

Impact of the McPhillamys Gold Project on the Koala (*Phascolarctos cinereus*)

1. This report has been prepared by Associate Professor Mathew Crowther addressing the potential impacts of the McPhillamys Gold Project on the local koala population.
2. I am Associate Professor in wildlife ecology and evolution in the School of Life and Environmental Sciences at the University of Sydney with a BSc (Hons) in Zoology and a PhD in Evolution and Ecology. A copy of my CV is in **attachment 1**.
3. I have researched koalas in NSW since 2006, including publishing over 130 scientific papers, including 20 papers on koalas. I have been the Chief Investigator of an ARC Linkage Grant on the conservation of koalas on the Liverpool Plains, as well as a co-investigator for two NSW Koala Strategy Research Grants. I been active in koala management by contributing to the NSW Koala Recovery Plan and I am a current expert advisory member on the IUCN Australasian Marsupials and Monotremes Group, the NSW Saving Our Species Koala Panel and the NSW Office of Environment and Heritage (OEH) NSW Koala Habitat Suitability project. I spoke at the NSW Inquiry into Koala populations and habitat in New South Wales in both Sydney and Gunnedah. I have extensive experience reviewing documents concerning koala management for government and non-government organisations. I am an employee of the University of Sydney.
4. I have been supplied with the following documents
 - a) *McPhillamys Gold Project Environmental Impact Statement (EIS)* prepared by LFB Resources NL, August 2019
 - b) *Appendix N – Mine Development Biodiversity Assessment Report* (Appendix N) prepared by LFB Resources NL, August 2019
 - c) *McPhillamys Gold Project Amendment Report* prepared by LFB Resources NL, September 2020
 - d) *Appendix M – Amendment Report – Biodiversity Assessment Development Report* prepared by LFB Resources NL, September 2020
 - e) *McPhillamys Gold Project Second Amendment Report* prepared by LFB Resources NL, May 2022
 - f) *Appendix E – Second Amendment Report – Biodiversity Assessment Development Report* prepared by LFB Resources NL, May 2022

- g) *McPhillamys Gold Project - Response to Request for Information (RFI-49618207 prepared by ERM, November 2022*
- h) *Second Amendment - Biodiversity Development Assessment Report, prepared by LFB Resources NL, September 2022*
- i) *Reconciliation of the calculations for Koala habitat to be impacted by the mine development for the EPBC assessment, prepared by ERM, October 2022*
- j) *Biodiversity, Conservation and Science Directorate (BCS) Response to advice on 2nd Amendment, 23 August 2022*
- k) *Biodiversity, Conservation and Science Directorate (BCS) Response to advice on 2nd Amendment, 7 October 2022*

Impacts on the Koala

5. The koala is listed as Endangered under both the Commonwealth EPBC Act 1999 and the NSW Biodiversity Conservation Act 2016.
6. Loss and fragmentation of habitat represents key threatening process for koala populations.
7. Fragmentation also increases edge effects which increases weed invasion, road mortality, dog attack and die-off of trees close to the edge of the habitat.
8. The McPhillamys Gold Project involves removal of 132.36 ha of native vegetation and fauna habitat (EIS 11-12). This includes 77.75 ha of koala habitat, which increases to 78.57 ha for the amended proposal based on the same methods of calculation.
9. It is uncertain how many koalas are in the habitat to be impacted by the McPhillamys Gold Project, as only one koala was sighted opportunistically, and no koala scats were found despite scats searches and spotlighting surveys (EIS, p 125; Appendix N, p 111).
10. Koalas were searched for using spotlighting and scat searches using the Spot Assessment Technique (Phillips and Callaghan 2011) and spotlighting (EIS, p 402). However, these techniques are less sensitive to detecting koalas in low density environments than song meters (Law *et al.* 2020; Law *et al.* 2022; Law *et al.* 2018),

detection dogs (Cristescu *et al.* 2015; Cristescu *et al.* 2020) and drones (Howell *et al.* 2022; Witt *et al.* 2020).

11. In addition, in low density koala populations, it can be extremely difficult to detect koalas, and this can be affected by weather and scat decay conditions (Dargan *et al.* 2019; Rhodes *et al.* 2011; Wilmott *et al.* 2019).
12. Hence in my opinion, detection dogs, drones and song meters would have been additional, and probably preferable techniques, to detect koalas and get a better understanding of local koala densities and habitat.
13. In addition to the one sighted koala, mine footprint is considered koala habitat due to the presence of the feed tree Manna Gum (*Eucalyptus viminalis*), listed in Schedule 2 of SEPP 44 Koala Habitat Protection.
14. The koala habitat, proposed to be cleared, consists of two Plant Community Types (PCT), PCT 951 which represents core koala habitat and PCT 1330 representing secondary koala habitat. The clearing will be 31.55ha of core habitat and 44.22ha of secondary koala habitat (EIS, p 419).
15. Note the PCT classification system changed in 2022, the system used by the proponent is the 2018 classification system. This will unlikely have any impact on the project or implications for the koalas on site.
16. Different areas of koala habitat can support different densities of koala populations. This depends on the density of trees in the landscape, the underlying soil fertility and particularly the levels of nitrogen, digestible nitrogen and toxins in the eucalypt leaves (Au 2018; Au *et al.* 2019).
17. One way of estimating how many koalas are in an area of habitat is to calculate the home ranges of koalas in similar habitat (Crowther *et al.* 2021). Home-ranges represent the areas in which koalas live, feed, rest and reproduce once they have dispersed from their mothers. Dispersal distances can be quite far, over 30km, especially when there is lesser quality habitat nearby or other koalas with established territories. Koalas are solitary animals, and hence their home-ranges tend to have minimal overlap. For example, the overlap of home-ranges of koala in the Liverpool Plains of northern NSW is 18% (Crowther *et al.* 2021).
18. For two properties of rural koala habitat on the Liverpool Plains, an area of similar koala habitat to the area of the proposed McPhillamys Gold Project , I calculated

mean home-range sizes of 18.62 ha \pm 4.66 (standard error) for the Watermark property and 14.42 ha \pm 3.40 (standard error) for the Dimberoy property (Crowther *et al.* 2021).

19. Applying the same method here, the loss of 77.75 ha of koala habitat due to the McPhillamys Gold Project represents the habitat for approximately 5 koalas.
20. Approximately 1516.3ha of koala habitat occurs within 5km of the mine development. Hence clearing of the habitat for the mine will result in 5% of koala habitat in the local region.
21. Although the precise size of the local koala population is somewhat uncertain due to only one koala detection, a loss of 5% of koala habitat represents a significant impact, in my opinion and could represent %% of the total local koala population which would about around 100 koalas based on the current calculations.
22. Approximately 148.6ha of koala habitat will be retained, but it will possibly be degraded by the clearing of the other habitat through habitat fragmentation and edge effects. These include increased road mortality, increased mortality of trees at edges, increased dog attacks and increased weed invasion.
23. This loss in habitat will be compensated with revegetation (EIS, p419). However, for trees to be used by koalas will take over 10 years, as koalas need larger trees to rest (Crowther *et al.* 2014; Crowther *et al.* 2022). Trees also have high mortality in the early years after planting.
24. Koalas that are detected during clearing will be encouraged to relocate to vegetated areas (EIS, p421). It is not the intention of the proponent to translocate any koalas, but to carry out pre-clearance inspections and encourage koalas to move into adjacent native vegetation. The low detectability of koalas is also a concern, as koalas may not be found in the pre-clearance inspections and possibly hurt or killed by the clearing actions.
25. I have concerns that, without accurate koala numbers or even multiple koala detections, that koalas will not be able to establish new home ranges due to resident koalas being territorial, or differences in environmental characteristics such as leaf nitrogen levels in the new habitat.
26. The vegetation on the site of the proposed pipeline is not identified as core koala habitat by the proponent, (EIS, p609) but the vegetation does contain manna gums,

a primary koala feed-tree species and hence could be considered koala habitat.

Hence more thorough koala surveys are required in this region.

27. Due to the low detectability of koalas on this site using scat searches and spotlighting (i.e. there was only one opportunistic koala sighting on site), it may be presumptuous to assume that the areas to be cleared, including the pipeline are not primary koala habitat, particularly when just based on PCTs. Hence, I would thoroughly assess all the areas of vegetation for koalas. using a combination song meters, drones and detection dogs.

Offsetting

28. The proponent's main mitigation action for the impact on koalas at the site is through biodiversity offsetting (EIS, pES.12).
29. The proponent has calculated offsets as per the Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Projects (OEH 2014). They have calculated 1,970 species credits for the koala.
30. The Proponent will meet the offset obligations through the use or combination of the following actions (EIS, pES.12):
- a. Establishing a biodiversity stewardship site managed under a stewardship agreement and/or
 - b. Purchasing and retiring credits available on the biodiversity credit register and/or
 - c. Payment into the Biodiversity Conservation Trust.
31. The potential stewardship site is located approximately 3km south west of Blayney, which supports Box Gum Woodland. This type of woodland supports trees used by koalas such as yellow box (*Eucalyptus melliodora*) and Blakely's redgum (*E. blakelyi*), but is not the type of woodland that usually contains manna gum. Hence, although the offset area may contain trees suitable for koalas, it is of different habitat to the habitat lost from the vegetation clearance.
32. Offsets are problematic, in my opinion, as they may not represent the koala habitat that is lost. Any revegetation, particularly *Eucalyptus* trees, require a long time to grow to be used by koalas, and although koalas use 10-year-old trees for food, they require larger trees for shelter (Crowther *et al.* 2014; Crowther *et al.* 2022). Offsets

need to be of suitable quality, not just tree species composition as koala distribution is also affected by soil type due to the soil affecting leaf nutrients and therefore palatability for koalas (Crowther *et al.* 2009). The levels of nutrients and toxins in the leaves can vary throughout the landscape, affecting their useability for food by koalas (Moore *et al.* 2010; Moore *et al.* 2004). Offset area can have other issues that may affect koalas, including populations of feral animals such as wild dogs which would make them of lesser value than the habitat that is lost

33. On the larger issues of biodiversity offsets, they have been criticized in the scientific literature because offsets frequently do not achieve the aims of no net loss (Sonter *et al.* 2017). This is particularly so where there is a lag between the loss of habitat and the amount of time for the restoration to become mature (Maron *et al.* 2010). Therefore, it is better to mitigate on-site rather than rely on offsets (Simmonds *et al.* 2020).
34. Even though the offsets are relatively geographically close to the impact site, there may be differences in the landscape which make comparisons of “like-for-like” difficult. Hence it is preferable to mitigate impacts on site, and only use offsets as a last resort.

References:

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Cristescu RH, Foley E, Markula A, Jackson G, Jones D, and Frère C (2015) Accuracy and efficiency of detection dogs: a powerful new tool for koala conservation and management. *Scientific Reports* **5**, 8349. doi: 10.1038/srep08349.

Cristescu RH, Miller RL, and Frère CH (2020) Sniffing out solutions to enhance conservation: How detection dogs can maximise research and management outcomes, through the example of koalas. *Australian Zoologist* **40**, 416-432. doi: 10.7882/az.2019.030.

Expert Witness Report of Associate Professor Mathew Crowther

Crowther MS, Dargan JR, Madani G, Rus AI, Krockenberger MB, McArthur C, Moore BD, Lunney D, and Mella VSA (2021) Comparison of three methods of estimating the population size of an arboreal mammal in a fragmented rural landscape. *Wildlife Research* **48**, 105-114. doi: 10.1071/WR19148.

Crowther MS, Lunney D, Lemon J, Stalenberg E, Wheeler R, Madani G, Ross KA, and Ellis M (2014) Climate-mediated habitat selection in an arboreal folivore. *Ecography* **37**, 336-343. doi: 10.1111/j.1600-0587.2013.00413.x.

Crowther MS, McAlpine CA, Lunney D, Shannon I, and Bryant JV (2009) Using broad-scale, community survey data to compare species conservation strategies across regions: A case study of the Koala in a set of adjacent 'catchments'. *Ecological Management & Restoration* **10**, S88-S96. doi: 10.1111/j.1442-8903.2009.00465.x.

Crowther MS, Rus AI, Mella VSA, Krockenberger MB, Lindsay J, Moore BD, and McArthur C (2022) Patch quality and habitat fragmentation shape the foraging patterns of a specialist folivore. *Behavioral Ecology* **33**, 1007-1017. doi: 10.1093/beheco/amac068.

Dargan JR, Moriyama M, Mella VSA, Lunney D, and Crowther MS (2019) The challenge for koala conservation on private land: koala habitat use varies with season on a fragmented rural landscape. *Animal Conservation* **22**, 543-555. doi: 10.1111/acv.12487.

Howell LG, Clulow J, Jordan NR, Beranek CT, Ryan SA, Roff A, and Witt RR (2022) Drone thermal imaging technology provides a cost-effective tool for landscape-scale monitoring of a cryptic forest-dwelling species across all population densities. *Wildlife Research* **49**, 66-78. doi: 10.1071/WR21034.

Law B, Gonsalves L, Bilney R, Peterie J, Pietsch R, Roe P, and Truskinger A (2020) Using passive acoustic recording and automated call identification to survey koalas in the southern forests of New South Wales. *Australian Zoologist* **40**, 477-486. doi: 10.7882/az.2019.033.

Law B, Gonsalves L, Burgar J, Brassil T, Kerr I, Wilmott L, Madden K, Smith M, Mella V, Crowther M, Krockenberger M, Rus A, Pietsch R, Truskinger A, Eichinski P, and Roe P (2022) Estimating and validating koala *Phascolarctos cinereus* density estimates from acoustic arrays using spatial count modelling. *Wildlife Research* **49**, 438-448. doi: 10.1071/WR21072.

Law BS, Brassil T, Gonsalves L, Roe P, Truskinger A, and McConville A (2018) Passive acoustics and sound recognition provide new insights on status and resilience of an iconic endangered marsupial (koala *Phascolarctos cinereus*) to timber harvesting. *PLoS One* **13**, e0205075. doi: 10.1371/journal.pone.0205075.

Maron M, Dunn PK, McAlpine CA, and Apan A (2010) Can offsets really compensate for habitat removal? The case of the endangered red-tailed black-cockatoo. *Journal of Applied Ecology* **47**, 348-355. doi: 10.1111/j.1365-2664.2010.01787.x.

Moore BD, Lawler IR, Wallis IR, Beale CM, and Foley WJ (2010) Palatability mapping: a koala's eye view of spatial variation in habitat quality. *Ecology* **91**, 3165-3176. doi: 10.1890/09-1714.1.

Moore BD, Wallis IR, Wood JT, and Foley WJ (2004) Foliar nutrition, site quality, and temperature influence foliar chemistry of tallowwood (*Eucalyptus microcorys*). *Ecological Monographs* **74**, 553-568. doi: 10.1890/03-4038.

Phillips S and Callaghan J (2011) The spot assessment technique: A tool for determining localised levels of habitat use by koalas *Phascolarctos cinereus*. *Australian Zoologist* **35**, 774-780. doi: 10.7882/AZ.2011.029.

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Simmonds JS, Sonter LJ, Watson JEM, Bennun L, Costa HM, Dutson G, Edwards S, Grantham H, Griffiths VF, Jones JPG, Kiesecker J, Possingham HP, Puydarrieux P, Quétier F, Rainer H, Rainey H, Roe D, Savy CE, Souquet M, ten Kate K, Victurine R, von Hase A, and Maron M (2020) Moving from biodiversity offsets to a target-based approach for ecological compensation. *Conservation Letters* **13**, e12695. doi: 10.1111/conl.12695.

Sonter LJ, Tomsett N, Wu D, and Maron M (2017) Biodiversity offsetting in dynamic landscapes: Influence of regulatory context and counterfactual assumptions on achievement of no net loss. *Biological Conservation* **206**, 314-319. doi: 10.1016/j.biocon.2016.11.025.

Wilmott L, Cullen D, Madani G, Krogh M, and Madden K (2019) Are koalas detected more effectively by systematic spotlighting or diurnal searches? *Australian Mammalogy* **41**, 157-160. doi: 10.1071/AM18006.

Witt RR, Beranek CT, Howell LG, Ryan SA, Clulow J, Jordan NR, Denholm B, and Roff A (2020) Real-time drone derived thermal imagery outperforms traditional survey methods for an arboreal forest mammal. *PLoS One* **15**, e0242204. doi: 10.1371/journal.pone.0242204.

Appendix 1

Associate Professor Mathew Samuel Crowther

School of Life and Environmental Sciences

Heydon-Laurence Building - A08

University of Sydney NSW 2006

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SUMMARY

I have an extensive background in wildlife ecology evolution and management with over 20 years teaching, research and field survey experience. I have conducted research and field studies on terrestrial wildlife both throughout Australia and internationally. The habitats ranged from tropical islands and savanna to temperate forests and sandy deserts, often in remote areas. I have a comprehensive knowledge of and experience with the identification, taxonomy, distribution, habitat and ecology of terrestrial vertebrate fauna. I am an acknowledged expert in mammals, and I have discovered and described two species and one subspecies. I am now on the leading experts in Koalas, being on many committees. My latest research is mainly on koalas, dingoes and rodents. I am also working on the chemical mechanisms of fear of cats by rodents. Recently I have branched into using the same approaches in animal performance to sports science.

I have a PhD in the ecology and evolution of *Antechinus* in eastern Australia (particularly in northern NSW) from the University in Sydney and a BSc (Hons) from UNSW. I have lectured in zoology, ecology, statistics, wildlife management and environmental impact assessment at the University of Sydney for 15 years, as well as being a Project Officer in Koala Survey at the NSW Department of Environment, Climate Change and Water for 3 years. Hence, I have a broad background in the wildlife management and conservation from the survey and research level through to the policy and legislative level. I have an extensive publication record and have authored or co-authored over 130 publications in various aspects of wildlife biology (h-index 34, 3909 citations), and have held two ARC grants as CI. I regularly comment on plans for government and private consultancies, and I have also worked internationally as a consultant in the Environmental Impact Assessment industry, including an assessment of a gas pipeline in PNG.

I have expertise in numerous areas of wildlife survey and management, including geographical information systems, high-level environmental statistical analysis, report writing, and trapping, tracking and identification of Australian wildlife.

ACADEMIC QUALIFICATIONS

Qualifications

B.Sc. (Hons) majoring in Zoology	University of New South Wales, Sydney NSW	1992-1995
Ph.D.	University of Sydney, Sydney NSW	1997-2001

PROFESSIONAL EXPERIENCE

Employment History

Expert Witness Report of Associate Professor Mathew Crowther

Associate Professor <i>University of Sydney</i>	2016-
Senior Lecturer <i>University of Sydney</i>	2013-2015
Environmental Consultant for Liquid Gas Nuigini for gas pipeline, Gulf Province, PNG <i>WorleyParsons Pty Ltd, Brisbane Qld</i>	2008
Project Officer (Koala Survey) <i>NSW Department of Environmental & Climate Change, Hurstville, NSW</i>	2006 – 2009
Lecturer in Vertebrate Biology & Wildlife Management <i>University of Sydney, Sydney, NSW</i>	2002 – 2012
Part-time Lecturer in Wildlife Health and Population Management Units <i>University of Sydney, NSW</i>	2001
Research Associate: Morphological and functional plasticity in the Australian populations of the house mouse, <i>Mus musculus domesticus</i> <i>University of Sydney, NSW</i>	1999-2001

Service experiences and achievements

Conference Organisation <i>Australian Mammal Society, University of Sydney, NSW</i>	2004, 2019
Expert committee member: National Koala Disease Risk Analysis <i>Department of Agriculture, Water and the Environment</i>	2021
Expert Advisor Koala Road Strike Options for Engineering Solutions <i>KBR and Port Macquarie Hastings Council</i>	2021-2022
Expert Committee Member: Provision advice regarding the protection of koala populations associated with the Cumberland Plain Conservation Plan <i>Office of the Chief Scientist and Engineer</i>	2021
Expert Witness Kings Hill Development koala project <i>APP Corporation Pty Limited and Colin Biggers & Paisley Pty Ltd</i>	2022-

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Expert Committee Member: Provision advice regarding the protection of koala populations associated with changes in Private Native Forestry <i>Office of the Chief Scientist and Engineer</i>	2021
Expert Witness <i>NSW Senate Inquiry into Koala Habitats and Populations NSW (Sydney and Gunnedah)</i>	2019
Expert Witness into Illegal Forestry Activity <i>Environmental Protection Agency NSW</i>	2020-2022
Reviewer of Shenhua Watermark Koala Plan of Management <i>Endeavor Veterinary Ecology and GreenCap</i>	2019-2020
External Committee Member for Saving our Species for Koalas <i>Office of Environment & Heritage NSW</i>	2014-
Expert Witness for illegal land clearing <i>Office of Environment & Heritage NSW</i>	2016
Expert Consultant on koala ecology for urban development <i>Cumberland Ecology, Sydney Australia</i>	2013-2014, 2017
Temporary Fencing on Appin Road: Costs and benefits for koalas <i>NSW Office of Environment and Heritage</i>	2018
Reviewer of NSW State of the Environment <i>Environmental Protection Agency NSW</i>	2012,2015,2018,2021
Nominated member of the IUCN Species Survival Commission Group on Australasian Monotremes and Marsupials	2001, 2018-
Editor PLoS ONE	2014-
Reviewed the monitoring program for horse riding in wilderness areas of National Parks <i>Office of Environment and Heritage</i>	2015-
Reviewer for ARC Discovery, Linkage and DECRA	2014-
Member of the ERA committee, and coordinator for code 0608 (Zoology)	2015, 2017
Editor Oecologia	2018-
Editor Frontiers in Ecology and Evolution	2018-
Expert Panel member for Koala Habitat Mapping, Koala Research Priorities and Koala Translocation	2019-2021

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NSW Department of Planning, Industry and Environment

Category B Member of the University of Sydney Animal Ethics Committee 2022

University of Sydney Animal Ethics Committee

Additional member promotions for Levels C and D 2022

Students supervised

Supervised/mentored students at M.Appl.Sc. (15), Honours(22) and PhD levels (8)

Field Experience

Extensive fieldwork experience Northern New South Wales, south-western Queensland,
National southern highlands of New South Wales, Barrington Tops,
the Warrumbungles, central and far-western New South
Wales, Northern Queensland, top-end Northern Territory.

Extensive fieldwork experience: Brazil, Papua New Guinea, Southern Africa, Switzerland
International and New Caledonia

Journal Refereeing

Since 2008, I have refereed 165 manuscripts for 41 journals. Journals refereed include: Ecological Monographs, Biology Letters, Journal of Animal Ecology, Journal of Applied Ecology, Behaviour, Behavioral Ecology and Sociobiology, Biological Journal of the Linnaean Society, Oikos, PLoS ONE, Landscape Ecology, Diversity and Distributions, Journal of Biogeography, Biological Conservation, Conservation Letters, Journal of Mammalogy, Mammalia, ZooTaxa, Ecosphere, Pest Management Science, Animals, Austral Ecology, Australian Journal of Zoology, Wildlife Research, Australian Mammalogy, Australian Zoologist, Records of the Western Australian Museum, Memoirs of the Queensland Museum.

Subjects Taught

Subjects at undergraduate level include BIOL2021 Zoology, Vertebrates and their Origins, Biology of Terrestrial Vertebrates, BIOL3007 Ecology, Ecological Methods, ENVI3112 Environmental Assessment, Introduction to Tropical Wildlife Biology, Tropical Wildlife Biology and Management, Veterinary Conservation Biology, BIOL2022 Biology Experimental Design and Analysis, ENVX2001 Applied Statistical Analysis, Saving Koalas (Interdisciplinary subject), Living Systems and Concepts in Biology.

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Subjects taught at Postgraduate level as part of the Wildlife Health and Population Management Course include *In situ* Wildlife Management, Introduction to Australasian Wildlife, Vertebrate Pest Control, Sustainable Use and Stewardship of Wildlife, and *Ex situ* Wildlife Management.

Subjects in the Open Learning Environment: R for beginners, OLET5610 Multivariate Data Analysis

Non-degree coursework for staff and students: Animal Ethics for Wildlife Biologists, R for biologists, ArcGIS for biologists

Subjects Coordinated

Unit Executive Officer for Biology of Terrestrial Vertebrates, Applied Ecology for Environmental Scientists and Environmental Assessment, Deputy Unit Executive Office for Tropical Wildlife Biology and Management and Ecology & Conservation, Course Coordinator for Wildlife Health & Population Management. Unit coordinator for BIOL2021 Zoology. Unit coordinator for BIOL3010 Tropical Wildlife Biology and . Unit coordinator for OLET5610 Multivariate Data Analysis

Other qualifications

Driver's Licence	Class 1A NSW Gold Licence
Certificate	4WD Safety Course
Certificate	Current St John's Applied First Aid and Remote Areas First Aid

PROFESSIONAL ACCOMPLISHMENTS

Grants and Awards Received

University of Sydney Postgraduate Travel Award	1998, 2000
Australian Museum Postgraduate Research Award	1997, 1999
University of Sydney Postgraduate Awards	1998
Australian Museum Collection Fellowship	1998
Ethel Mary Read Award of the Royal Zoological Society of NSW	1997, 1998
Joyce Vickery Award of the Linnean Society of NSW	1997, 1998
Bollinger award for the Best Student Presentation at the Australian Mammal Society Annual Meeting	1996

Expert Witness Report of Associate Professor Mathew Crowther

Pest Animal Control CRC Research Grant	2004
Crowther, M.S. Predation by Small Mammals on Invertebrates: Is Population Regulation Top Down or Bottom Up? <i>University of Sydney Sesqui R&D Grant</i> (\$20,000):	2005
Crowther, M.S. , Letnic, M., Fillios, M.A. A dingo for the Modern Age. <i>Australia & Pacific Science Foundation</i> (\$30,000):	2011
Crowther, M.S. , Lunney, D.H., Moore, B.D., McArthur, C.; Krockenberger, M.B., McAlpine, C.A.; Wilson, B.R. & Howes, M. Rehabilitating a changing landscape: using the latest advances in koala ecology to direct adaptive management. <i>ARC Linkage Grant</i> with Office of Environment and Heritage, and Shenhua Watermark as Linkage Partners (\$680,000).	2015
McGregor, I.S., Crowther, M.S. Connor, M. & Banister, S. (2016). Cracking the predator code: understanding the chemosensory detection of predator odours by rodents. <i>ARC Discovery</i> . (\$390,000)	2016
Crowther, M.S. , von Ogtrop, F., McBratney, A. OLE Education Grant for teaching Multivariate Data Analysis (\$12,000)	2016
Neilson, J., Crowther, M.S. Strategic Teaching Grant for International Field Course (\$15,000)	2017
Crowther, M.S. Review of Forestry Impacts on Koalas in NSW. <i>Natural Resources Commission</i> (\$20,000)	2018
Krockenberger, M.B., Timms, P. Quigley, B., Higgins, D.P., Wylie, C., Crowther, M.S. , McArthur, C. & Mella. V.S.A. Vaccination against chlamydiosis: An effective disease management tool in wild populations? <i>NSW Koala Research Strategy Grant</i> (\$363,208)	2020
Higgins, D.P., Krockenberger, M.B., Crowther, M.S. , McArthur, C. & Mella. V.S.A. Impacts and drivers of chlamydial disease in the koala: relationships between the host, pathogen and environment. <i>NSW Koala Research Strategy Grant</i> (\$113,080).	2020
Crowther, M.S. , Bedoya-Perez, M.A., McGregor, I.S. & Ward, M.P. Ecology of <i>Rattus norvegicus</i> . <i>City of Sydney Council Grant</i> (\$120,000)	2020
Fillios, M.A., Letnic, M., Crowther, M.S. , Cairns, K.M., Koungoulos, L. & Curry, M. Nature vs. Nurture: Evaluating physical and genetic variability in modern and pre-Contact dingoes. <i>Australia & Pacific Science Foundation</i> . (\$44,000).	2020
Wilson, R.S. , Crowther, M.S. Predicting the mortality risk of koalas moving on the ground. Queensland. <i>Community Sustainability Action grants - Round 4 - Koala Applied Research South East Queensland</i> , Queensland Government. (\$97,190).	2021-2023
Crowther, M.S. , Higgins, D.P. & Krockenberger, M.B. Preliminary feasibility assessment for koala translocation at three initial sites. NSW Department of Planning, Industry and Environment. <i>Koala Research Strategy Grant</i> . (\$250,000)	2021

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Crowther, M.S., van Ogtrop, F.. & Bishop, T.F. Air bears: Predicting koala habitat by combining leaf chemistry with hyperspectral imagery': SOLES Strategic Partnership Seeding grants (\$91,000) 2022-

Professional Memberships

Australian Mammal Society

Ecological Society of Australia

Royal Zoological Society of NSW

IUCN Australasian Monotremes and Marsupials Specialist Group

Koala Research Network

Journal Publications

Since 1998, I have published 130 peer-reviewed articles and book chapters and have presented 40 talks on my work at national and international conferences. I have 3909 citations to date; my *h*-index is 34, *i10* index is 85 and *m*-index is 1.4 (5.2 for last 5 years), placing me in the top 10% of researchers in wildlife management / terrestrial ecology. I also have 9 publications that are citation classics (>100 citations). SJR is the Scimago Journal Rank, Q is the quartile for the subject category and IF are Impact Factors.

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Van Dyck, S. & **Crowther, M.S.** (2000). Reassessment of northern representatives of the *Antechinus stuartii* complex (Marsupialia: Dasyuridae): *A. subtropicus* sp. nov. and *A. adustus* new status. *Mem. Qld Mus.* **45**:611-35. (SJR 0.17, Ecology Q4, IF = 0.31).

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Crowther, M.S., McAlpine, C.A., Lunney, D., Shannon, I. & Bryant J.V. (2009). Using broad-scale, community survey data to compare species conservation strategies across regions: a case study of the koala in adjacent catchments. *Ecol. Manag. Restor.* **10**:S88-S96. (SJR 0.47, Nature and Landscape Conservation Q2, IF = 2.211).

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Theses

Ph.D. USyd	Thesis title: Variation and Speciation in the <i>Antechinus stuartii</i> - <i>A. flavipes</i> complex (Marsupialia: Dasyuridae) in Eastern Australia	1997-2001
B.S.c. (Hons) UNSW	Thesis title: The effects of sympatry on the morphological variation on South-Eastern Australian <i>Antechinus</i> (Marsupialia: Dasyuridae)	1995

Media Publicity

Interviews for ABC TV, ABC 24, SBS TV, The Guardian, the Australian newspaper, The Sydney Morning Herald, The Age, The Daily Telegraph, Radio National, JJJ, ABC Sydney, ABC Canberra, ABC Regional Victoria, ABC Newcastle, BBC London, Le Monde, University of Sydney News, Inner West Courier, Namoi Valley Independent