



MOUNT EMERALD WIND FARM – NORTHERN QUOLL MONITORING PROGRAM

SUMMARY OF RESULTS: FEBRUARY 2019

Site	No. individual quolls detected (naïve occupancy) ¹		Quoll population estimate (se) ²		Modelled occupancy (se) ³		Modelled detection probability (se) ⁴		Overall trend in quoll population between sampling occasions
	Feb 2018	Feb 2019	Feb 2018	Feb 2019	Feb 2018	Feb 2019	Feb 2018	Feb 2019	
Mt Emerald Site 1	21(0.694)	10(0.277)	45.5(11.4)	Insufficient spatial recapture data	1(0.001)	0.541 (0.224)	0.085 (0.013)	0.0533 (0.0245)	All abundance metrics downwards
Mt Emerald Site 2	18(0.53)	12(0.314)	67.9(29.1)	21.4(5.02)	0.53*	0.435 (0.128)	0.05 (0.01)	0.0902 (0.0279)	All abundance metrics downwards
Davies Ck Site, Davies Ck NP	20(0.416)	8(0.22)	38.7(10.8)	Insufficient spatial recapture data	0.64 (0.123)	0.999 (0.024)	0.105 (0.0231)	0.016 (0.00559)	All abundance metrics downwards
Tinaroo Ck Site, Dinden NP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Upper Walsh River Site	1(0.06)	2(0.12)	Insufficient spatial recapture data	Insufficient spatial recapture data	0.06*	0.178 (0.155)	Insufficient spatial recapture data	0.046 (0.0427)	No statistically discernable change
Brooklyn Sanctuary	14(0.25)	22(0.5)	Insufficient spatial recapture data	49.1(11.6)	0.384 (0.125)	0.72 (0.155)	0.078 (0.026)	0.085 (0.0225)	All metric upwards or unchanged

Table 1. Three metrics of quoll abundance and detection probability values for six quoll monitoring sites monitored during February 2019.

NOTES.¹ naïve occupancy is proportion of sites at which quolls were detected, ² population estimated using spatially explicit capture-recapture modelling (Efford 2016); ³ 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); ⁴ 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); ⁵ 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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This report summarises the results of northern quoll camera monitoring at Mt Emerald and surrounding sites during February 2019.

Trail cameras were used to collect capture-recapture and site occupancy data on five populations of northern quoll *Dasyurus hallucatus* (Fig. 1) during February 2019. Access to one site “Tinaroo” was denied 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.

Fifty-four individual quolls were detected (Table 1) during approximately 2520 camera trap days across the five sites. Population estimates were able to be generated 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 all sites (Table 1).

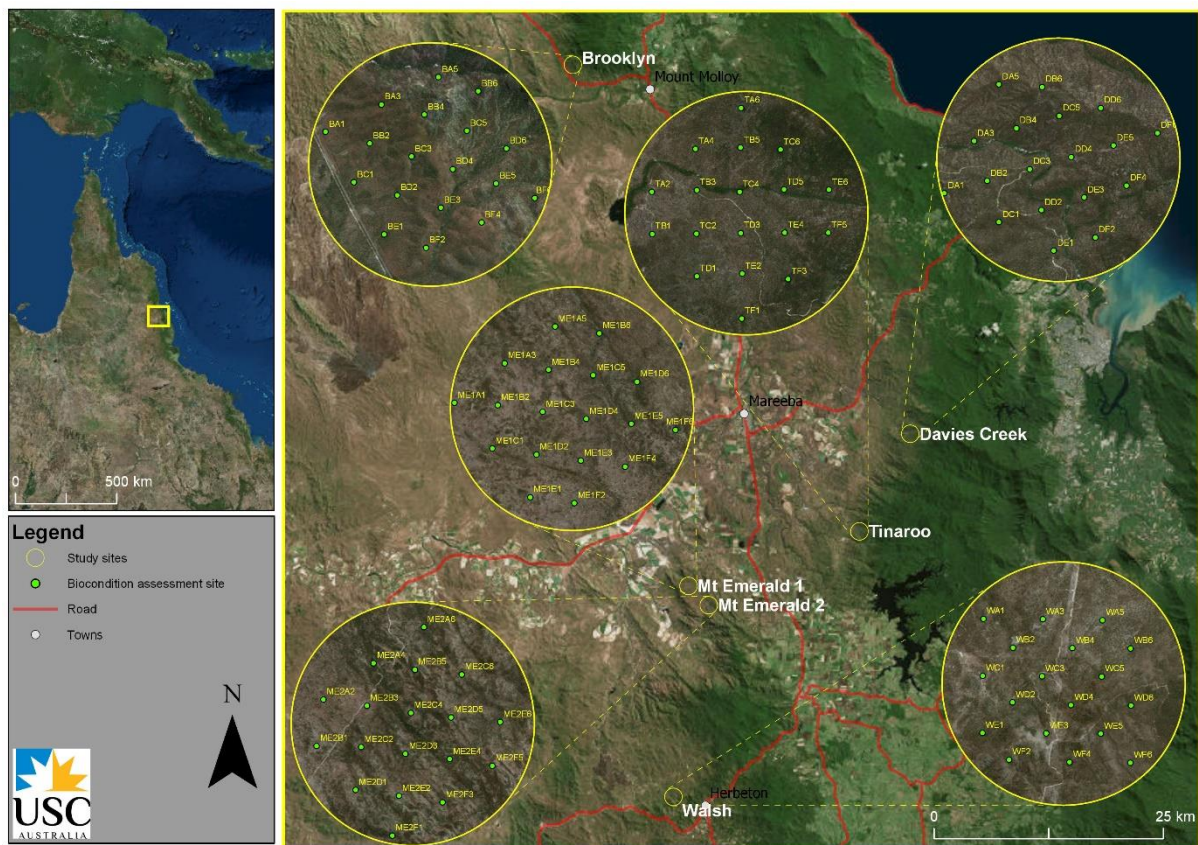


Fig. 1. Indicative locations of the six monitoring grids (red diamonds) used to monitor Northern Quoll populations in the northern Atherton Tablelands from July 2017 onwards. Monitoring site names in white text. Local place names in black text. Note that Site Tinaroo was not utilised during February 2019 due to permits being denied for this area. Basemap: GoogleEarth Pro 9 December 2017.

The number of quoll individuals detected on each of our 3km² sites ranged from 2 to 22 (Table 1). The numbers from the Mt Emerald sites are at the higher end of this range (Table 1). The occupancy of the Mt Emerald sites was within the range of values, but at the higher end of those value at the two control sites (Table 1).

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Changes in quoll populations between February 2018 and February 2019

Completion of the Feb 2019 monitoring allows a comparison with monitoring at the same sites from the previous February session (February 2018; Table 1). Quoll abundance (measured as the number of individuals detected and modelled population size, has decreased at both Mt Emerald sites since February 2018. This pattern is also evident at one of the control sites (“Davies Creek”). Another control site (“Walsh”) remains stable at very, very low quoll numbers. Brooklyn site is the only site at which there is an increase in the number of individuals and the estimated population size. Given this, there is superficially at least, no evidence of a disproportionate decrease in quoll numbers at the Mt Emerald sites compared to the control sites.

A detailed analysis of quoll population changes across all sites and sampling occasions will be provided separately as a final report for this project.

Vegetation Monitoring

Full Biocondition Monitoring was undertaken at all Biocondition plots (Fig. 2) during the February 2019 round of monitoring (summarised raw data included as a separate attachment to this document “MtEmBioConditiondata_master_6.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. Similarly, 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 (Fig. 2). 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). There is no apparent decline in ground cover compared between February 2018 and February 2019, except at the Walsh sites, which are still recovering from severe wildfire in late 2018.

Summary of impacts of Mt Emerald windfarm on quoll populations

Quolls continue to be present on Mt Emerald windfarm monitoring sites 1 and 2. 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 (Mt Emerald 1 and 2) have fluctuated, these fluctuations are within the range of such changes experienced at the control sites. A full summary of trends across all times and sites will be provided in our concluding report in mid-2019.

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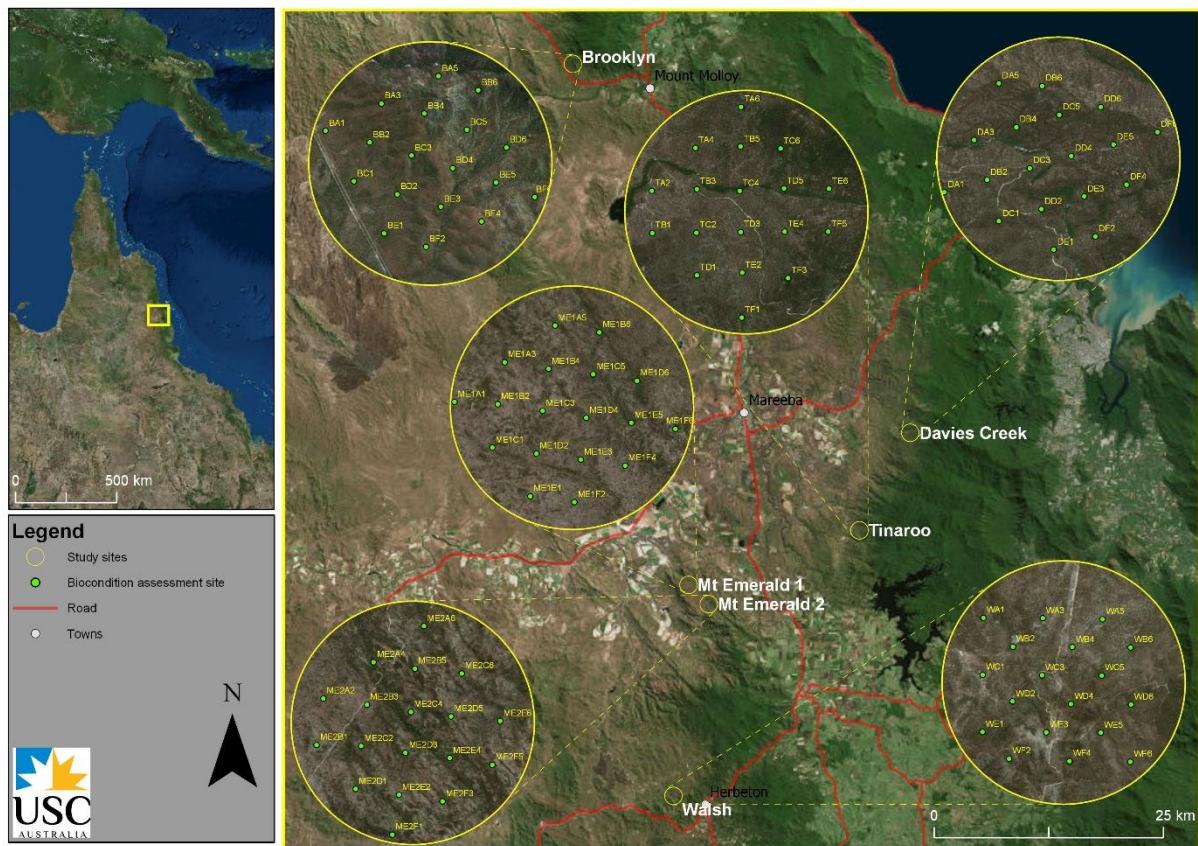


Fig. 2. Indicative locations of the six Biocondition monitoring grids (green circles) used to monitor habitat Biocondition in the northern Atherton Tablelands from July 2017 onwards. Monitoring site names in white text. Local place names in black text. Note that Site Tinaroo was not utilised during July 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.

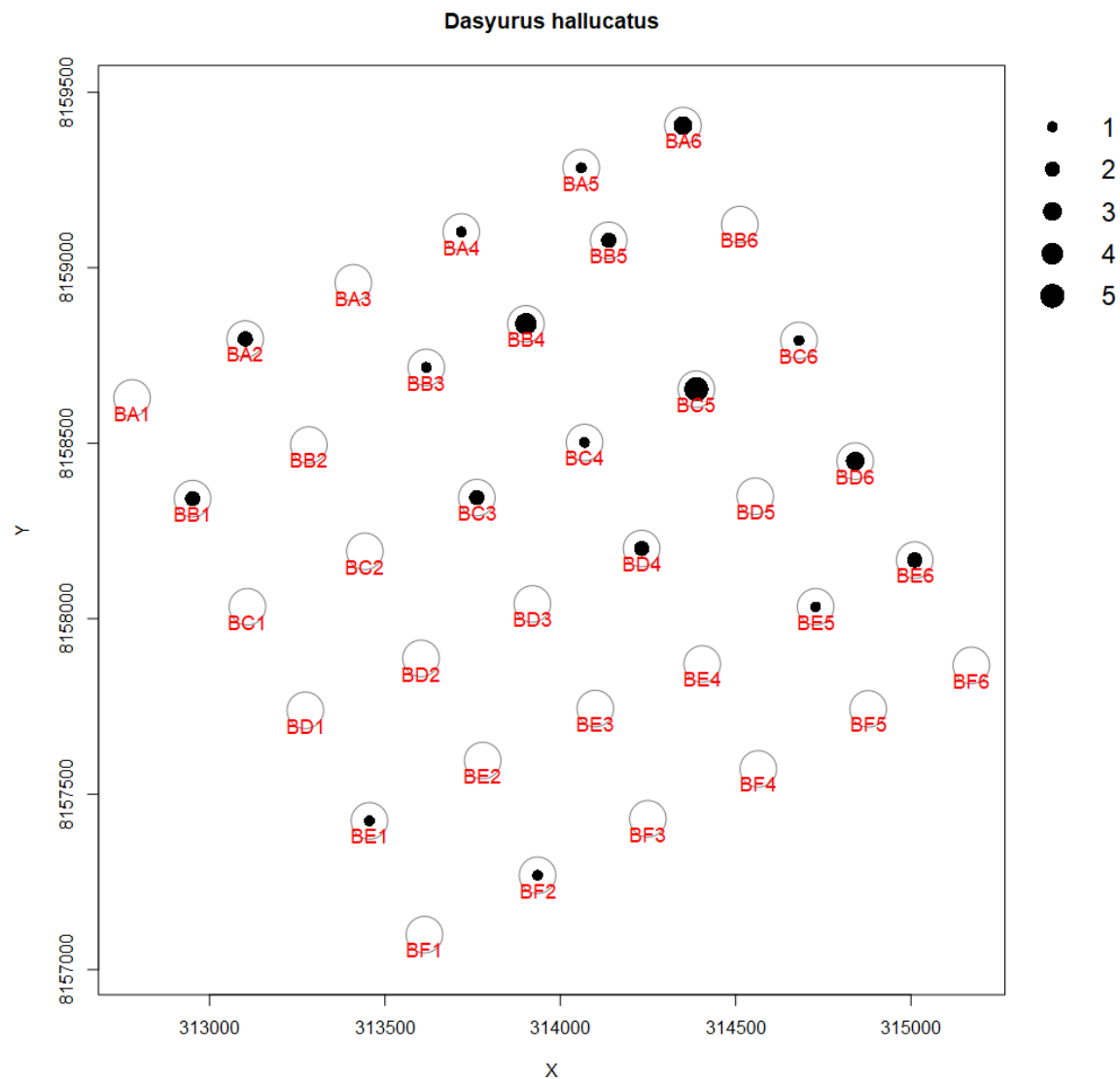


Fig. A1. The distribution of quolls, and the number of detections at each camera trap station during February 2019 monitoring at Site “Brooklyn”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR” (Niedballa *et al.* 2016). Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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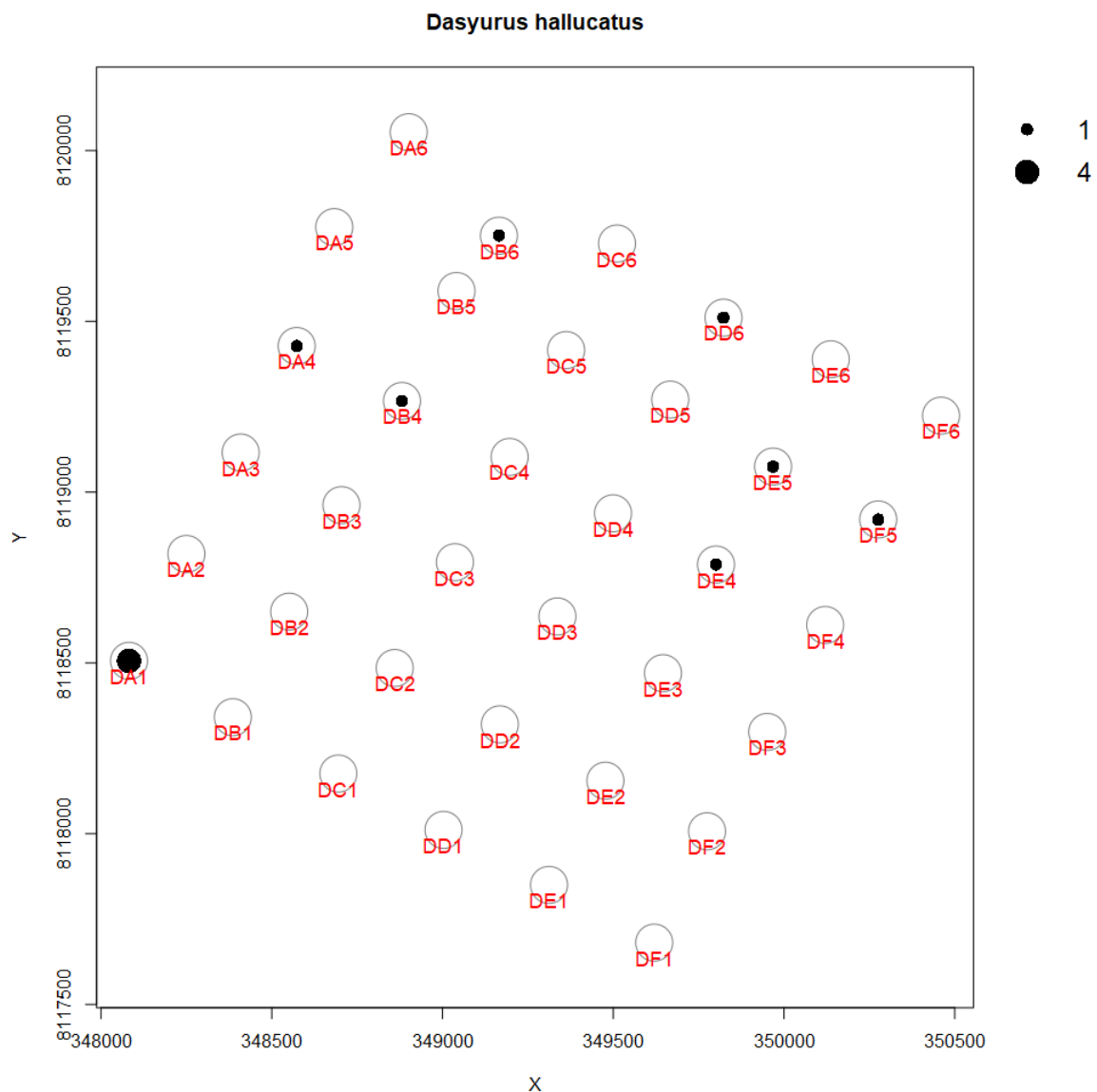


Fig. A2. The distribution of quolls, and the number of detections at each camera trap station during February 2019 monitoring at Site “Davies Creek”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR” (Niedballa *et al.* 2016). Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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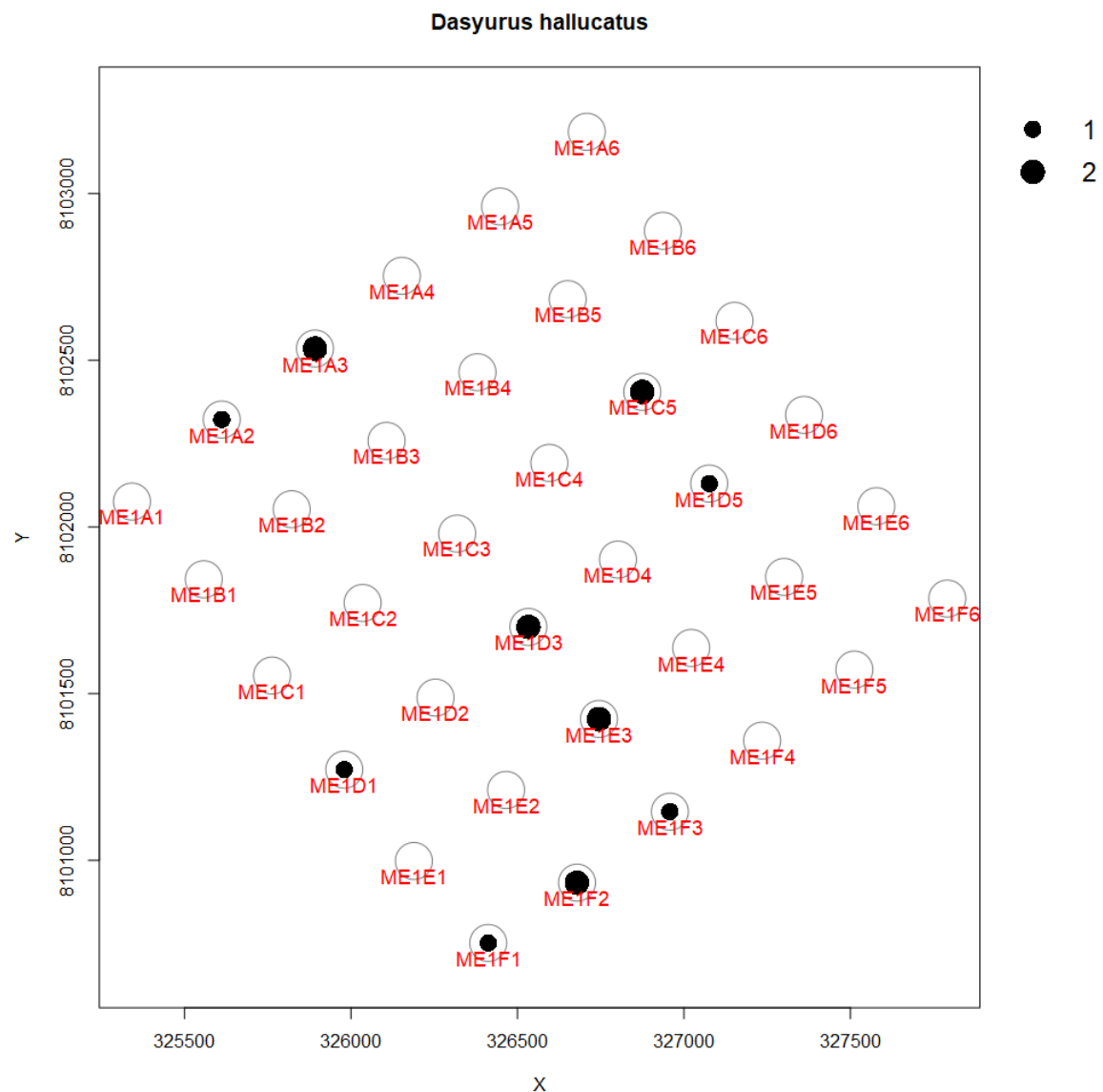


Fig. A3. The distribution of quolls, and the number of detections at each camera trap station during February 2019 monitoring at Site “Mt Emerald 1”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR” (Niedballa *et al.* 2016). Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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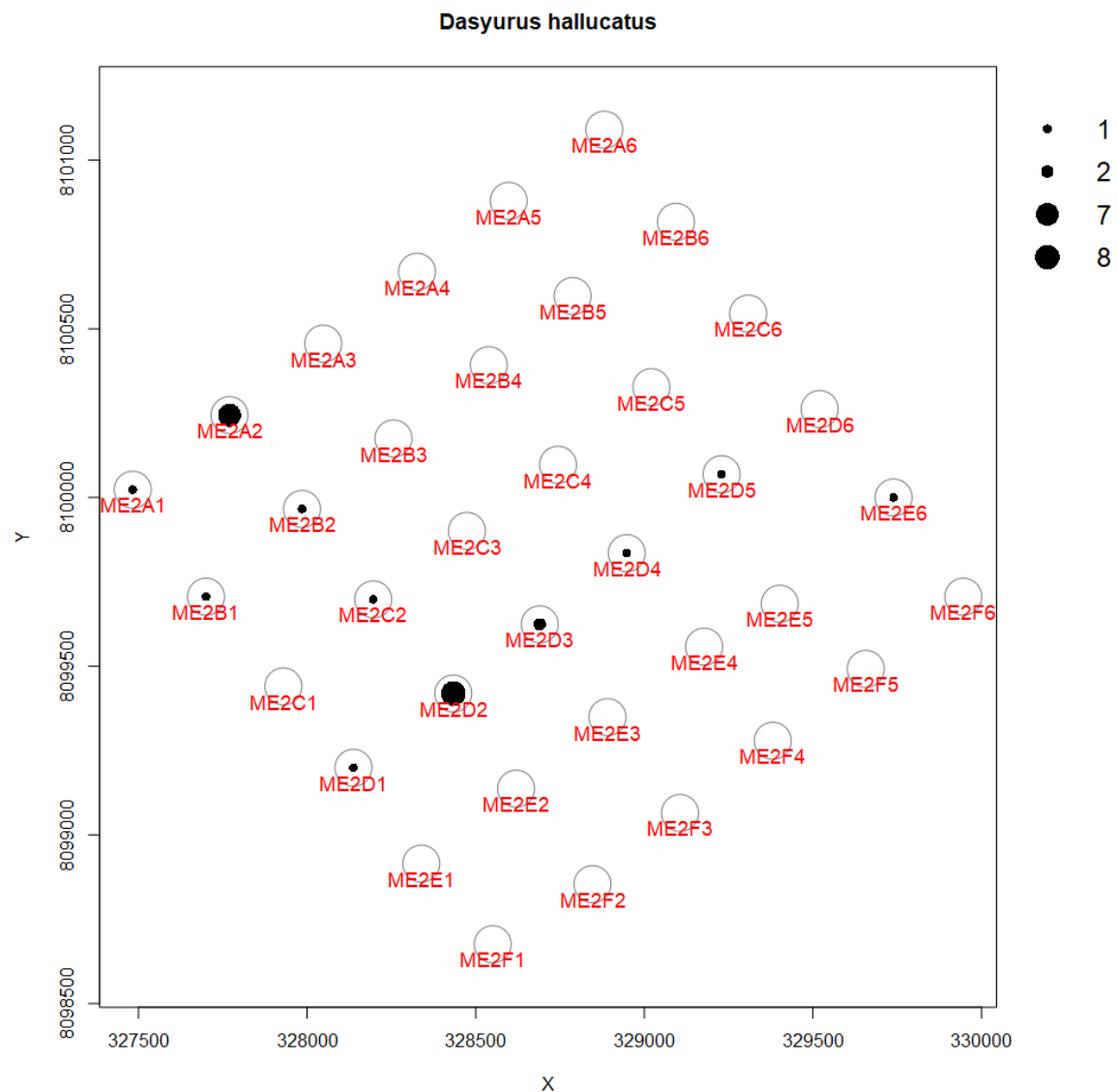


Fig. A4. The distribution of quolls, and the number of detections at each camera trap station during February 2019 monitoring at Site “Mt Emerald 2”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR” (Niedballa *et al.* 2016). Each camera station is approximately 350-m-apart and site locations are illustrated in Map 1.

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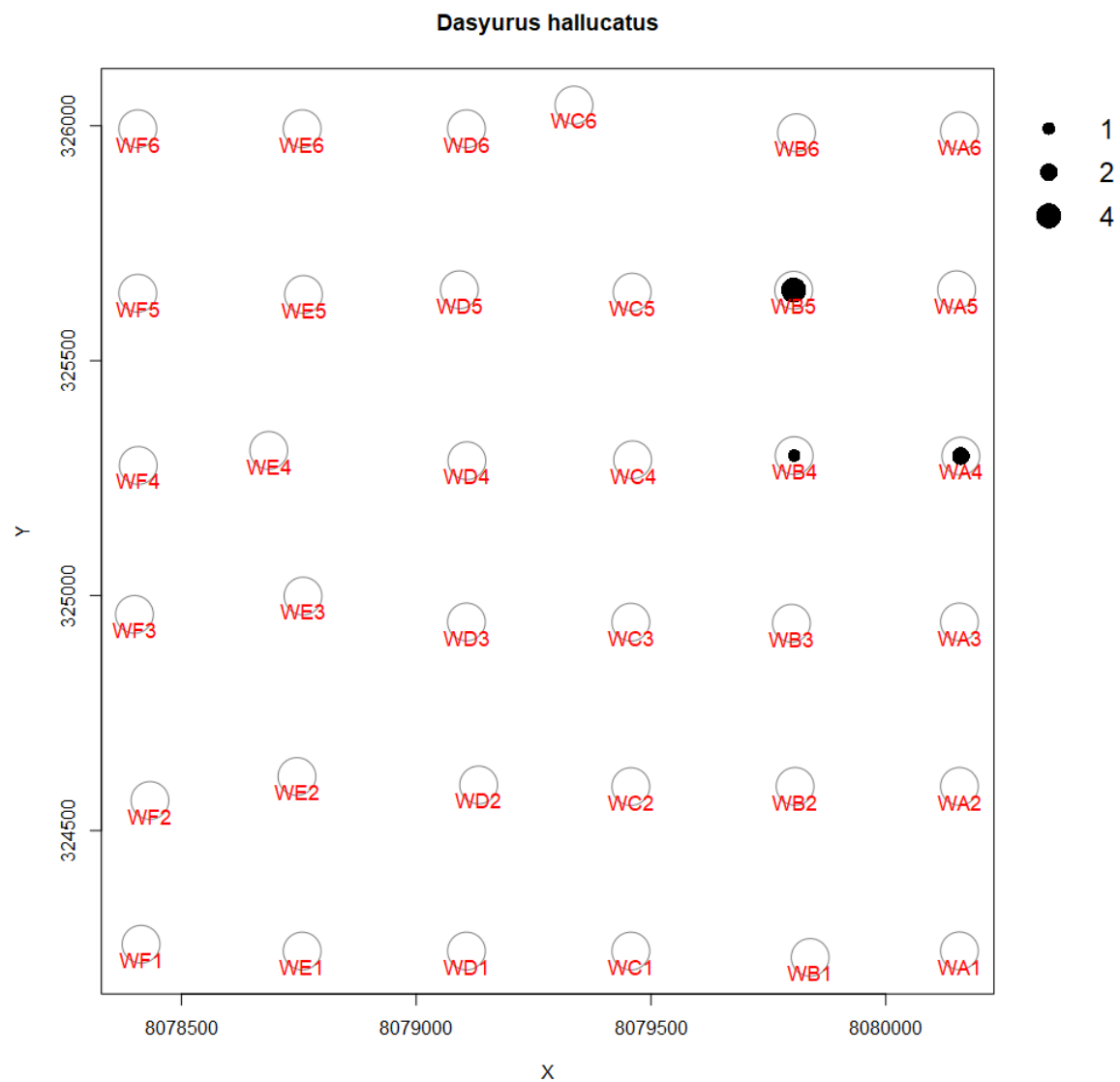


Fig. A5. The distribution of quolls, and the number of detections at each camera trap station during February 2019 monitoring at Site “Walsh River”. The number of detections per station is reflected in the size of the black circle, as per the legend to the right of the plot. Plots were generated within R-package “camtrapR” (Niedballa *et al.* 2016). 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.

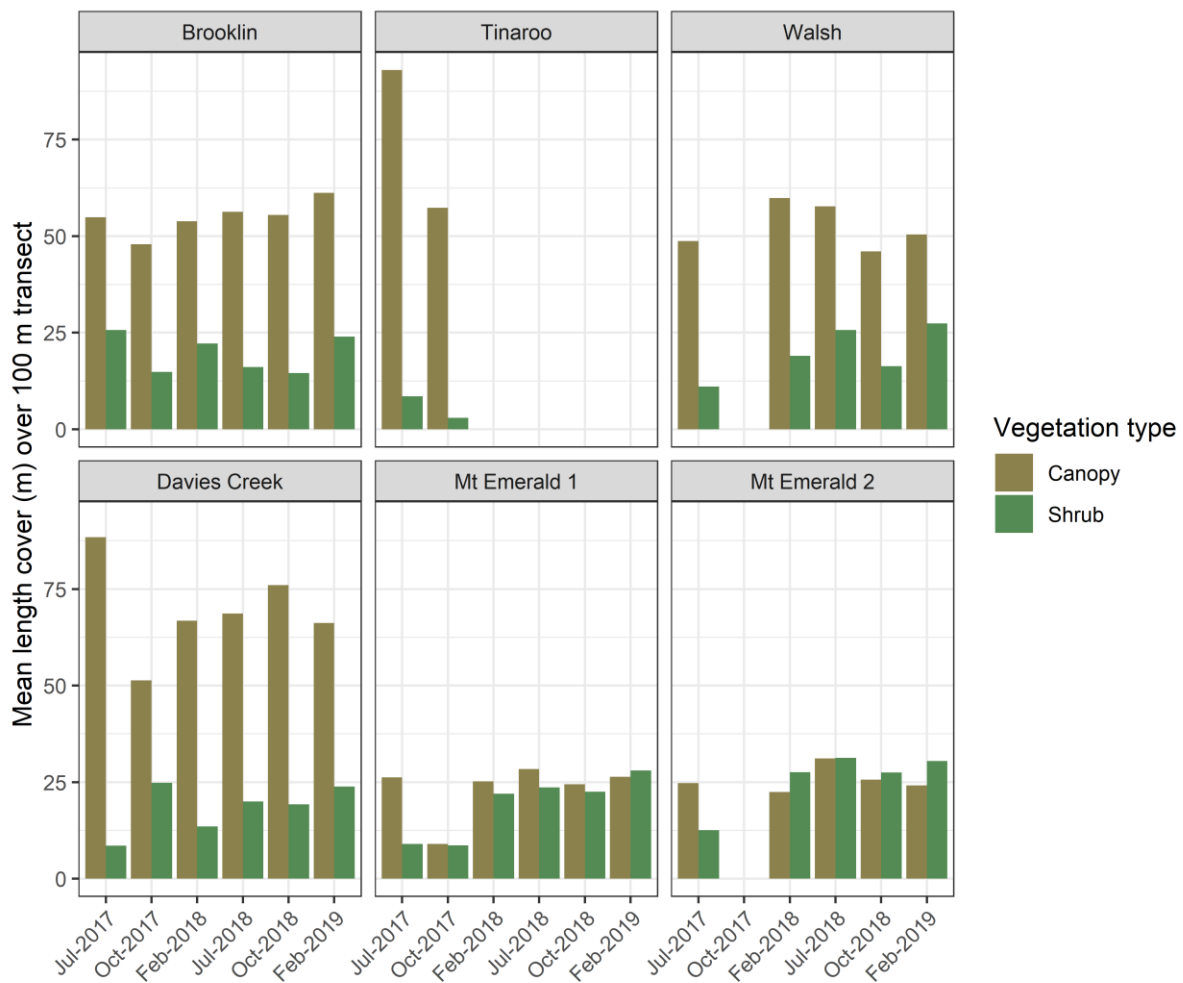


Fig. 2.1. Canopy and shrub cover on the 18 BioCondition plots at each of the six quoll monitoring sites surveyed between July 2017 and February 2019. Data was not collected from sites on some occasions due to site access or other logistic issues. Note that site Tinaroo has been unavailable from February 2018.

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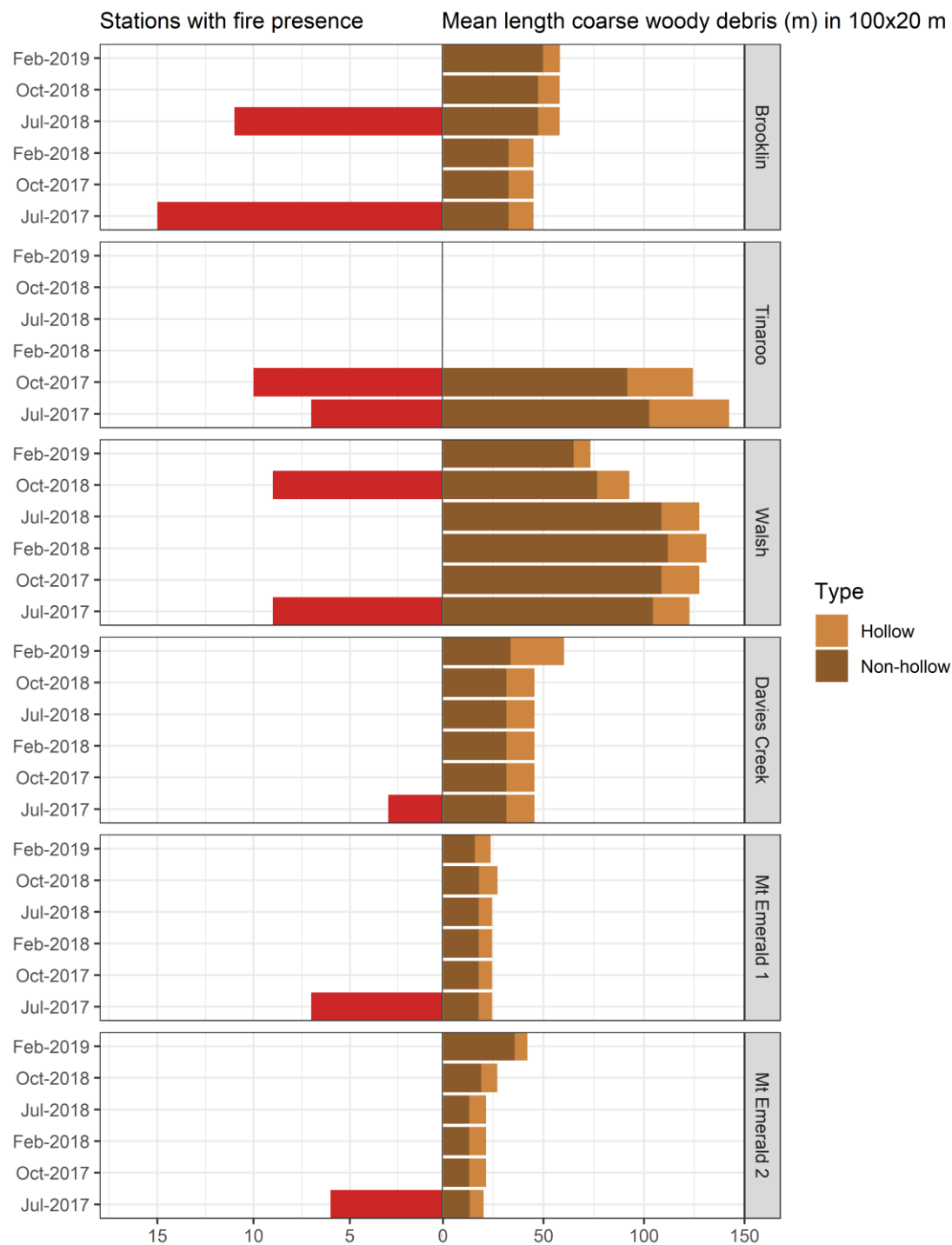


Fig. 2.2. Number of stations (out of 18 at each site) on which there was evidence of recent fire and mean length of hollow and non-hollow coarse woody debris at each site between July 2017 and February 2019. Note that site “Tinaroo” has been unavailable from February 2018.

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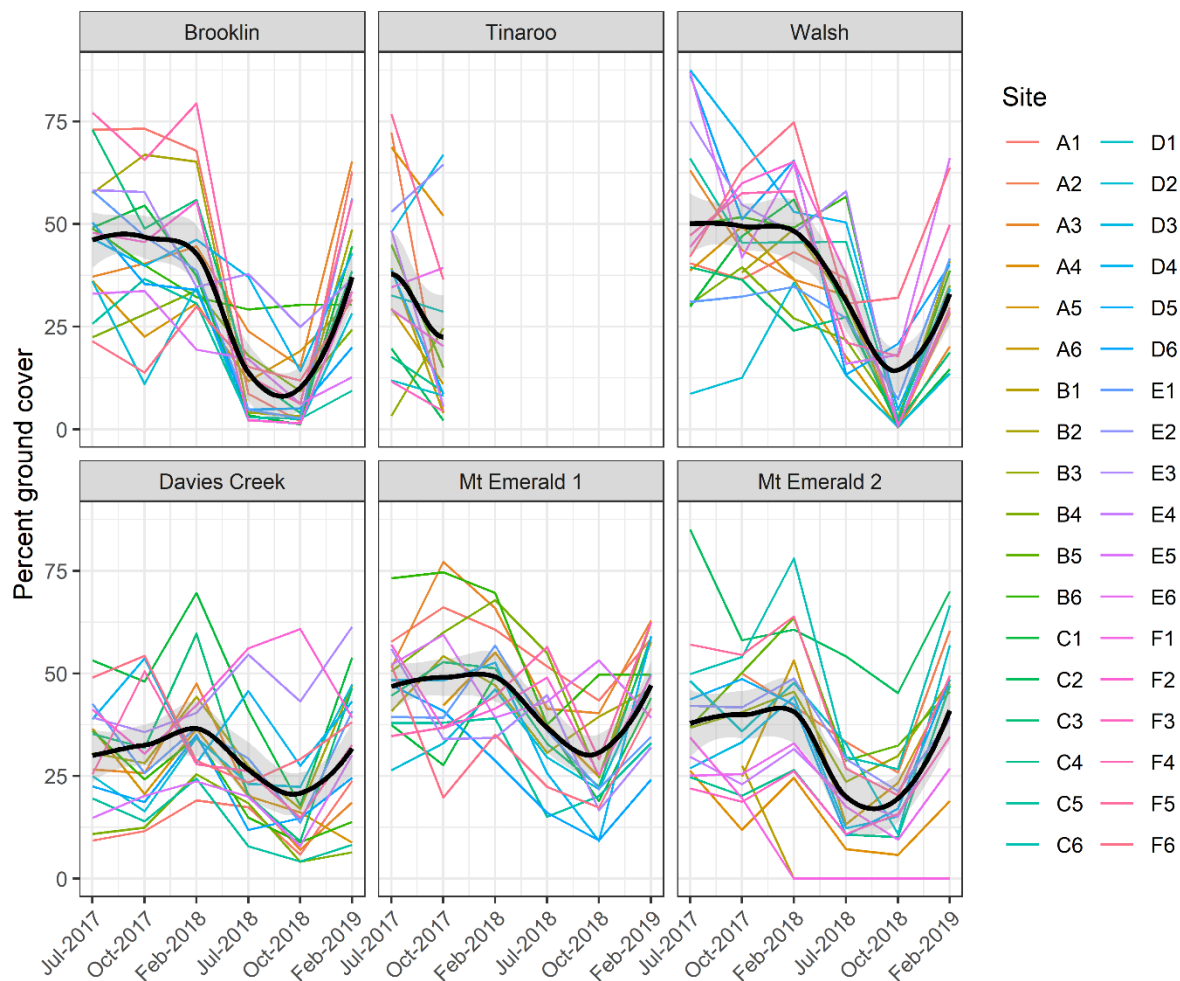


Fig. 2.3. The percentage of vegetative ground cover at each Biocondition station at each quoll monitoring site between July 2017 and February 2019. Individual plot measurements at each site are individually labelled for each site. Alphanumeric site numbers relate to the labelled stations in Fig 2. The 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.



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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>>.

Niedballa, J., Sollmann, R, Courtiol, A., and Wilting A. (2016). camtrapR: an R package for efficient camera trap data management. *Methods in Ecology and Evolution* 7(12), 1457-1462.