NSW koala baseline survey summary report 2025

Department of Climate Change,
Energy, the Environment and Water

NSW GOVERNMENT

Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the Traditional Custodians of the lands where we work and live.

We pay our respects to Elders past, present and emerging.

This resource may contain images or names of deceased persons in photographs or historical content.

This document should be cited as: Gallahar N, Hope B, Webb E, Clements M and Grounds S (2025) *NSW koala baseline survey summary report 2025*, Department of Climate Change, Energy, the Environment and Water, Parramatta, NSW

Artist and designer Nikita Ridgeway from Aboriginal design agency Boss Lady Creative Designs created the People and Community symbol.

Cover photo: A fire-injured koala (*Phascolarctos cinereus*) released near Numeralla in the NSW Snowy Monaro region. Lucy Morrell/DCCEEW

Published by:
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ISBN 978-1-76186-082-9
EH 2025/0426 December 2025

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Key findings

The NSW koala baseline survey program is the most comprehensive statewide survey of koalas ever undertaken. It provides a new, scientifically rigorous understanding of where koalas are in New South Wales. Using cutting-edge technology, the NSW Department of Climate Change, Energy, the Environment and Water (the department) has systematically surveyed koalas (*Phascolarctos cinereus*) to model the distribution of koala occupancy (the likelihood of finding a koala) and koala abundance (the number of koalas per hectare) across the state.

The survey effort for the baseline program involved more than 6,500 kilometres of night-time drone flights and over 400,000 hours of acoustic recording during the koala breeding season. Over 1,000 sites across national parks, state forests, Aboriginal and private land have been surveyed using advanced survey methods to maximise survey effort and data quality. In addition, survey data from over 2,500 sites from other NSW Koala Strategy programs are used in the results and analyses.

The key results are:

- We estimate that there are 274,000 (231,000 to 320,000, 95% confidence interval) koalas in New South Wales.
- Koalas were detected by 1,179 of 2,979 (40%) passive acoustic recorders, and by 384 of 1,160 (33%) drone surveys.
- Koalas were detected non-uniformly across the study area. Some areas had notable presence of koalas (for example, North Coast, Greater Sydney, Byadbo Wilderness), while some areas had notable absences (for example, Far West, Pilliga and much of the South Coast).
- Maps of koala occupancy and abundance across New South Wales are presented at Figure 1 and Figure 2, respectively.

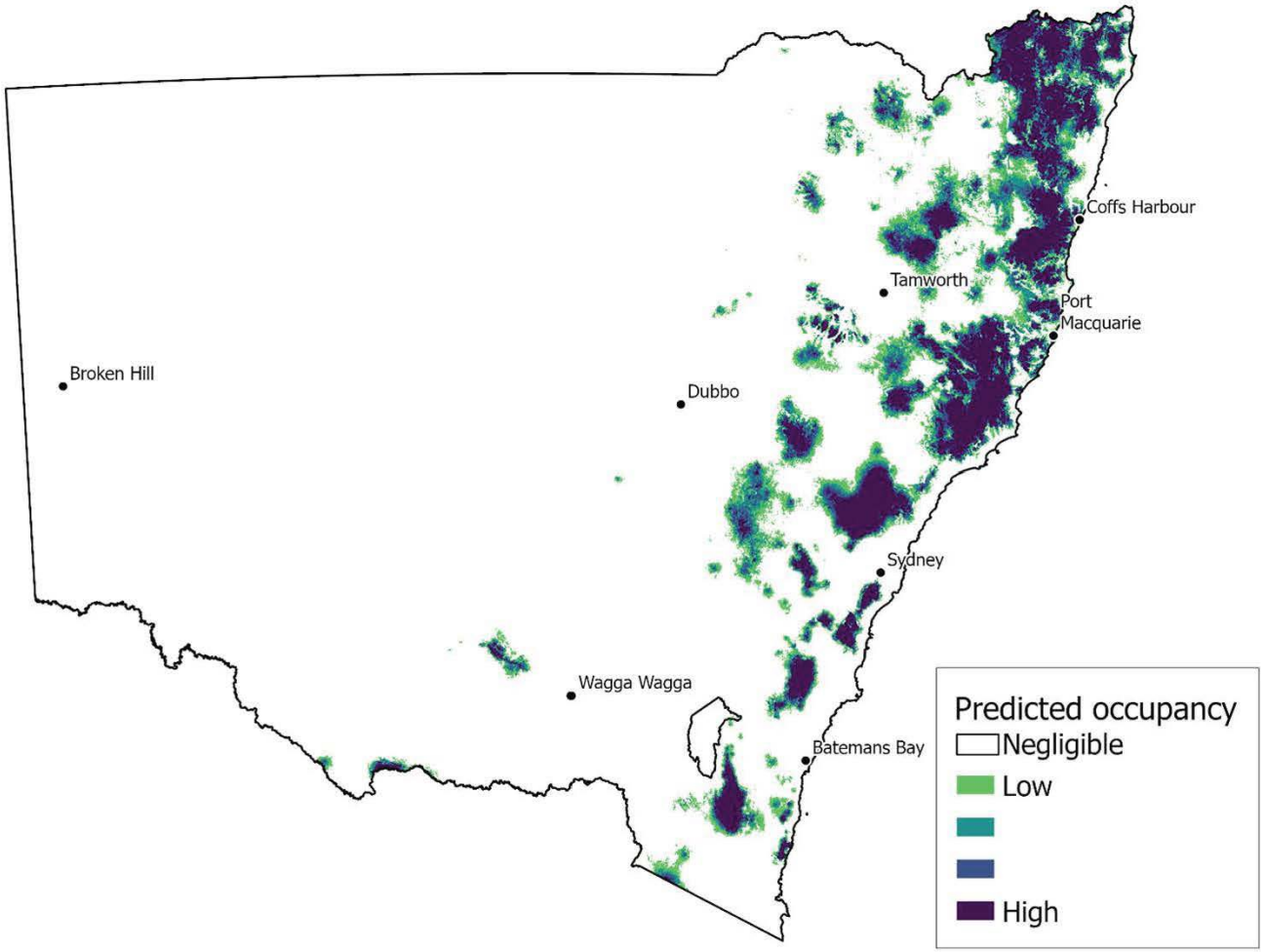

Figure 1 Koala occupancy (likelihood of finding a koala) modelled across the predicted range of koalas in New South Wales

Note: High values are shown in purple and blue, with low values in green.

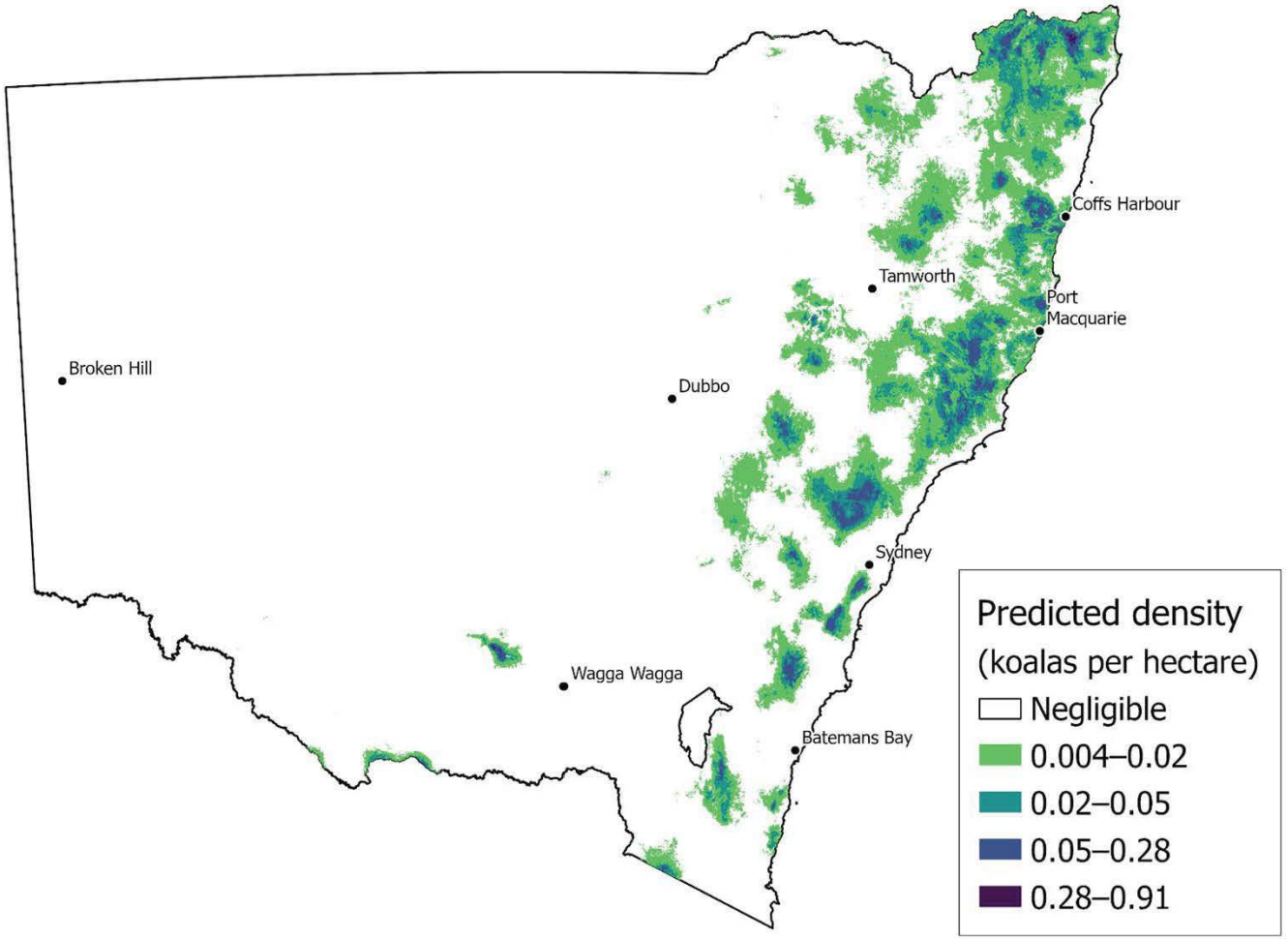

Figure 2 Koala abundance (number of koalas per hectare) modelled across the predicted range of the koala in New South Wales

Note: High values are shown in purple and blue, with low values in green.

Introduction

The koala is currently listed as endangered in New South Wales (NSW), and the combined koala populations of New South Wales, Queensland and the Australian Capital Territory are listed as endangered by the Australian Government. Koalas currently face an increasing and cumulative range of threats. At the state scale they are threatened by the effects of climate change (more frequent and intense fires, droughts and increasing temperatures), habitat degradation, disease and declining genetic diversity (McAlpine et al. 2015; Reckless et al. 2017; McLennan et al. 2025). Locally, they are impacted by vehicle strikes and domestic dog attacks (NSW Chief Scientist & Engineer 2016). Historically, koalas have faced significant decline since European settlement, due to habitat loss from urban development and agriculture, and an intensive hunting industry in Queensland and New South Wales between 1890 and the early 1900s when several million koala skins were exported (Phillips 1990). The 2020 inquiry into NSW koala populations and habitat concluded that, without action, koalas in New South Wales could be extinct by 2050 (NSW Parliament 2020).

NSW Government commitment

The NSW Koala Strategy was established to deliver targeted investment and action for koalas (DPE 2022). Under Pillar 4 'Building our knowledge of koalas', the department developed a baseline survey in 2022. The aim of this survey was to collect high-quality data about koalas across New South Wales using scientifically rigorous and innovative methods.

Purpose

This report provides a summary of the NSW koala baseline survey results. These results are a snapshot in time of koala occupancy, abundance, distribution and an estimate of the number of koalas in the state ('a population estimate'). This report outlines the specific objectives of the baseline survey, the scientific methods used, and how the outputs and knowledge has provided a solid foundation for koala conservation, management and monitoring in the future.

The *NSW koala baseline survey technical report 2025* (Gallahar et al. 2025) provides detailed information on the survey methods, modelling analyses and results.

Objectives

The objectives of the baseline survey were to:

1. estimate the distribution of koala occupancy and koala abundance using field-based surveys at a large and representative set of sites across the koala's potential range in New South Wales
2. calculate a population estimate of koalas in New South Wales.

Key terms

- **Occupancy** refers to the likelihood of a koala being in an area.
- **Abundance** refers to the estimated total number of koalas across the study area. In our modelled maps, this abundance is represented spatially as density, expressed as the estimated number of koalas per hectare.
- **Distribution** in this report refers to the spatial distribution of koala occupancy and abundance across the koala's potential range in New South Wales.
- The **population estimate** represents the estimated median number of koalas in New South Wales, with a range that we are 95% confident that the true number falls within (upper and lower limit).

Koala with joey, Heathcote National Park. Steve Anyon-Smith/DCCEEW

Methods

Study area

The study area covers the potential range of the koala in New South Wales and the Australian Capital Territory. The western boundary of the koala's current range is not accurately known, therefore, the study area has been extended further west than current koala records indicate. The study area includes multiple tenures, including public land (national park, state forest, other Crown, Water NSW land), Aboriginal land and private land (freehold or leasehold).

Survey design

A spatially balanced and cost-effective survey design was used to select baseline survey sites. The primary focus was to develop a robust sampling design based on expert understanding of where koalas have the potential to exist and persist, both now and into the future (their 'potential range').

Three key drivers of koala population density, identified through an expert workshop (see Foster et al. 2024), were incorporated into the survey design:

1. **presence of preferred food tree species**: at least one preferred food tree species present, as predicted by species distribution models
2. **climate**: extreme maximum summer temperatures that may constrain the distribution of koalas
3. **soil moisture**: a proxy for environmental productivity, which incorporates precipitation, evaporation and soil moisture retention properties.

These drivers were combined to produce a map of the potential range of the koala from which baseline survey sites were selected.

Survey methods

Acoustic recorders and night-time drone flights were used for the baseline survey. These methods were informed by pilot studies undertaken at the start of the program (Beranek et al. 2024; Gillespie et al. 2025), which evaluated the effectiveness of different methods for surveying statewide koala occupancy and abundance.

For the baseline survey, acoustic recorders were used at 994 sites and night-time drone flights were used at 503 of these sites; with each site covering a 750 × 750 m (56 hectare) area. There were ~10 sites where only drone surveys were undertaken (due to acoustic recorder technical issues), resulting in a total of over 1,000 baseline survey sites.

At each site a single acoustic recorder was attached to a tree in the middle of the site and was set to record through the night for 2 weeks during the koala breeding season (September to December). Recordings of male koala bellows were then analysed to identify sites where koalas were present or absent. Acoustic recorders perform well for

assessing koala occupancy, achieving high detection and avoiding false absences (Gillespie et al. 2025). Night-time drones used a thermal camera to detect koalas, with a spotlight used to confirm the identification if necessary (Figure 3).

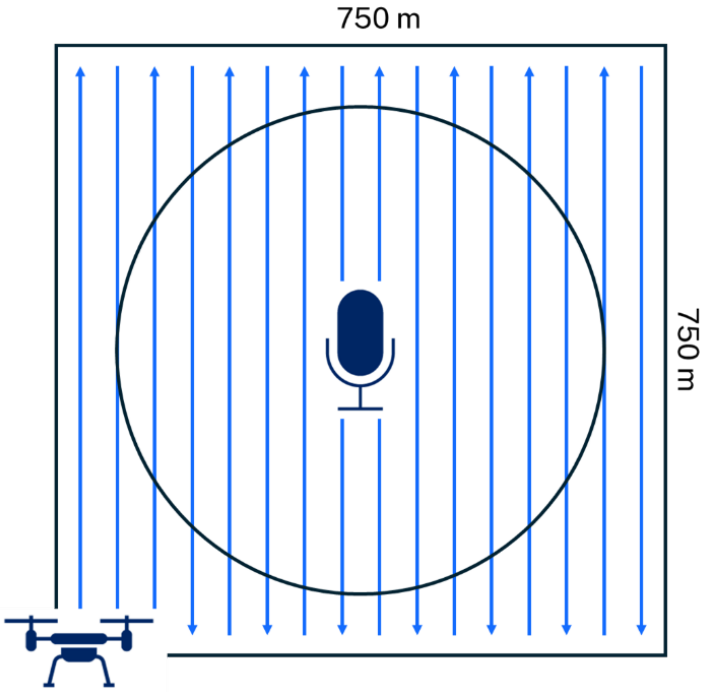

Figure 3 **Diagram of site sampling design, indicating the position of the acoustic recorder in the centre of the site, the nocturnal drone surveys (blue lines) and the radius of call detection (black circle)**

Modelling

A key objective of the baseline was to model koala occupancy and abundance across the species range in New South Wales. Modelling serves 2 main functions: it provides a map indicating where koalas are predicted to occur; and it helps us to better understand how environmental factors influence the distribution and abundance of koalas across the state.

Two mathematical models were used to interpret the raw survey results. A spatial single-species occupancy model determined where koalas are likely to be found. This model takes into account imperfect detection (where a koala may be present at a site but not recorded). An integrated species distribution model combined acoustic and drone data to predict koala abundance across New South Wales. These predictions, along with habitat data, were used to calculate a modelled population estimate of the number of koalas in the state. A set of 62 environmental variables (including 60 covariates and 2 masks) were considered when undertaking the modelling, including temperature, wind, tree height, soil nitrogen and rainfall.

Standardised survey approaches enabled data from a number of koala programs to be used in the baseline analyses, increasing the precision of results. Survey data from over 3,500 sites were available for use in the modelling, including data from over 1,000

baseline survey sites as well as an additional 2,500 sites established under other NSW Koala Strategy survey programs (Table 1). Data quality control was applied to remove acoustic survey sites that did not fit data quality standards. For example, sites with daytime recordings, multiple song meters at a single site, inadequate survey effort, and sites located too close to one another were not included. Of the 3,028 acoustic survey sites available, 2,979 were used in the modelling.

Table 1 **Summary of passive acoustic recorder and drone surveys undertaken by various koala monitoring programs**

Survey	Acoustic surveys	Drone surveys
Baseline survey program	994	503
Priority population monitoring*	1,580	0
Mid North Coast assessment area (Jessop et al. 2025)*	0	336
Departmental regional delivery programs*	454	59
NSW National Parks and Wildlife Service*	0	262
Total	**3,028**	**1,160**

* = surveys undertaken by other programs with compatible data that were available for use in modelling.

Results

We estimate that there are 274,000 (median value) (231,000 to 320,000, 95% confidence interval) koalas in New South Wales.

Koalas were detected by passive acoustic recorders at 1,179 of the 2,979 (40%) sites and by drone flights at 384 of 1,160 (33%) sites used in the modelling. The total number of koala detections by drones was 1,306, with occupied 56-hectare sites having an average of 3.4 koala detections, ranging from 1 to 43.

The occupancy and abundance maps (Figures 1 and 2) depict the koala population in New South Wales in 2 different ways. Occupancy is the predicted likelihood of koala presence, while abundance is the predicted number of koalas in an area.

The occupancy model shows that at a state scale koalas are more likely to occupy areas with consistent temperatures, low windspeed (on yearly averages), shallower soils, and where trees are healthy and known feed trees are present.

The abundance model shows that at a state scale there are likely to be more koalas in areas with taller trees, where known feed trees are present and in areas with higher soil nitrogen. The model shows that there are likely to be fewer koalas in areas further from waterways (rivers, streams and ephemeral creeks) and in arid areas.

The distribution of koalas in New South Wales is concentrated along the coast and adjacent ranges, particularly in the north-east of the state. In inland areas, the distribution of koalas is more fragmented, linked to habitat islands in agricultural landscapes (Figure 1 and Figure 2).

Discussion

The baseline survey has enabled a precise abundance estimate of koalas in New South Wales through advanced survey methods and statewide survey coverage. This refined estimate can be used to track long-term population trends at the state scale.

A valuable outcome of the baseline program was the standardisation of advanced koala survey techniques across New South Wales, enabling other koala programs to use comparable, robust and scalable techniques. The uptake of these standard methods was high and, as a result, we were able to include additional high-quality data from other NSW Koala Strategy programs in our modelling to increase model precision.

The abundance and occupancy maps (Figure 1 and Figure 2) illustrate that koalas occur across New South Wales in patches constrained by suitable habitat and climate, and have a preference for wetter, fertile areas with a moderate climate and with preferred feed trees present. In areas where koalas are more likely to occur (higher predicted occupancy) there can be a wide range of predicted koala abundance. In areas of high occupancy, abundance can be used as a more sensitive indicator to monitor population trends (Falaschi et al. 2025). Occupancy can be a useful tool for determining the potential distribution of a population.

Conclusion

This report provides key information on koala occupancy, abundance and distribution across New South Wales. Ecological influences associated with koala abundance and distribution are described to assist in decision-making through spatial prioritisation.

Acknowledgements

We thank the NSW Department of Climate Change, Energy, the Environment and Water (the department) Science and Insights' Koala Science team for their resilience and enthusiasm in the field or office: Alex Faulkner, Alison Curtin, Brian Adam, Claire Gale, Dominika Guttenova, Graeme Gillespie, Ian Davidson, Lisa Metcalfe, Lucy Smith, Madison Casley, Mez Kocyigit, Nicola Fernandes, Robbie Birkett, Rukshana Sultana, Simone Grounds, Sophie Hall, Tim Jessop, Veronica Gama, Zoe Armstrong, Lucy Smith and Madison Casley.

We also thank the department's Spatial Insights and Customer Delivery team (Allen McIlwee, Michael Day, Rob Day) for their exceptional spatial skills. Officers who contributed to baseline via survey delivery, contributing field data, facilitated site access and strategic discussions on survey design include Billie Roberts, Brendan Taylor, Enhua Lee, Jess Bettanin, John Turbill, Kylie Madden, Lachlan Willmott, Margot Law, Sally Miller and Victoria Inman.

We acknowledge advice and support from different agencies: Wen-Hsi Yang, Scott Foster, Peter Caley, Andrew Hoskins (CSIRO); Brad Law, Leroy Gonsalves, Traecey Brassil (NSW Department of Primary Industries and Regional Development – Forest Science); Dave Ramsey (Victorian Department of Energy, Environment and Climate Action – Arthur Rylah Institute for Environmental Research); Adam Roff and Jared Wood (the department's Drone Hub); Mathew Crowther (University of Sydney); Ben Moore (University of Western Sydney); Brendan Wintle (University of Melbourne); Ryan Witt, Chad Beranek, Darren Southwell (University of Newcastle); Steven Phillips (Biolink) and for facilitating site access (Forestry Corporation NSW Chris Slade and National Parks and Wildlife Service Dave Kelly, Rachel Labador and Tim Johnson). We thank the ACT Government, specifically Environment, Planning & Sustainable Development Directorate and Parks ACT and their staff for advice and facilitating site access.

We give a big thanks for private landholders.

We thank the Traditional Owners of the lands we work on.

We thank Simone Grounds, Laura Babian and Jane DeGabriel for their guidance.

References

Beranek CT, Southwell D, Jessop TS, Hope B, Gama VF, Gallahar N, Webb E, Law B, McIlwee A, Wood J, Roff A and Gillespie G (2024) 'Comparing the cost-effectiveness of drones, camera trapping and passive acoustic recorders in detecting changes in koala occupancy', *Ecology and Evolution*, 14(7):1–14, doi:10.1002/ece3.11659.

DPE (NSW Department of Planning and Environment) (2022) 'NSW Koala Strategy: towards doubling the number of koalas in New South Wales by 2050', DPE, Sydney.

Falaschi M, Parrino EL, Manenti R and Ficetola GF (2025) 'Differences in estimates of extinction risk between occupancy and abundance data', *Conservation Biology*, 39:e70020, doi:10.1111/cobi.70020.

Foster SD, Lawrence E and Hoskins AJ (2024) 'Spatially clustered survey designs', *JABES*, 29:130–146, doi:10.1007/s13253-023-00562-1.

Gallahar N, Hope B, Webb E, Clements M and Grounds S (2025) 'NSW koala baseline survey technical report 2025', Department of Climate Change, Energy, the Environment and Water, NSW Government.

Gillespie GR, Gallahar N, McIlwee AP, Hope BD, Webb EB, Clements M, Gama VF, Casley M and Jessop TS (2025) 'Initial evaluation of a state-wide multi-method survey to estimate koala occupancy and abundance', *Ecological Indicators*, 176:113654, doi:10.1016/j.ecolind.2025.113654.

Jessop T, Gallahar N and Curtin A (2024) 'Koala survey of the Mid North Coast assessment area', Department of Climate Change, Energy, the Environment and Water, NSW Government.

McAlpine C, Lunney D, Melzer A, Menkhorst P, Phillips S, Phalen D, Ellis W, Foley W, Baxter G, de Villiers D, Kavanagh R, Adams-Hosking C, Todd C, Whisson D, Molsher R, Walter M, Lawler I and Close R (2015) 'Conserving koalas: a review of the contrasting regional trends, outlooks and policy challenges', *Biological Conservation*, 192: 226–236, doi:10.1016/j.biocon.2015.09.020.

McLennan EA, Wilmott L, Madden K, Belov K and Hogg CJ (2025) 'Low genetic diversity and high inbreeding in one of the last chlamydia-free strongholds for New South Wales koalas', *Conservation Genetics*, doi:10.1007/s10592-025-01682-6.

NSW Chief Scientist & Engineer (2016) 'Report of the Independent Review into the decline of koala populations in key areas of NSW', Chief Scientist & Engineer, Sydney.

NSW Parliament (2020) *Koala populations and habitat in New South Wales* [PDF 5.9MB], Portfolio Committee No. 7 – Planning and Environment, Legislative Council, NSW Government, Sydney.

Phillips B (1990) *Koalas: the little Australians we'd all hate to lose*, Australian Government Publishing Service.

Reckless HJ, Murray M and Crowther MS (2017) ‘A review of climatic change as a determinant of the viability of koala populations’, *Wildlife Research*, 44(7):458–470, doi:10.1071/WR16163.

More information

- NSW Koala Strategy
- Koala monitoring programs
- NSW koala baseline survey technical report 2025
- SEED Koala Data Hub