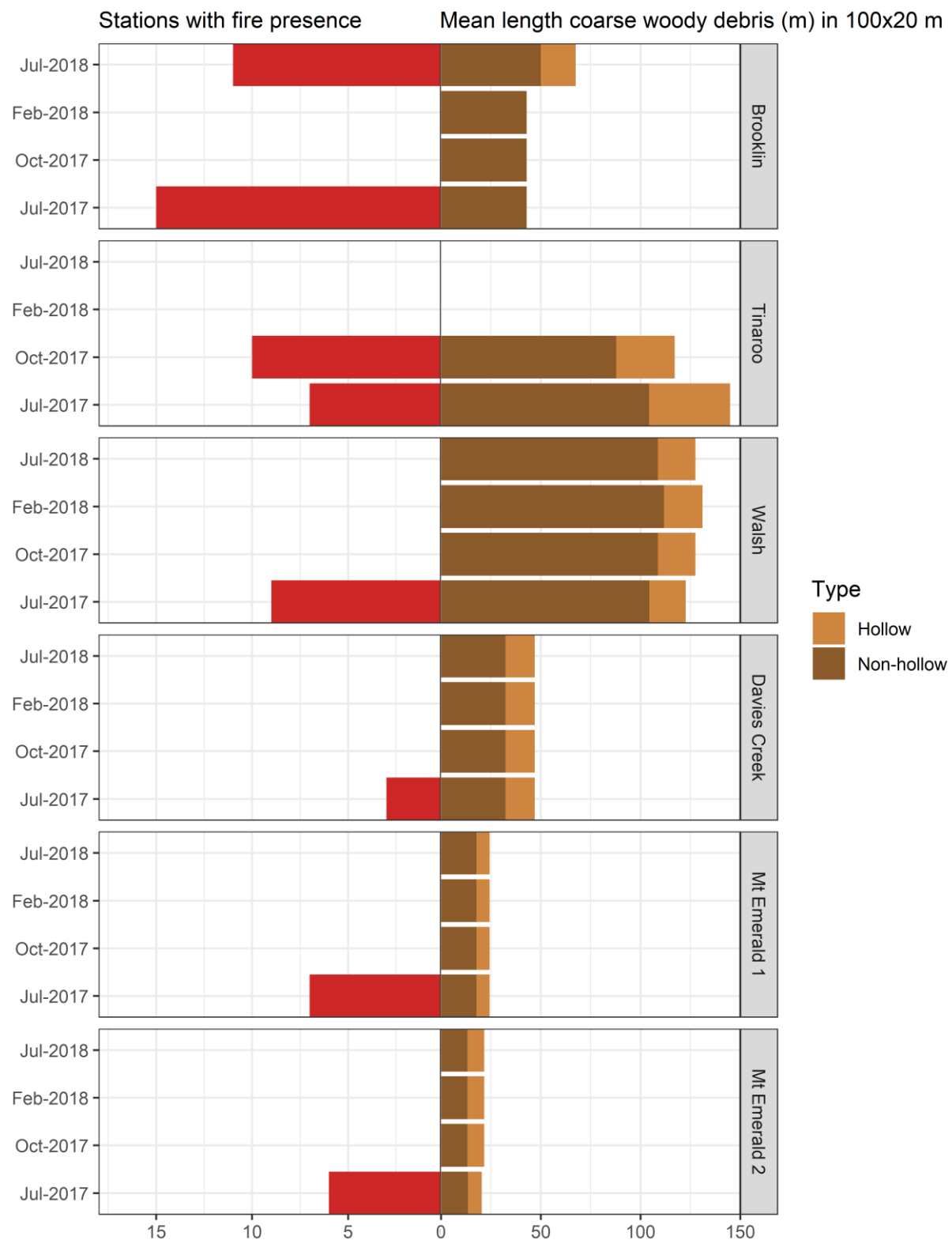
**Appendix B. Trends in canopy and shrub cover, incidence of fire and extent of coarse woody debris on each quoll monitoring site during this study.**



**Fig. B1. Canopy and shrub cover on the 18 Biocondition plots at each of the six quoll monitoring sites surveyed between July 2017 and July 2018. Data was not collected from sites on some occasions due to site access or other logistic issues. Note that site @Tinaroo@ has been unavailable from February 2018.**

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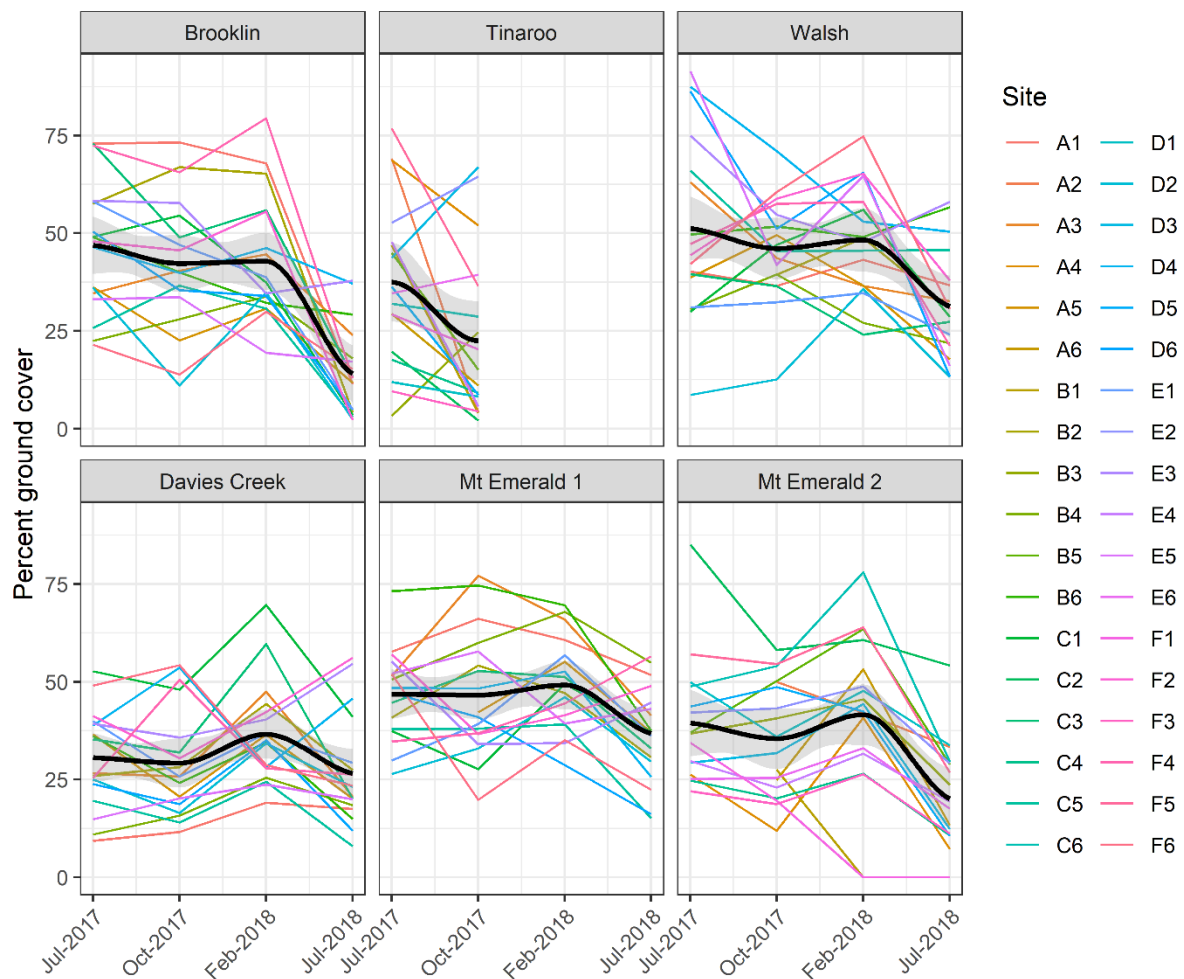
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**Fig. B2. Number of stations (out of 18 at each site) on which there was evidence of recent fire and mean length of hollow and non-hollow coarse woody debris at each site between July 2017 and July 2018. Note that site “Tinaroo” has been unavailable from February 2018.**

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**Fig. B3.** The percentage of vegetative ground cover at each Biocondition station at each quoll monitoring site between July 2017 and July 2018. Individual plot measurements at each site are individually labelled for each site. Alphanumeric site numbers relate to the labelled stations in Fig 2. The thick black line represents an average value for each site, and the grey margin the standard error of that mean. Note that site “Tinaroo” has been unavailable from February 2018.



SUMMARY OF RESULTS

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**References**

Efford, M. G. (2016) secr: Spatially explicit capture-recapture models. R package version 2.10.4. <http://CRAN.R-project.org/package=secr>.

Hines, J. E. (2006). PRESENCE- Software to estimate patch occupancy and related parameters. USGS-PWRC. <<http://www.mbr-pwrc.usgs.gov/software/presence.html>>.