



Hanging in the balance: a review of Victorian koala populations, threats and management

 Desley A. Whisson^{A,*}  and Stacey E. Harwood^A 

For full list of author affiliations and declarations see end of paper

*Correspondence to:

 Desley A. Whisson
School of Life and Environmental Sciences,
Deakin University, Geelong, VIC, Australia
Email: desley.whisson@deakin.edu.au

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ABSTRACT

Koalas (*Phascolarctos cinereus* Goldfuss, 1817) in Victoria have a complex history of near-extirpation, reintroduction, and population recovery. Today, their abundance varies considerably throughout their Victorian range, with some regions supporting low-density populations and others having unsustainably high densities. Although considered relatively secure compared with northern populations, Victoria's koalas not only face the same threats, but also additional challenges associated with low genetic diversity, overabundance, and commercial blue gum (*Eucalyptus globulus*) plantations. Management actions to conserve low-density populations, improve genetic diversity, mitigate the ecological and poor welfare consequences of overabundance, and address welfare and landscape-scale issues associated with blue gum plantations are required. However, management is often reactive, constrained by limited funding, and hindered by public perceptions and misinformation propagated through news and social media. Here, we review the legacy of past management, the current distribution and abundance of koalas in Victoria, and key threats and challenges. We argue that effective future management requires population and disease monitoring, proactive strategies to prevent overabundance crises, habitat management, and transparent communication with the public to achieve balanced outcomes for koala welfare, populations and habitat.

Keywords: abundance, blue gum plantations, distribution, genetic diversity, management, *Phascolarctos cinereus*, public perception, southern koalas, threats.

The koala, *Phascolarctos cinereus*, is an arboreal folivore found in eucalypt forests and woodlands along the eastern seaboard of Australia and into the southern states of Victoria and South Australia. Widespread hunting of koalas for the fur trade in the early 1900s resulted in severe population declines across much of the species' range (Melzer *et al.* 2000). Although hunting ceased by the mid-20th Century, koalas continue to be threatened by ongoing habitat loss and degradation, disease, bushfires, droughts, heatwaves, vehicle collisions and dog attacks (McAlpine *et al.* 2015). Climate change further compounds these threats by reducing the extent of climatically suitable habitat, lowering the nutritional quality of foliage, and increasing the frequency and severity of fires, droughts and heatwaves (McAlpine *et al.* 2015).

In Queensland, New South Wales and the Australian Capital Territory, suspected population declines and range contractions led to the 2012 listing of these 'northern' koala populations as threatened under the *Environment Protection and Biodiversity Conservation Act* 1999 (Threatened Species Scientific Committee 2012). In 2022, following the Black Summer bushfires that burnt a considerable area of koala habitat, these populations were up-listed to Endangered (Department of Agriculture, Water and the Environment 2022). By contrast, koalas in Victoria are considered relatively stable (Department of Agriculture, Water and the Environment 2022). However, they remain poorly studied, with most research focussing on high-density populations and management methods (Whisson and Ashman 2020). Projected warmer and drier conditions will

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likely result in a significant eastward and southward contraction of the species' climate envelope (Adams-Hosking *et al.* 2011). Consequently, Victoria's koala populations may play an increasingly important role in the species' long-term conservation. A detailed understanding of their distribution and status, along with targeted actions to mitigate threats, is therefore critical for effective conservation of the species.

Legacies of the past

Once widespread throughout Victoria, koala populations were decimated by hunting for the fur trade and widespread land clearance (Menkhorst 2008). By the 1920s, koalas were thought to be nearly extinct in Victoria, with only a few remnant populations on the mainland, and populations on French Island and Phillip Island that were established from a small number of introduced koalas (Wedrowicz *et al.* 2017). These island populations later became the primary source of individuals to re-establish koalas across Victoria (Fig. 1). Menkhorst (2008) reports that from 1923 to 2006, ~24,600 koalas were translocated to more than 250 release sites in Victoria and South Australia. Although considered to be successful in recovering the species, this history of management has resulted in Victoria's koalas having low genetic diversity (Houlden *et al.* 1996; Taylor *et al.* 1997; McLennan *et al.* 2025). Even the remnant South Gippsland population (the 'Strzelecki koala'), which retains greater genetic diversity than populations derived from island founders

(Wedrowicz *et al.* 2018), shows signs of inbreeding and has lower heterozygosity than northern populations (McLennan *et al.* 2025). This raises concerns regarding the resilience of southern koalas to environmental change and disease.

The history of translocations also has led to the establishment of koala populations in areas where they previously did not occur, including islands and mainland sites with limited or no opportunities for dispersal (Menkhorst 2008). In some of these locations, populations occur at high densities that overbrowse preferred food trees. Without intervention, this can result in widespread defoliation and tree death, leading to nutritional stress or starvation of koalas, and ecosystem impacts (Whisson *et al.* 2016).

The distribution and abundance of Victoria's koalas

Several attempts to estimate the total population and distribution of koalas in Victoria have resulted in estimates ranging from 182,000 based on expert elicitation (Adams-Hosking *et al.* 2016) to 413,000 using survey data from multiple studies (Heard and Ramsey 2020). The latter figure is likely inflated due to a survey bias towards regions with high-density koala populations (Heard and Ramsey 2020). To obtain a more accurate estimate, statewide koala surveys using a robust experimental design were conducted in 2023 and 2024. A report detailing the findings is currently pending approval for release by the Department of Energy, Environment and Climate Action (DEECA) who funded the surveys.

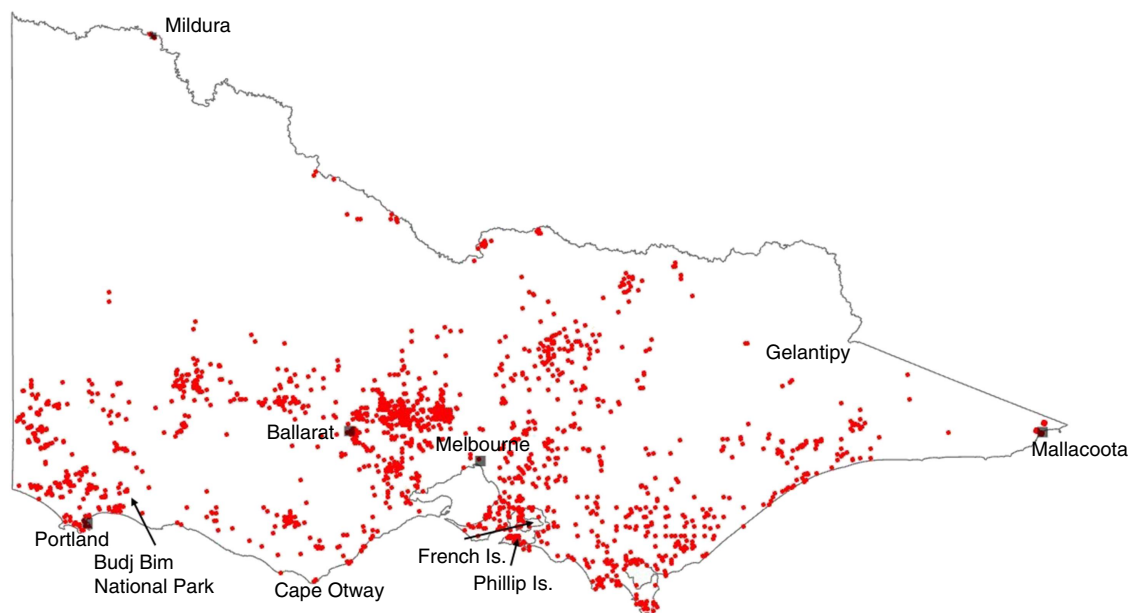


Fig. 1. In the 20th Century, thousands of koalas were translocated from French and Phillip Islands to multiple sites throughout Victoria to restore populations after hunting decimated the species. This map shows release sites (red points) and locations mentioned in the text (data source: Victorian Department of Environment, Land, Water and Planning 2024).

A large proportion of Victoria's koalas occur in the south-west, with reports of overabundance at multiple sites. Although there is a history of high-density populations in some native woodlands and forests of the far south-west (e.g. Budj Bim National Park), the establishment of ~80,000 ha of commercial blue gum plantations has allowed koala populations to increase and expand in the region (Ashman *et al.* 2020). By contrast, koalas occur at relatively low densities across most of Victoria (D. Whisson, unpubl. data).

Although statewide population estimates are valuable for guiding policy at a national scale, local and regional studies are more informative for understanding the drivers of koala distribution and abundance to guide local management (McAlpine *et al.* 2008). However, relatively few such studies have been conducted in Victoria, and longitudinal monitoring to assess population trends is rare. Monitoring is usually limited to locations where koala populations are actively managed (e.g. Budj Bim National Park), or where community groups are interested in the conservation of their local koala populations.

Published studies have identified key factors influencing koala presence and abundance in different regions. The presence of preferred tree species has been shown to be important in Ballarat (Januchowski *et al.* 2008), far south-west Victoria (Ashman *et al.* 2020), the Mornington Peninsula (Whisson *et al.* 2023) and South Gippsland (Harwood and Whisson 2025). Landscape context also plays a role, with koala occupancy of sites increasing with tree cover in the surrounding landscape (Ashman *et al.* 2020; Whisson *et al.* 2023). Soil fertility may further influence distribution but interacts with other site and landscape variables (Januchowski *et al.* 2008; Ashman *et al.* 2020; Harwood and Whisson 2025). For example, Januchowski *et al.* (2008) found that higher soil fertility combined with the presence of preferred food trees in fragmented peri-urban habitats was associated with a higher probability of koala presence than in contiguous forest.

Dynamic landscapes, complex threats

Victorian koalas face many of the same threats as their northern counterparts, including habitat loss, modification and degradation, bushfire, drought and heatwaves, disease, vehicle strikes, and dog attacks (McAlpine *et al.* 2015). In addition, Victorian koalas face challenges associated with low genetic diversity, overabundance, and welfare issues associated with the harvest of commercial blue gum plantations. Not only do these threats vary in significance across regions, but their interactions generate complex management challenges.

Low genetic diversity

Low genetic diversity can have profound consequences for a species, reducing adaptive potential, and increasing inbreeding

and the associated risk of inbreeding depression (Bijlsma and Loeschcke 2012). These effects limit a population's capacity to respond to change, making them highly susceptible to environmental threats and disease outbreaks (Frankham 2005). This is of particular concern for Victorian koalas that experienced a significant genetic bottleneck in the late 1800s. (Houlden *et al.* 1996; Seymour *et al.* 2001; Kjeldsen *et al.* 2019; McLennan *et al.* 2025).

Encouragingly, recent research suggests that Victorian koalas are showing signs of demographic recovery with an increasing effective population size (N_e) and the presence of functional genetic variation (Ahrens *et al.* 2025). Ahrens *et al.* (2025) observed an abundance of rare alleles, both in remnant populations and introduced populations that experienced rapid growth within a few decades. They suggested that this may provide a mechanism by which populations can 'escape' inbreeding, not by restoring ancestral diversity, but by generating new alleles, purging deleterious alleles, and increasing the efficiency of selection by recombination. Theoretically, these evolutionary processes could result in healthier populations with fewer deleterious alleles and a greater combination of novel genetic variation. However, Ahrens *et al.* (2025) also cautioned that this newly acquired diversity could be easily lost in a future bottleneck resulting from disease or other threats.

Genetic rescue should be considered to mitigate the negative effects of low genetic diversity (Lott *et al.* 2022; Clarke *et al.* 2024). Although there are concerns that genetic rescue could introduce maladaptive or deleterious alleles, these risks are likely outweighed by the benefits of increased genetic diversity (Gates *et al.* 2025). The source of koalas used for genetic rescue requires careful consideration guided by whole-genome data and simulation modelling (Lott *et al.* 2022; Gates *et al.* 2025). Based on evidence of historical interbreeding across biogeographic barriers, Lott *et al.* (2022) proposed using koalas from neighbouring genetic clusters as the most feasible and effective approach. In this context, individuals from the genetically distinct South Gippsland population or NSW may provide the most suitable source for genetic rescue efforts.

Disease

Multiple infectious and non-infectious diseases affect Victorian koalas, but their relative significance for individuals and populations remains poorly understood because of sampling bias and limited investigation of the complex relationships between koalas, disease agents, and environmental conditions that influence the clinical expression and outcomes of disease. Disease research in Victoria has primarily relied on samples collected from koalas captured during management programs (Patterson *et al.* 2015; Legione *et al.* 2016; Vaz *et al.* 2019), detection of infectious agents in faecal pellets (Wedrowicz *et al.* 2018; Kramer *et al.* 2025), and passive surveillance based on wildlife rehabilitator records (Schlagloth *et al.* 2021)

or necropsy examinations (Wilson *et al.* 2025). Samples from management programs bias our understanding of disease to overabundant populations, and non-invasive sampling does not provide insight into the prevalence and severity of clinical disease. Passive surveillance may overestimate the significance of trauma due to dog attacks or vehicular strikes.

Chlamydiosis, caused by infection with *Chlamydia pecorum*, has been the focus of considerable research yet its significance for Victorian koala populations remains unclear (Patterson *et al.* 2015; Legione *et al.* 2016). Although *C. pecorum* has been widely detected in mainland populations, its prevalence is highly variable and infection is not always associated with urogenital tract disease (Patterson *et al.* 2015; Legione *et al.* 2016). The occurrence of ‘wet bottom’ in koalas testing negative for *C. pecorum* suggests that there are other causes of urogenital tract disease in Victorian koalas that require investigation (Patterson *et al.* 2015; Legione *et al.* 2016). Recently, sarcoptic mange and oxalate nephrosis have been identified as important emerging diseases (Speight *et al.* 2017, 2020).

The welfare of Victorian koalas also may be affected by the expression of heritable conditions associated with low genetic diversity. Malocclusion, the misalignment or incorrect positioning of the teeth (Pettett *et al.* 2019, 2025; Butcher *et al.* 2020), is frequently observed in Victorian koalas (Whisson and Wicker, unpubl. data; Fig. 2). It can have significant welfare impacts resulting from impaired mastication of food and the potential development of severe periodontal disease (Pettett *et al.* 2019).



Fig. 2. Malocclusion (misalignment of the upper and lower teeth) can lead to significant dental problems. For this koala, malocclusion has resulted in asymmetrical wear and fracture of an incisor (photograph by L. Wicker).

High-density populations

At multiple locations in Victoria, koala populations occur at unsustainably high densities and are considered ‘overabundant’ (Whisson and Ashman 2020). The intense browsing pressure exerted by these populations on preferred food trees can cause widespread defoliation and tree mortality, leading to nutritional stress or starvation of koalas and long-term impacts on ecosystems and their ability to sustain koala populations into the future. For example, Whisson *et al.* (2016) documented densities of up to 23 koalas per hectare in manna gum (*Eucalyptus viminalis* Labill., 1806) woodlands at Cape Otway, prior to a population collapse due to mass starvation (Fig. 3a, b). In addition to the significant impacts on koala welfare, ~100 ha of manna gum woodland has now been completely lost, and remaining habitat is significantly degraded (Fig. 4).

Although lack of dispersal opportunity may be a contributing factor for overabundance on offshore islands or habitat islands on the mainland, the presence of preferred food trees, manna gum or swamp gum (*Eucalyptus ovata* Labill., 1806), and the behavioural and physiological factors of koalas likely play a role in most locations (Whisson and Ashman 2020). In far south-west Victoria, koala overabundance in remnant woodlands and in roadside vegetation is strongly linked to the presence of commercial blue gum plantations (Ashman *et al.* 2020).

Commercial blue gum plantations

Since the early 1990s, the area of commercial blue gum plantations has increased, particularly in far south-west Victoria (Gerrand *et al.* 2003). Koalas have benefitted from the establishment of plantations that provide habitat and preferred food resources in what was formerly a predominantly cleared agricultural landscape (Ashman *et al.* 2020). During harvest, plantation companies are required to search for koalas and when found, retain the tree in which the koala is sitting, along with the surrounding eight trees (The Conservation Regulator, Victoria 2023) (Fig. 4). Although this minimises a koala’s risk of injury or death during harvest (Hynes *et al.* 2021), koalas are cryptic and difficult to detect in mature plantations where trees may exceed 30 m in height. Consequently, not all koalas are detected.

Koalas that survive plantation harvest must either use the unharvested patches of trees or disperse to other suitable habitat. In a telemetry study, Hynes *et al.* (2021) found that 21% of koalas remained in small patches of harvested trees for up to 15 weeks after harvest, with the rest dispersing to neighbouring blue gum plantations. Although mortality was not recorded in the Hynes *et al.* (2021) study, dispersal can have considerable energetic costs and increases the risk of predation and vehicle strike. Where habitats already support high-density populations, dispersing koalas also can place

(a)



(b)



Fig. 3. (Caption on next page)

Fig. 3. The unsustainable browsing pressure of a high-density population of koalas at Cape Otway resulted in widespread defoliation of trees and the mass starvation of koalas in 2013. (a) Multiple koalas in one tree in September 2013; (b) Over 100 ha of manna gum woodland has been completely lost to overbrowsing (September 2025) (photographs by D. Whisson).



Fig. 4. A koala sitting in a tree on the edge of a blue gum (*Eucalyptus globulus*) plantation. When plantations are harvested, koalas either remain in small patches of retained trees in the coupe or disperse to adjacent habitat (photograph by D. Whisson).

additional stress on remnant trees and woodlands (Ashman *et al.* 2020; Hynes *et al.* 2021).

Management challenges

Effective management of koalas in Victoria is complicated by contrasting population densities and threats across the state, lack of adequate funding to support monitoring and

proactive management actions, and public perceptions. In areas where koala populations are already unsustainably high, management must focus on mitigating ecological impacts and addressing animal welfare concerns (Whisson and Ashman 2020). Conversely, in regions of low population densities, conservation actions are required to reduce risks from threats such as urbanisation, habitat loss and climate change. Action is also needed to address the effects of low genetic diversity.

The Victorian Koala Management Strategy

The Victorian Koala Management Strategy, first published in 2004 and revised in 2023 (Department of Energy, Environment and Climate Action 2023) provides a framework for addressing the diverse management challenges and knowledge gaps surrounding Victoria's koalas. It served as a catalyst for critical research into the distribution, abundance, genetics, and health of koalas in Victoria ('The Great Victorian Koala Survey' to inform management, see <https://www.ari.vic.gov.au/research/environmental-management/wildlife-management2/the-great-victorian-koala-survey>). However, actions to address the diversity of threats faced by koalas have often been constrained by limited funding and a lack of will and foresight to implement proactive management. In areas where overabundance occurs, early intervention is not only critical in preventing ecosystem damage and a koala welfare crisis, but also more cost-effective and humane. Once a crisis has developed, management options are limited to alleviating koala suffering.

Managing overabundance

Managing koala overabundance is challenging and costly, with methods limited to fertility control, translocation exclusion methods, and habitat management (Whisson and Ashman 2020). The effectiveness of these methods relies on proactive implementation guided by predictions of emerging issues. Fertility control is slow acting, requiring 5–10 years to achieve a positive habitat response (Todd *et al.* 2008; Ramsey *et al.* 2021). Although translocation can immediately reduce koala densities at a site, its use is constrained by the availability of suitable release sites (Menkhorst 2017) and carries considerable risks. These include the potential spread of infectious disease, overbrowsing at release sites, and welfare impacts on translocated individuals. Translocated koalas often travel long distances from release sites, exposing them to risks of vehicle strike, predation and unsuitable habitat (Whisson *et al.* 2012). Survival of translocated koalas is highly variable, depending on the health of individuals, and the habitat and weather conditions at the release site (Menkhorst 2017).

Where overabundance occurs, ongoing management is usually required due to the geographic scale and size of the koala population, and immigration of koalas into treated areas (Todd *et al.* 2008). A long-term management program in Budj Bim National Park was initially successful in reducing koala densities and overbrowsing, but immigration of koalas from commercial blue gum plantations surrounding the park is now limiting the long-term effectiveness of the program.

Balancing emotion and evidence in management

Public perceptions of the status and threats faced by southern koalas play a strong role in influencing management decisions, yet they often diverge from ecological reality. This can make it challenging to implement effective, science-based

management strategies (Drijfhout *et al.* 2022). Management actions such as fertility control, translocation and euthanasia are often controversial but may be critical for mitigating the impacts of high-density populations or alleviating animal suffering.

Media portrayals of issues and management amplify these challenges. Scientific rationales for management actions are typically oversimplified or misrepresented, with emotive headlines like 'koala culling', 'koala crisis' or 'koala slaughter'. Such framing reinforces misconceptions and can pressure managers to adopt visible, symbolic responses rather than evidence-based solutions, or to delay or even avoid taking action.

Transparent and empathetic communication by managers is critical but often inadequate or lacking. One recent example relates to the euthanasia of more than 1000 fire-affected koalas at Budj Bim in March 2025. Because the site was largely inaccessible on foot, a helicopter was used for aerial assessment and the shooting of suffering koalas. A public statement about the response was not issued until 9 May (see <https://www.wildlife.vic.gov.au/media-releases/wildlife-welfare-emergency-response-following-fire-at-budj-bim-national-park>). Limited engagement and transparency with the public and wildlife groups about the operation fuelled widespread misinformation and negative media. Scientists and managers must clearly articulate the ecological and welfare rationale for interventions. Ultimately, managing koalas is as much about social science, politics, and media, as it is about ecology. Public education, community engagement, and open dialogue are key to building trust and improving acceptance of management that prioritises both ecosystem health and animal welfare.

The future of Victorian koalas

Multiple actions are needed to secure the future of Victorian koalas, including genetic rescue, effective management of overabundance, and revegetation to improve connectivity and expand existing koala habitat. Revegetation should incorporate a diversity of canopy species that differ in palatability to koalas, and avoid creating monocultures that lead to unsustainable koala densities. Well-planned habitat restoration not only provides habitat for koalas but also benefits a wide range of other forest-dependent species, helping to restore ecosystem function and resilience.

Multiple initiatives are making significant contributions to koala habitat restoration across the state. For example, the Koala Clancy Foundation has planted more than 164,000 koala trees since 2016 and aims to reach 300,000 by 2030 (see <https://www.koalacancyfoundation.org.au/>). Their projects focus on creating climate-resilient forests in the You Yangs, Little River, Moorabool River, and Barwon River catchments. Similarly, Mornington Peninsula Koala Conservation (see <https://mpkoalas.org.au/>) has been

undertaking revegetation with the Mornington Peninsula Landcare Network, Parks Victoria, and private landholders to expand and connect koala habitat across the Mornington Peninsula. They also support ongoing systematic monitoring efforts that are being used to improve understanding of the koala population and to guide management (Whisson *et al.* 2023).

Conclusion

Victoria's koalas face complex and interacting threats that put their welfare, the ecosystems they rely on, and their populations at risk. Effective implementation of the Victorian Koala Management Strategy is essential to address these challenges and to respond to emerging issues. Crucial steps include population and disease monitoring to provide a strong scientific basis for decisions, proactive management to prevent overabundance, and actions to improve genetic diversity. Equally important is transparent, empathetic communication with the public to build trust and support for management. By acting now, Victoria can secure a future where koala populations are healthy, genetically resilient, and in balance with their habitats. Failure to act risks local extinctions of koalas, continued crises of overabundance, and loss of public trust.

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Author affiliation

^ASchool of Life and Environmental Sciences, Deakin University, Geelong, VIC, Australia.