

Koala Karaoke

Cold Country Koala Karaoke Survey Report

Koala Habitat Recovery Project



Published by Local Land Services
Cold Country Koala Karaoke Survey Report 2021
First published November 2022
ISBN

More information

This document was prepared by Georgeanna Story and Kirrily Gould, Land Services Officers of South East Local Land Services as part of the Koala Habitat Recovery Project - Enhancing Koala Habitat.

This document should be cited as: Story G and Gould K 2022 Koala Karaoke: Cold Country Koalas Karaoke 2021 Survey Report, Koala Habitat Recovery Project. South East Local Land Services, NSW Department of Planning, Industry and Environment.
www.lls.nsw.gov.au

Acknowledgments

This project was funded through the Regional Fund for Wildlife and Habitat Bushfire - Enhancing Koala Habitat, South East NSW. Staff from South East Local Land Services and National Parks and Wildlife Service contributed to the fieldwork and landholder engagement for the survey. Advice on the survey design was provided by Margot Law of Wingecarribee Shire Council and Dr Brad Law of Department of Primary Industries.

Landholders were an integral part of this project and provided significant contribution to the survey program and koala conservation. Analysis of the bioacoustic recordings was undertaken by Dr Brad Law and Isobel Kerr from the NSW Forest Science, Department of Primary Industries.

© State of New South Wales through Local Land Services, 2022.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing November 2022. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of Local Land Services or the user's independent adviser.

Table of Contents

Project overview	1
Project area.....	1
Koala Karaoke Project Results	2
Monaro ARKS Results.....	4
Avonside Zone Results	5
Koalas and Vegetation.....	6
Discussion.....	8
References	9

Project overview

Koalas in the Cold Country areas of the Monaro have been subject to a number of challenges over the years. Bushfires have been a frequent threat and the most recent 2019/20 fires were the most extensive, with approximately 20% of the koala core habitat affected. Bushfires impact koalas on a number of fronts, from direct mortality to long lasting impacts on the vegetation [1, 2]. A reduction in feed trees and fragmentation of habitat suppress population recovery and changes in the leaf chemistry of preferred eucalypt species changes the quality of the habitat that remains [3]. A number of research programs are underway to help understand how the koalas react to these changes and what management we can undertake to help support and secure our koala populations (e.g. The Australian National University and University of Sunshine Coast).

Understanding where koalas are in our region is the first step to this management process [2]. Cold Country koalas have been surveyed periodically since 2011 by NSW NPWS, with the latest survey completed in the Numeralla area mid-2019 (NPWS personal communication). Koalas have been traditionally surveyed using a scat count technique called the Grid Based Spot Assessment Technique (RGSAT). This method uses a grid to pick survey sites, which then counts scats under trees at the site [4]. More recently koala surveys have employed bioacoustic survey techniques [5]. Throughout the breeding season, male koalas bellow to attract females and mark their territory. The bioacoustic survey exploits this behaviour and uses recording devices to detect koala presence. By deploying the recorders in a grid arrangement, the results can identify the occurrence of koalas in each area and has been able to provide information on koala abundance [6].

The South East Local Land Services Koala Habitat Recovery Project undertook a bioacoustic koala survey across the Monaro during the 2021 breeding season. The survey aimed to improve baseline knowledge of koala presence post-bushfire and work with landholders to help detect the presence of koalas on their property. The results of this survey will also help to direct priority areas for koala habitat protection and regeneration and identify where on-ground activities will best support koala populations.

Project area

The project surveyed two distinct areas within the Snowy-Monaro region (Figure 1). The first was within the area mapped as the Monaro Area of Regional Koala Significance (ARKS), which stretches from Kybeyan through Numeralla to the Tinderry. The second area was within the Avonside area, and included the forested areas between Berridale, Dalgety and Jindabyne. Both areas are known to support koala populations and mapped as supporting high quality koala habitat. Surveys were conducted over 7 nights between October – December 2021 using Song Meter Micro audio recorders. Recorders were deployed across an area in a 2km grid pattern, as close as logistically possible. Measurements of the surrounding vegetation and topography were also recorded [7]. Audio recordings were analysed by the NSW Primary Industries Forest Science Unit.

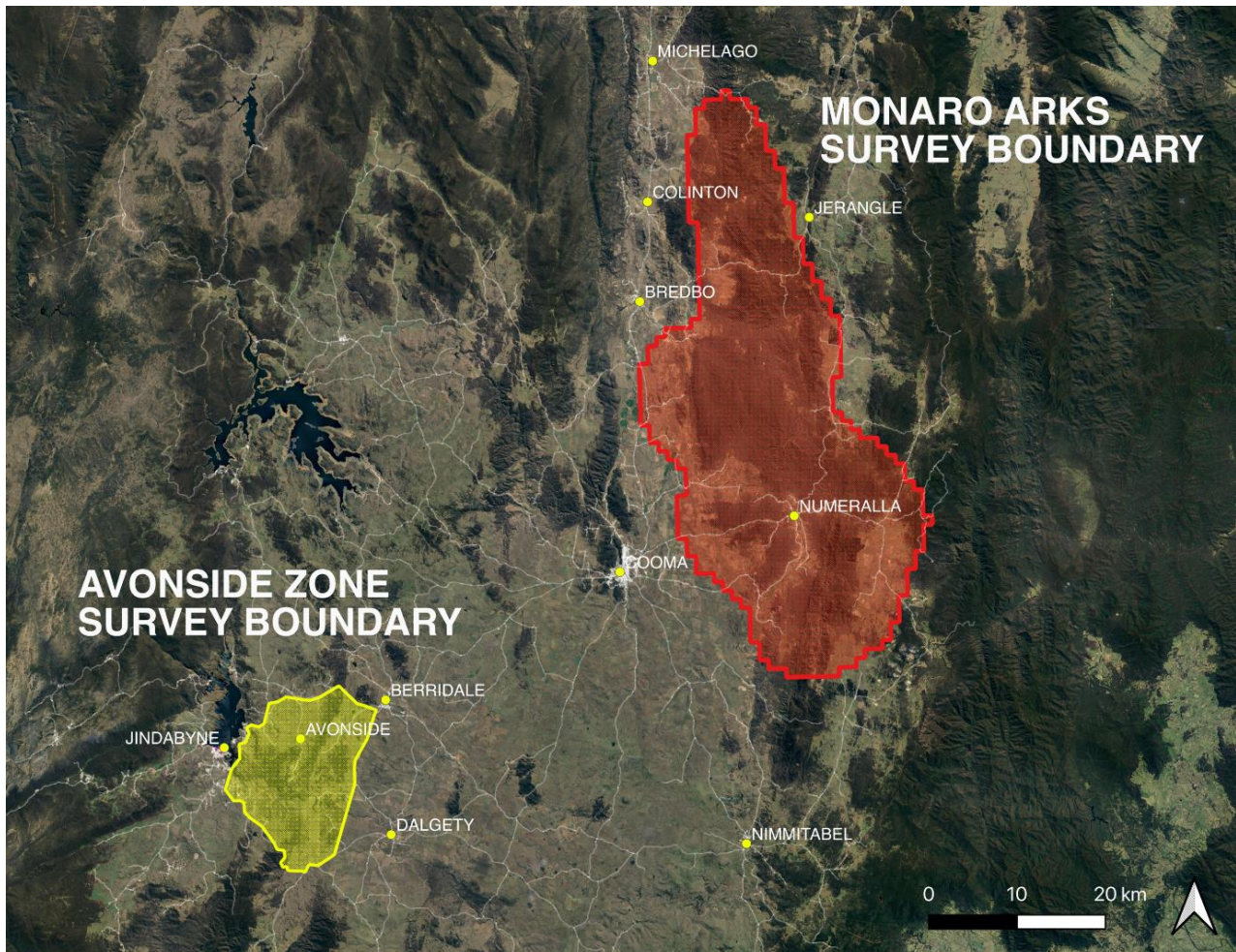


Figure 1. The areas of focus for the 2021 Koala Karaoke survey.

Koala Karaoke Project Results

Both survey areas recorded koala bellows however there were far more heard in the Monaro ARKS. In the 550 nights of recording data 431 calls were heard, compared with 3 calls in 175 nights across the Avonside Zone. As the survey technique aims to exploit the male koalas bellowing behaviour, it was expected that males were heard most often. We did however also detect females responding to male calls on 42 occasions. Calls were heard during all hours of the night but displayed a peak between 10pm and 4am (Figure 2)

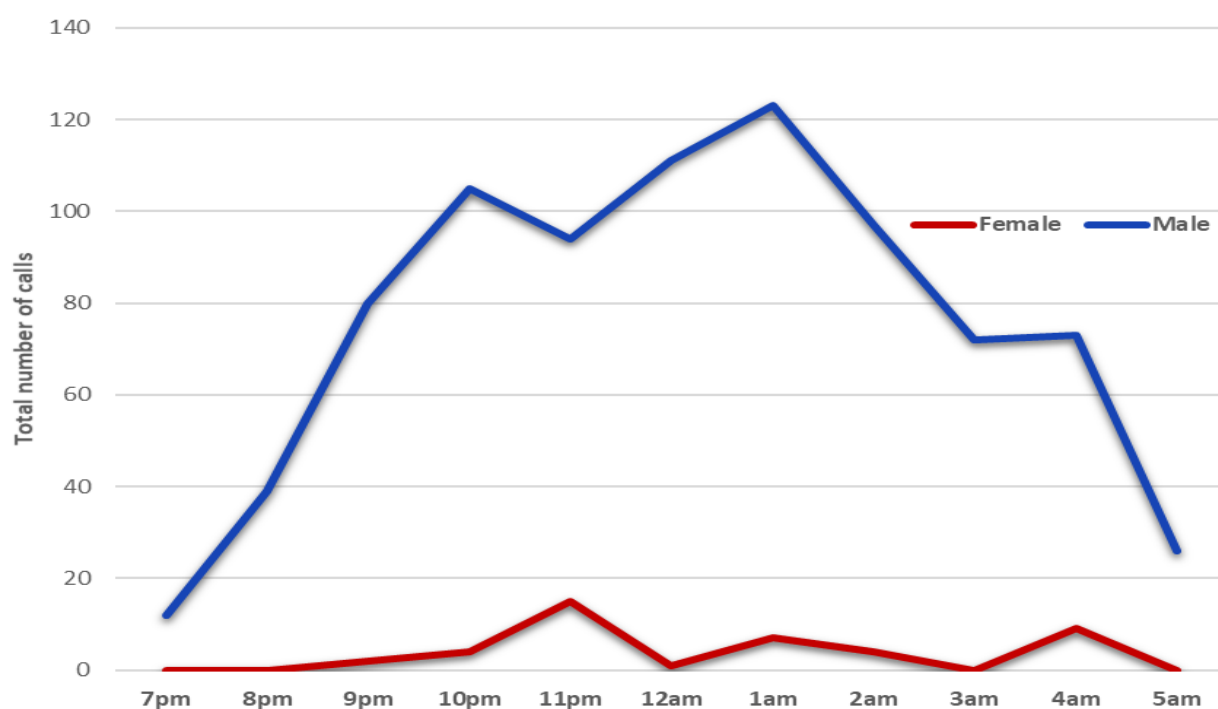


Figure 2. The timing of calls of males and females.

Other survey results varied between the two areas and are outlined below in Table 1. Koala presence was found to be much higher in the Monaro ARKS, with 56% of the recorders detecting koala calls. Some properties had multiple recorders deployed, so once this was accounted for we found that 63% of the properties surveyed had koalas present. Of the 39 private properties participating in the survey, over half of these detected koalas. There was only a single property in the Avonside Zone that recorded koalas.

Table 1. Survey results for the Monaro ARKS and Avonside Zone surveys

	Monaro ARKS	Avonside Zone
Number of recorders	79	25
Recorder activity	56%	4%
Number of participating properties	46	21
Property activity	63%	5%
Number of private : public properties	39:7	20:1
Activity of private : public properties	56%:100%	5%:0%

Monaro ARKS Results

There were 3 survey clusters across the Monaro ARKS, Numeralla, Jerangle and Tinderry. The map in Figure 3 highlights the survey area and koala detection success for each of the cluster areas. The Numeralla cluster recorded the greatest detection level, with 83% of recorders hearing koalas.

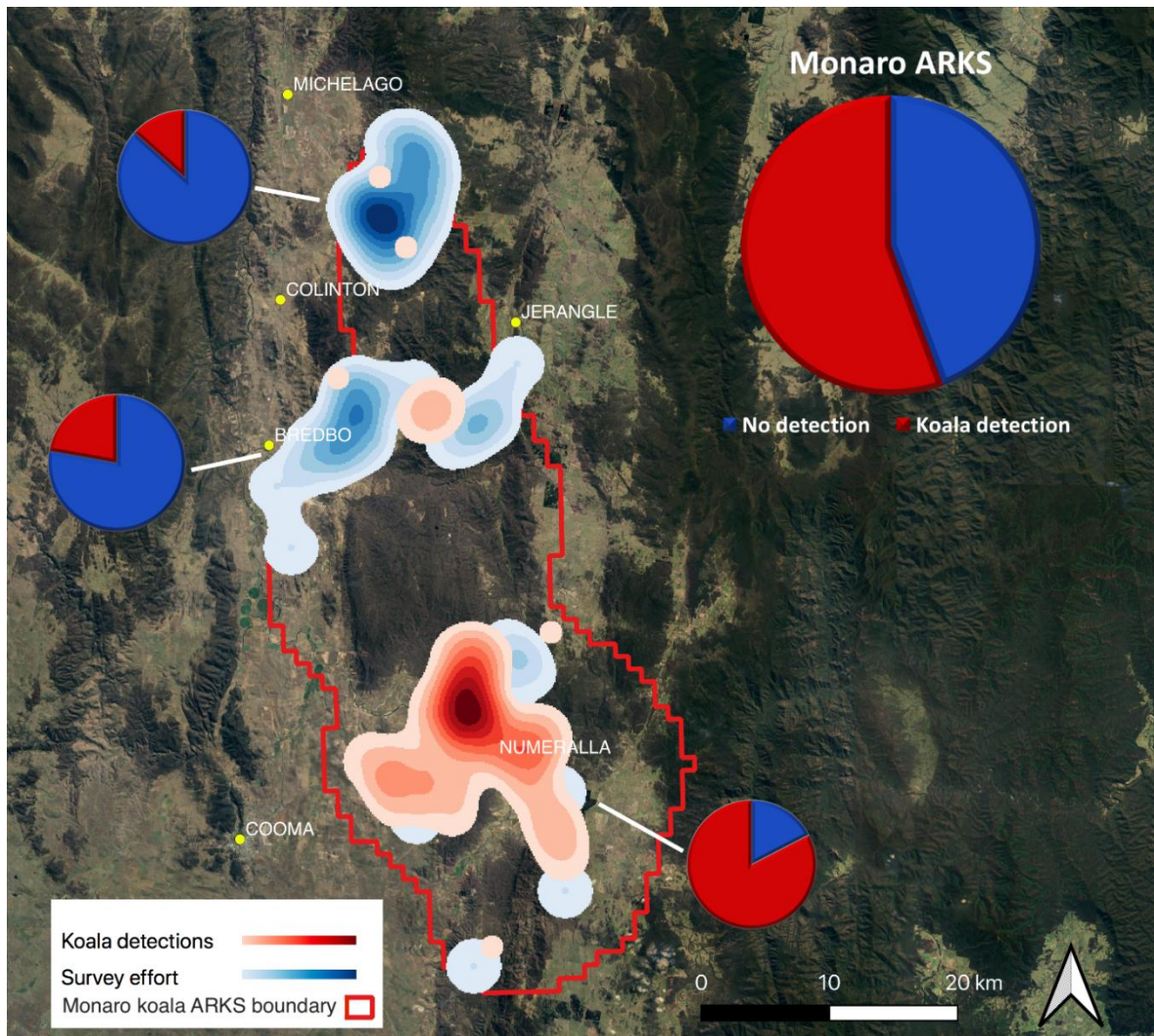


Figure 3. Survey effort and koala presence across the Monaro ARKS and the recorder activity for the region and each cluster.

The survey results for each cluster are listed in Table 2. The results highlight how important private landholders are for koala conservation right across the region.

Table 2. Survey details and results for the cluster areas within the Monaro ARKS.

	Numeralla	Jerangle	Tinderry
Approximate survey area	4,600ha	1,800ha	1,500ha
Number of recorders	46	18	15
Recorder activity	83%	22%	13%
Number of participating properties	27	13	6
Property activity	89%	23%	33%
Number of private : public properties	21:6	12:1	6:0
Activity of private : public properties	86%:100%	17%:100%	33%:0%

Avonside Zone Results

There was only the single koala detection in the north east section of the Avonside Zone (Figure 4), with a male koala calling 3 times on the one night. The low call detection is in line with the absence of other koala sign observed during the survey.

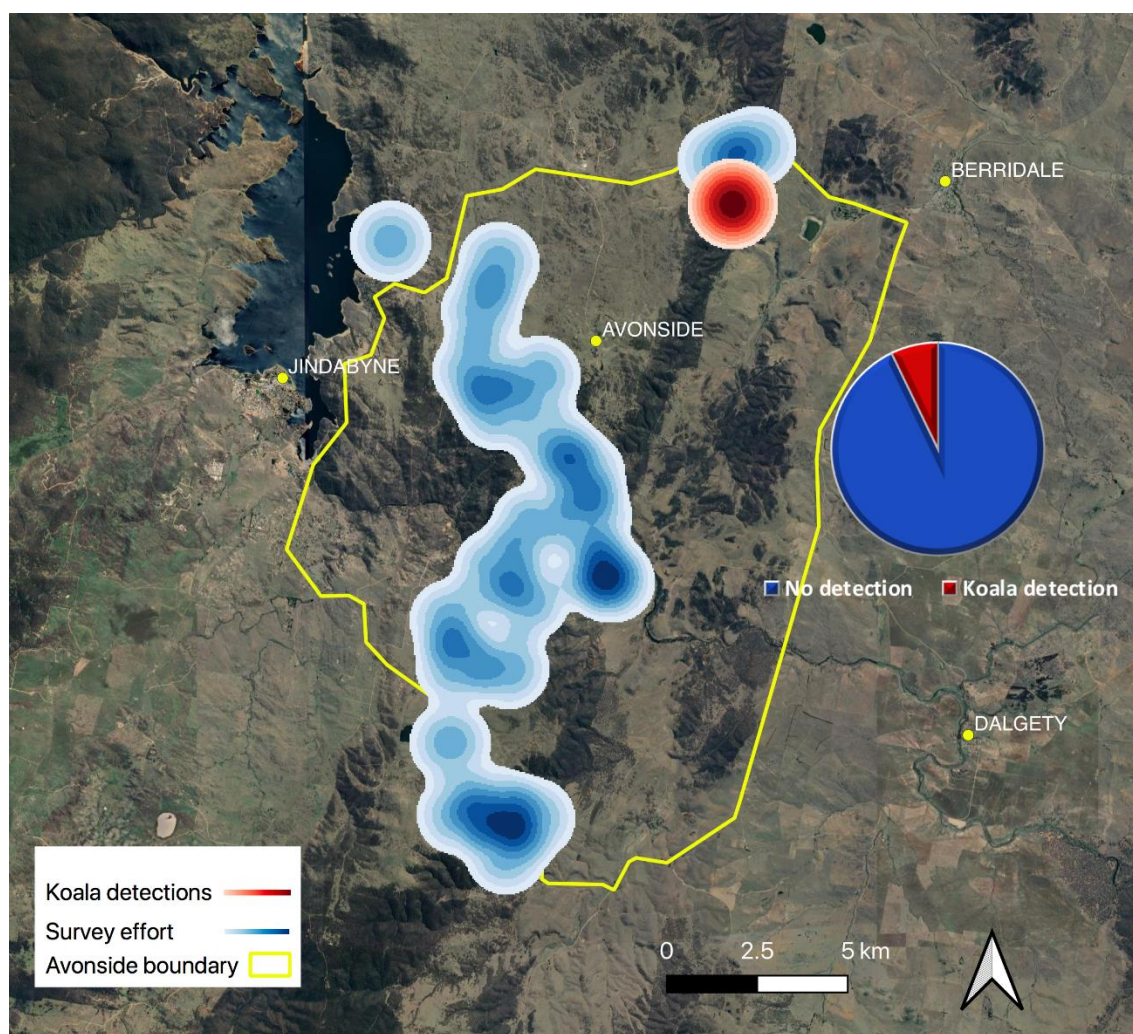


Figure 4. Survey effort, koala presence and recorder activity across the Avonside Zone.

Koalas and Vegetation

The specialised diet of koalas mean that the type and abundance of trees are important predictors of koala presence [8]. For each recorder, a number of vegetation characteristics were measured, such as tree species, canopy cover and regeneration state.

Several studies have examined the importance of different eucalyptus species as koala food [4, 9]. All have found that *Eucalyptus viminalis*, *E. mannifera* and *E. rossi* are important for the diet of koalas on the Monaro. This survey found a similar result, with a positive relationship between the percent of koala detections with increasing diversity of these 3 feed tree species (Figure 5).

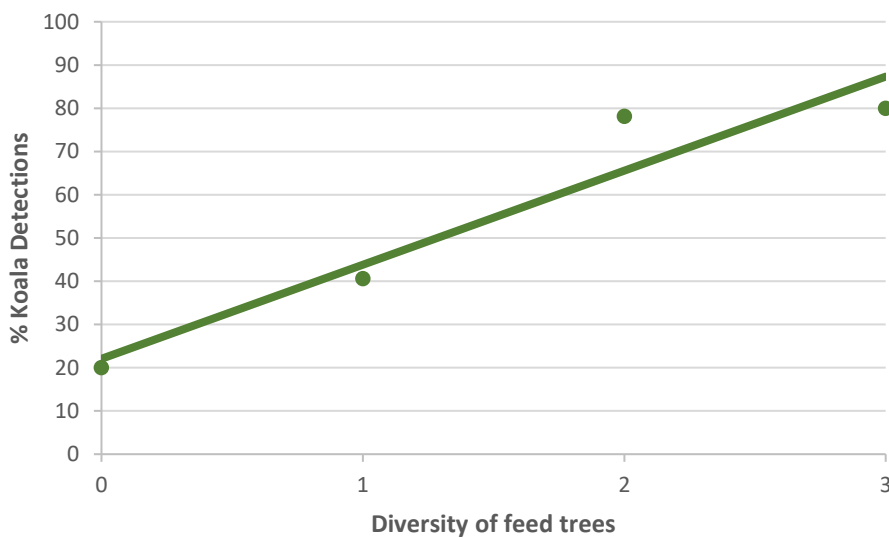


Figure 5 Percent of koala detections with increasing diversity of feed trees ($R^2= 0.91$).

Large mature gum trees are also thought to provide better food and habitat resources for koalas. This survey classified the vegetation as regenerating, mixed regeneration and mature vegetation. The results shown in Figure 6 support the importance of mature vegetation, with a significant relationship between the vegetation regeneration state and koala detection ($R^2= 0.96$)

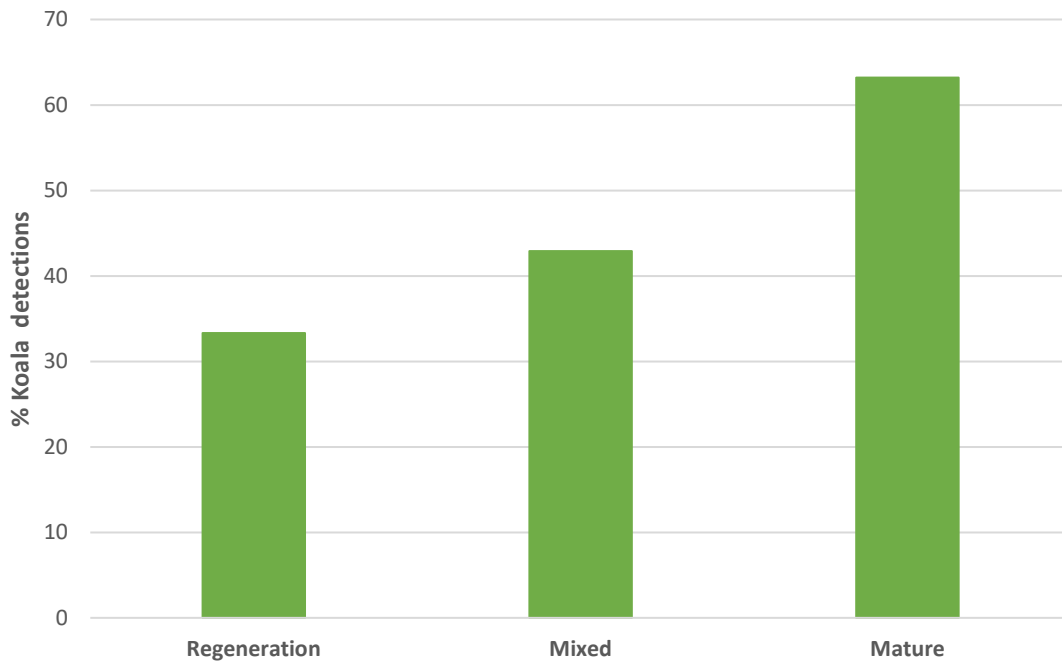


Figure 6. Percent of koala detections with increasing vegetation regeneration.

There are many factors that contribute to the regeneration state of vegetation. In the Monaro region, wildfire has had a major impact on the vegetation [4]. For this survey, the impact of fire was classed as recent, 10 years, 20 years and no fire impact. It was found that koala detections occurred in all time since fire categories but were more frequent in the areas that had a longer period since a wildfire (Figure 7).

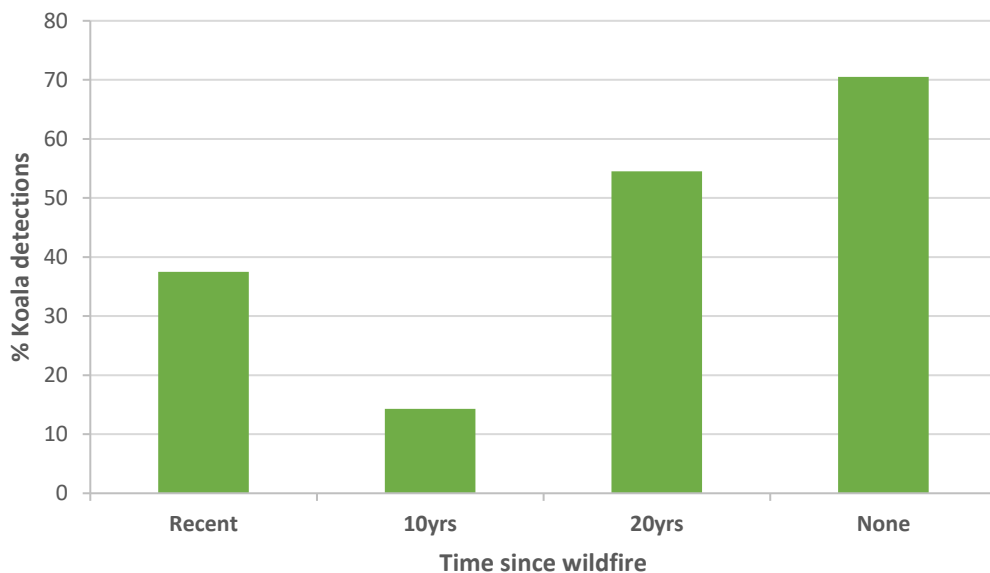


Figure 7. Percent of koala detections with increasing time since wildfire.

Discussion

The results from this koala survey has provided information on the distribution of koalas across the Monaro post 2019/20 bushfires. The results have shown that koalas continue to occupy areas right across the Monaro ARKS area and still persist in the Avonside Zone. There were stark differences in recorder activity between clusters within the Monaro ARKS, with the Numeralla area detecting substantially more koalas. These results mirror results of past surveys over the last decade. Koala detections have consistently been far more frequent in areas south of the Bredbo River, compared with those to the north [4, 10].

In comparison with other karaoke surveys, the 56% detection in the Monaro ARKS is higher than most. Surveys across the Wingecarribee, Glenn Innes & Tenterfield recorded 33%, 13% and 33% respectively. Of course, in sites with where no koalas were detected there may still have been koalas present, they were just not calling throughout the week of survey. Despite such limitations, this snapshot of koala occupancy will provide a baseline for future surveys to measure any occupancy changes. By following the set protocols of the Koala Karaoke program [7], detection probability is kept consistent and allows comparisons over time.

The influence of vegetation on koala presence followed similar patterns described for koalas across their distribution. Areas with a mature woodland, not recently subject to wildfire and containing a diversity of favoured feed trees tended to detect koalas more frequently. Mature trees are known to be more favoured by koalas, offering higher food resources and protection [8]. Removal of these trees by wildlife destroys this resource and it takes many years to recover [4]. Meanwhile, a diversity of feed trees buffers changes in leaf chemical composition, which can vary with tree age and climatic conditions [11]. Tree species diversity allows koalas to select leaves with suitable nutrition level across a greater range of conditions.

The Monaro ARKS is not new to wildfires, having had sections burnt by 6 wildfires since 1989 [4]. The 2019/20 bushfire were the most extensive [2], however results from this survey suggests that the koala population continues to persist right across the range. Whether areas burnt in the last fire will provide suitable habitat into the future is unknown. Studies elsewhere have quantified the persistence of koalas with different fire severity and the recovery of the vegetation since 2019/20 [12, 13], however no current assessments are available for the Monaro. Allen (2015) suggested that a previous fire in the Kybeyan area had not suitably recovered to serve as koala habitat more than 10 years after the blaze. Despite such loss of habitat however, a range expansion of 30% was recorded for koalas within the ARKS between 1998 and 2015. Unfortunately, this was not a pattern consistent across the Cooma-Monaro LGA, which recorded a 30% decline over the same period [9].

Wildfire has also impacted the Avonside Zone in 2003 and similar concerns were expressed about the quality and extent of remaining habitat. Small refuge areas in the eastern section allowed koalas to persist in the area, however from 2010 dieback started to impact the main koala feed tree of the area, the ribbon gum (*Eucalyptus viminalis*). A survey shortly after identified a dense but confined koala population and localised extinction was expected (Pam O'Brien, personal communication 2021). Despite this prediction recent sightings and the audio recorder detection confirm koalas still persist in the area, although in low numbers. Further work is required to understand whether koalas are still on a slow decline, or if numbers have stabilised.

The Monaro ARKS benefits from a much larger forested area than the Avonside Zone. The area includes approximately 150,000 ha of steep and rugged terrain [4]. As a consequence, the extent of land clearing is low, allowing large areas of habitat to remain after each wildlife event. With koalas now listed as an endangered species, caring for the remaining habitat is critical. Climate change induced variations in temperature, rainfall and CO₂ levels offer a challenge for koalas across their distribution [11]. The nutrient levels and water content of leaves are predicted to decline and incidence of dieback events increase [14]. Climatic modelling suggest that the Monaro ARKS will remain climatically suitable for koalas, while more northerly and western populations will struggle to survive [11].

Cold Country koalas are also special in their own right. These koalas have been found to be unique in that they chew the bark of particular trees which has not been detected in any other koala population. They are known to have done this for over 20 years across approximately 10,000ha of the Numeralla and Bredbo regions [4]. It is thought that this behaviour is to supplement their diet, increasing the intake in minerals, nutrients and/or moisture [15]. Brittle gums (*E. mannifera*) seem to be the favoured trees for this behaviour. Video of the footage of koalas chewing bark can be found here: <https://www.youtube.com/watch?v=U5wz7bEaDUM>.

The evidence from this survey has identified that the Monaro ARKS koala population have come through the 2019/20 fires in reasonable condition. While the survey results only provide information on occupancy levels and not density, the distribution of koalas are similar to that pre-fire. What this survey has also highlighted is that private landholders are critical for conservation of cold country koalas. Almost 90% of the land is privately owned and in the Monaro ARKS more than half of the surveyed private properties detected koalas.

The willingness of landholders to participate in this survey was exceptional and demonstrates the role that the community can have in species conservation. We thank all those landholders that participated in the survey and shared so freely their insights into koalas on their property.

Through the Cold Country Koala Karaoke survey and broader Koala Habitat Restoration Project, South East Local Land Services has highlighted the current status of koala populations in the region. The project has also supported the continuing protection and enhancement of koala habitat.

Continued support of landholders in this region will secure koala habitat and conservation of this unique species.

References

1. EPA, E.P.A., *Nature Conservation (Koala) Plan 2006 and Management Program 2006-2016*. 2006.
2. Cristescu, R.H., et al., *Difficulties of assessing the impacts of the 2019–2020 bushfires on koalas*. Austral Ecology, 2021.
3. Au, J., et al., *A nutritional mechanism underpinning folivore occurrence in disturbed forests*. Forest Ecology and Management, 2019. **453**: p. 117585.
4. Allen, C., *Towards a Comprehensive Koala Plan of Management for North East Monaro*. 2015.
5. Law, B.S., et al., *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, 2018. **13**(10): p. e0205075.
6. Law, B., et al., *A predictive habitat model for Koalas *Phascolarctos cinereus* in north-east New South Wales: Assessment and field validation*. 2017, NSW Department of Industry — Lands and Forestry: Paramatta.
7. South East Local Land Services, *Koala Karaoke Audio Monitoring procedures for Landholders*. 2021.

8. Callaghan, J., et al., *Ranking and mapping koala habitat quality for conservation planning on the basis of indirect evidence of tree-species use: a case study of Noosa Shire, south-eastern Queensland*. Wildlife Research, 2011. **38**: p. 89-102.
9. Cooma-Monaro Shire Council, *Cooma-Monaro Shire LGA Comprehensive Koala Plan of Management Draft*. 2015.
10. Allen, C., *Koala Surveys in the Southern Tablelands November 2010 - June 2011*. 2011.
11. Adams-Hosking, C., et al., *Modelling climate-change-induced shifts in the distribution of the koala*. Wildlife Research, 2011. **38**: p. 122-130.
12. Law, B.S., et al., *Fire severity and its local extent are key to assessing impacts of Australian mega-fires on koala (*Phascolarctos cinereus*) density*. Global Ecology and Biogeography, 2022. **31**(4): p. 714-726.
13. Phillips, S., K. Wallis, and A. Lane, *Quantifying the impacts of bushfire on populations of wild koalas (*Phascolarctos cinereus*): Insights from the 2019/20 fire season*. Ecological Management & Restoration, 2021. **22**(1): p. 80-88.
14. Adams-Hosking, C., et al., *Modelling changes in the distribution of the critical food resources of a specialised folivore in response to climate change*. Diversity and Distributions, 2012. **18**: p. 847-860.
15. Au, J., et al., *Bark chewing reveals a nutrient limitation of leaves for a specialist folivore*. Journal of Mammalogy, 2017. **98**(4): p. 1185-1192.