



ACT
Government

Native Species Conservation Plan



Gula (Koala)
Phascolarctos cinereus



Acknowledgement of Country

We acknowledge the Ngunnawal people as traditional custodians of the land and recognise any other people or families with connection to the lands of the ACT and region. We wish to acknowledge and respect their continuing culture and the contribution they make to the life of this city and this region.

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Executive Summary

The Nggunawal people are the caretakers of Country and, as such, hold a deep connection to the Australian Capital Territory and surrounding regions. To the Nggunawal people, the presence of Gula (Koala; *Phascolarctos cinereus*) indicated healthy and thriving habitats (Dhawura Nggunawal Caring for Country Committee, pers comm). With the establishment of European settlement in the late 1800's, the Gula experienced significant declines in the ACT and surrounding regions, primarily due to hunting and land clearing by European settlers. More recently, the 2019-2020 bushfires impacted significant portions of habitat throughout parts of Queensland, New South Wales and the Australian Capital Territory. The decline of populations in NSW, QLD and the ACT, in addition to widespread destruction of habitat led to the Koala being listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. Given the current conservation status of the species nationally and locally, there is a need for Gula populations to be assessed across Nggunawal Country and for conservation plans to be enacted in the ACT. Critically, it is important that the role of Nggunawal people as carers of Gula on Country is supported.

The Draft Native Species Conservation Plan for the Gula (Koala) has been developed as per the *Nature Conservation Act 2014*. It supports delivery of the National Recovery Plan for the Koala *Phascolarctos cinereus* (Department of Agriculture Water and the Environment, 2022).

Working in collaboration with the Nggunawal Community for cultural knowledge and vision input the plan has six main objectives:

1. Establish a baseline monitoring project to identify sites with Gula presence in the ACT.
2. Assess quality, quantity and distribution of Gula habitat in the ACT, including linkages with habitat across the borders into NSW (i.e., encompassing Nggunawal Country).
3. Following habitat assessment, identify critical gaps for the management and conservation of key habitat refugia and any restoration opportunities.
4. Undertake a feasibility study into establishing a Gula captive breeding program at Tidbinbilla Nature Reserve that contributes to the recovery of wild populations of the species in ACT and across Nggunawal Country.
5. If viable, establish a conservation translocation and supplementation plan to release Gula across Nggunawal Country.
6. Engage strongly with community to promote collaborations, knowledge sharing, skill development and a greater overall interest in wildlife conservation, thus empowering the community to continue engaging in conservation activities beyond those in this plan.

A combination of scientific and traditional (Nggunawal) methods will be utilised to achieve these objectives. Scientific methods will focus on collecting and analysing data, whereas the traditional knowledge methods will centre around the Nggunawal Community sharing knowledge and reconnecting to Country. Both sources of information will be used to better inform the conservation outcomes of this plan. It is anticipated that a collaborative approach will ensure that thriving populations of Gula persist on Nggunawal Country.

Introduction

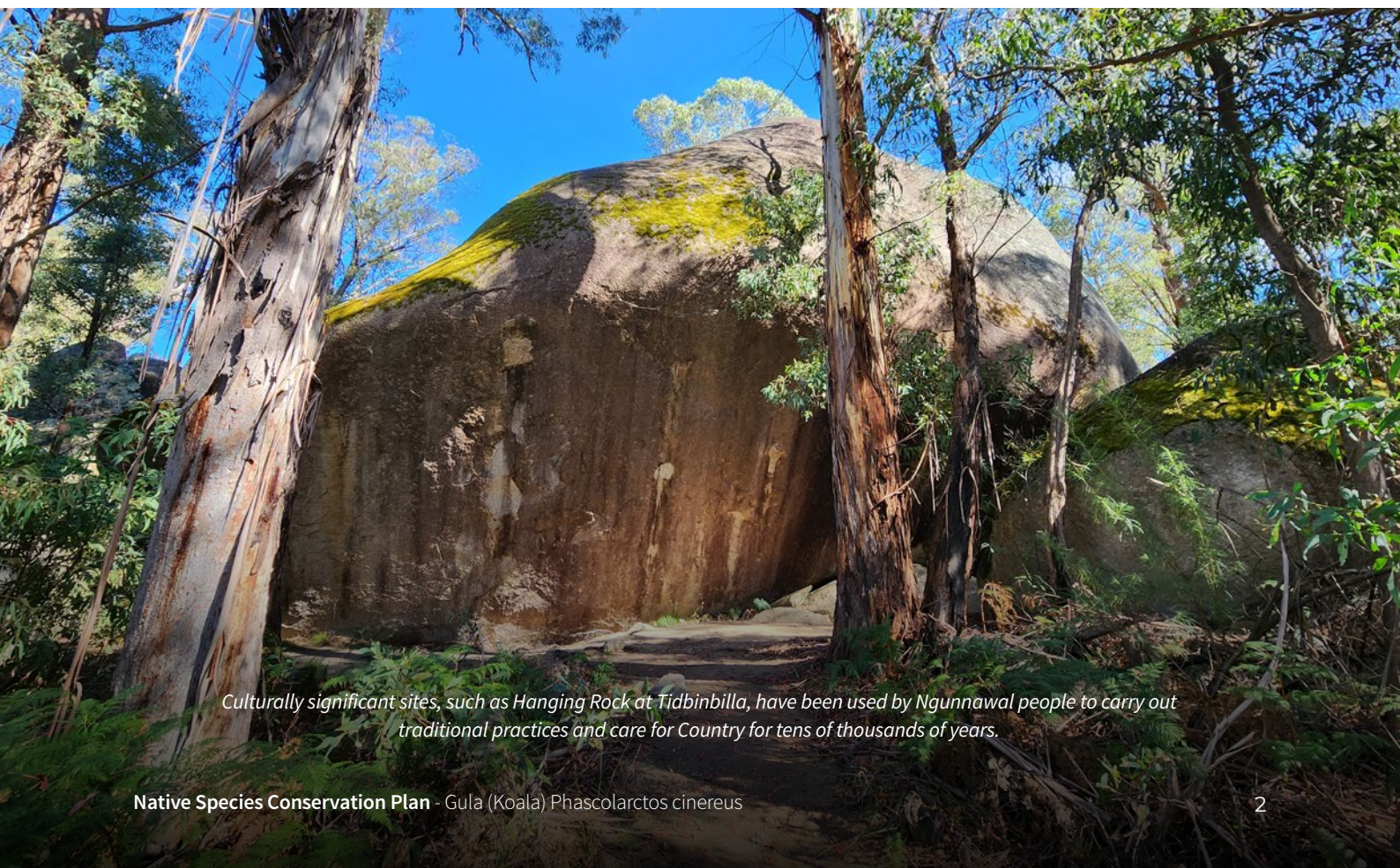
Gula on Ngunnawal Country

The Koala (*Phascolarctos cinereus*) is known in the Ngunnawal language as Gula (Winanggaay Ngunnawal language group). The term ‘Gula’ will be used throughout this document when referring to animals on Ngunnawal Country, and ‘Koala’ will be used when referring to other populations or the species more generally. Gula was once found across the native woodland communities of the Ngunnawal and neighbouring nations. The Ngunnawal people have held a sacred physical and spiritual connection to the Canberra and surrounding region for more than 60,000 years, a connection which is still felt deeply today. This connection is built through a deep kinships system created by the Ngunnawal people, which is also interconnected through the land, water, and species on Ngunnawal Country.

Ngunnawal Country extends beyond the administrative borders of the Australian Capital Territory into New South Wales and is delimited by naturally occurring barriers such as rivers. The Ngunnawal people are the caretakers of Country and, as such, feel a strong connection to Country that is nurtured by respect and intimate knowledge of their land (Australians Together, 2016).

Due to the impacts of European settlement, including practices such as hunting and land clearing, Gula populations on Ngunnawal Country have declined to the point that there are no known wild populations of Gula remaining in the ACT today. The loss of Gula from native woodlands affected the ability of the local Ngunnawal people to effectively care for Country through their traditional practices and kinship systems.

The ACT Government is committed to restoring Gula populations in the ACT along with the Ngunnawal Custodians kinships systems in caring for Ngunnawal Country.



Culturally significant sites, such as Hanging Rock at Tidbinbilla, have been used by Ngunnawal people to carry out traditional practices and care for Country for tens of thousands of years.

Conservation status

National

In 2021, the Koala (in Queensland, New South Wales and Australian Capital Territory) was up-listed from Vulnerable to Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Threatened Species Scientific Committee, 2021). Koalas are also categorised as Endangered under QLD and NSW state legislation. Following the Koala's up-listing to Endangered status, the Department of Agriculture, Water and the Environment developed the 'National Recovery Plan for the Koala *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory)' (the National Recovery Plan). The overarching goal of the National Recovery Plan is to "stop the trend of decline in population size of the listed Koala, by having resilient, connected, and genetically healthy metapopulations across its range, and to increase the extent, quality and connectivity of habitat occupied" (Department of Agriculture Water and the Environment, 2022). The plan is underpinned by three main objectives, which aim to stabilise, maintain and increase Koala populations, maintain and improve metapopulation processes, and engage partners, communities and individuals in listed Koala monitoring, conservation and management, all by 2032 (Department of Agriculture Water and the Environment, 2022).

Australian Capital Territory

In the ACT, the Gula was revised from Vulnerable to Endangered in April 2023 under the *Nature Conservation Act 2014* (NC Act). No wild Gula populations are currently known to exist in the ACT and lone individuals are observed only rarely. Despite this, it is likely that high-quality Gula habitat remains in the ACT and possible that undocumented populations may exist. Locally important food tree species (State of New South Wales and Office of Environment and Heritage, 2018; Youngentob, Marsh and Skewes, 2021) shelter and social needs were identified in parts of the ACT during a 2018 survey, however those same surveys covered limited area and did not find any evidence of Gula presence (Capital Ecology, 2018). A thorough baseline monitoring project would ascertain whether Gula populations exist in the ACT.

In aligning with the goals defined in the National Recovery Plan, a greater understanding of the status of Gula in the ACT, and the capacity of ecosystems in the ACT to support viable populations of Gula, will help guide future management action. Once these key elements are understood, strategies to promote resilient, connected and genetically healthy metapopulations can be enacted.

Current and emerging threats

- Threats identified in the National Recovery Plan include:
- Climate change: drought and heatwaves, leading to reduction in food and shelter trees, and increased mortality
- Land use change, leading to loss of habitat and reduction in habitat quality
- Altered fire regimes, particularly when inappropriate practices contribute to catastrophic bushfires
- Direct mortality from dog predation, vehicle strike and disease
- Fragmentation of populations leading to reduction of genetic diversity and inbreeding



One of the major threats to Koalas is climate change. Image: Mark Jakobsons.

Policy context

The Gula is considered a threatened native species under section 61 and is given special protection status under section 109 of the NC Act. A draft native species conservation plan can be created by the Conservator of Flora and Fauna under section 117 of the NC Act for species with special protection status such as the Gula. A draft native species conservation plan “means a draft plan detailing how the native species may be appropriately managed on the stated land...”. For the Gula, stated land is considered as land in the ACT that contains suitable Gula habitat as described in ‘Objective 2’ of this document.

It is legislatively required that, during the preparation of a draft native species conservation plan, the Scientific Committee and the public are consulted. Stated land lessees and custodians also need to be consulted if lessees and custodians are required by the plan “to do or not do something”. The Scientific Committee and some stated land lessees and custodians (e.g., rural leaseholders; Parks and Conservation Service) have already been consulted on the formation of this plan. The availability of this plan on *Your Say* from July to August 2023 provided an opportunity for members of the public to provide written submissions to the conservator about the draft native species conservation plan. Section 121 of the NC Act requires the Conservator to “consider any submissions received during the public consultation period; and make any revisions to the draft plan that the Conservator considers appropriate; and prepare a final version of the draft plan”. The final version of the draft native species conservation plan is considered a native species conservation plan under section 122 of the NC Act.

Aim

The overarching aim of this plan is to gain a better understanding of Gula populations and habitat status in the ACT, and to develop strategies to improve the conservation trajectory for the species across Ngunnawal Country.

Objectives

Working in collaboration with the Ngunnawal Community for cultural knowledge and vision input, the plan has six main objectives:

1. Establish a baseline monitoring project to identify sites with Gula presence in the ACT.

- 1a. Monitor potential Gula habitat to assess Gula presence, with a focus on areas significant to the Ngunnawal Community and in alignment with the National Koala Monitoring Program.
- 1b. Record any sites with Gula presence.
- 1c. If Gula are detected, use more intensive monitoring to identify if a population exists at the site.

2. Assess quality, quantity and distribution of Gula habitat in the ACT, including linkages with habitat across the borders into NSW (i.e., encompassing Ngunnawal Country).

- 2a. Using best available knowledge, identify current and future Gula habitat distribution across Ngunnawal Country by undertaking fine-scale modelling of key environmental variables, including locally important koala trees and NARClIm predictions.

- 2b. Characterise habitat at sites where Gula are detected during baseline monitoring surveys (if they are detected), to better understand Gula use of habitat in the ACT.
- 2c. Ground-truth current and potential Gula habitat by undertaking in-situ habitat assessments, including estimates of carrying capacity of habitats.

3. Following habitat assessment, identify critical gaps for the management and conservation of key habitat refugia and any restoration opportunities.

- 3a. Using identified current and potential Gula habitat, prioritise areas for corridor enhancement, restoration and climate refugia protection.
- 3b. Protect identified key habitat areas where applicable.
- 3c. Undertake habitat and corridor restoration activities (e.g., land rehabilitation, tree planting).

4. Undertake a feasibility study into establishing a Gula captive breeding program at Tidbinbilla Nature Reserve that contributes to the recovery of wild populations of the species in ACT and across Nggunawal Country.

- 4a. Consider source animals, genetics of source animals, disease, diet and microbiome, breeding options, colony size and resource requirements for captive population.
- 4b. Assess the suitability of the TNR facilities for hosting a captive breeding program.
- 4c. If feasible, introduce genetically suitable Gula to TNR, to establish a genetically robust insurance population and a source of animals for release.

5. If viable, establish a conservation translocation and supplementation plan to release Gula across Nggunawal Country.

- 5a. Working within the National Recovery Plan framework, use findings from baseline monitoring and habitat assessments to explore options for translocating Gula to the ACT and Nggunawal Country in nearby NSW.
- 5b. Consider the viability of translocating the TNR captive population (described in objective 4) or animals from other captive or wild populations to the wild on Nggunawal Country.
- 5c. Determine the minimum viable population size required for translocated or supplemented populations.

- 5d. Consider and mitigate threats to Gula survival (where feasible).
- 5e. Stage releases and apply adaptive management framework to increase success of translocated or supplemented populations.

6. Engage strongly with community to promote collaborations, knowledge sharing, skill development and a greater overall interest in wildlife conservation, thus empowering the community to continue engaging in conservation activities beyond those in this plan.

- 6a. Collaborate with the Nggunawal Community on all aspects of this plan, thus ensuring the plan encompasses Nggunawal values and vision. Ensure Nggunawal people are involved in coordinating and carrying out the plan, ecological skills are developed in the Nggunawal Community and traditional knowledge is shared and grown amongst Nggunawal people.
- 6b. Create citizen science projects within the Gula monitoring and habitat restoration components of this plan to facilitate knowledge sharing within the wider community.
- 6c. Build relationships with rural leaseholders in order to protect and restore Gula habitat on rural land.
- 6d. Collaborate with other stakeholders, such as other government agencies and research institutions, to undertake research and address knowledge gaps.



The ACT Government is committed to conserving the Gula on Ngunnawal Country.

Research and Management

It is not known whether Gula populations persist in the ACT and further research is required into habitat suitability in the ACT. Details on how Gula populations may be managed in the future will be refined following the outcomes of the actions described in this plan.

Importantly, findings will help to inform realistic targets for Gula populations in the ACT. These will include potential population size and distribution when considering carrying capacity of existing and/or restored habitats. For example, the discovery of thriving, connected Gula populations in the ACT would likely elicit the goal of maintaining population sizes. Conversely, the absence of Gula populations and the presence of quality Gula habitat capable of supporting thriving Gula populations would likely elicit the goal of increasing Gula abundance to at least minimum viable population size and, potentially, up to carrying capacity.

Objective 1 – Gula baseline monitoring

Incorporating scientific and traditional methods into baseline monitoring will ensure monitoring is both scientifically rigorous and incorporates the traditional knowledge and values of Ngunnawal people. Deciding where to monitor and which detection methods to use will be a collaborative effort between the Ngunnawal Community, the National Koala Monitoring Program (*led by CSIRO*) and the ACT Government.

Significant areas identified by the Ngunnawal Community will be included in baseline monitoring, ensuring the Ngunnawal perspective of healthy Gula habitat is represented. Consultation with the Ngunnawal Community will help to identify significant locations. For example, culturally important locations and/or habitat types known to support a range of culturally important species may be of conservation priority to Ngunnawal people. These locations may include sites where Gula were known to occur prior to European settlement.

Baseline monitoring in the ACT will also include sites chosen by CSIRO as part of the National Koala Monitoring Program, which “*aims to provide a fit-for-purpose, long-term program which improves our understanding of the status and trends of koala populations and supports evidence-based management strategies across the koala’s range*” (Foster and Hoskins, 2022). CSIRO has provided the ACT Government with a list of potential survey sites, which will be vetted for practicality. Working down the list to ensure the design maintains statistical integrity, sites will be chosen for inclusion in the monitoring program if they are accessible via vehicle within 200 m and in Gula habitat. For the purpose of baseline monitoring, Gula habitat is considered as vegetation communities dominant in locally important koala trees or ancillary habitat trees of the Southern Tablelands as identified by Youngentob, Marsh and Skewes, (2021). Initial vetting of the sites provided by CSIRO indicates several sites across the ACT are suitable Gula monitoring sites (Figure 1).

Finally, Gula baseline monitoring will include sites selected by the ACT Government. These sites will be in areas of the ACT considered most likely to contain Gula populations. Proximity to previous Gula sightings and current NSW Gula populations will form the basis of site selection. For example, remnant eucalypt woodland stretching across tenure from Gigerline Nature Reserve in the south, to Rob Roy Nature Reserve in the north will be thoroughly surveyed due to its proximity to previous sightings and the known Gula population in Tinderry Nature Reserve, NSW. The inclusion of sites such as these will ensure a strategic and thorough survey effort is implemented in the ACT and Gula baseline monitoring will be useful for informing decisions at the ACT level.

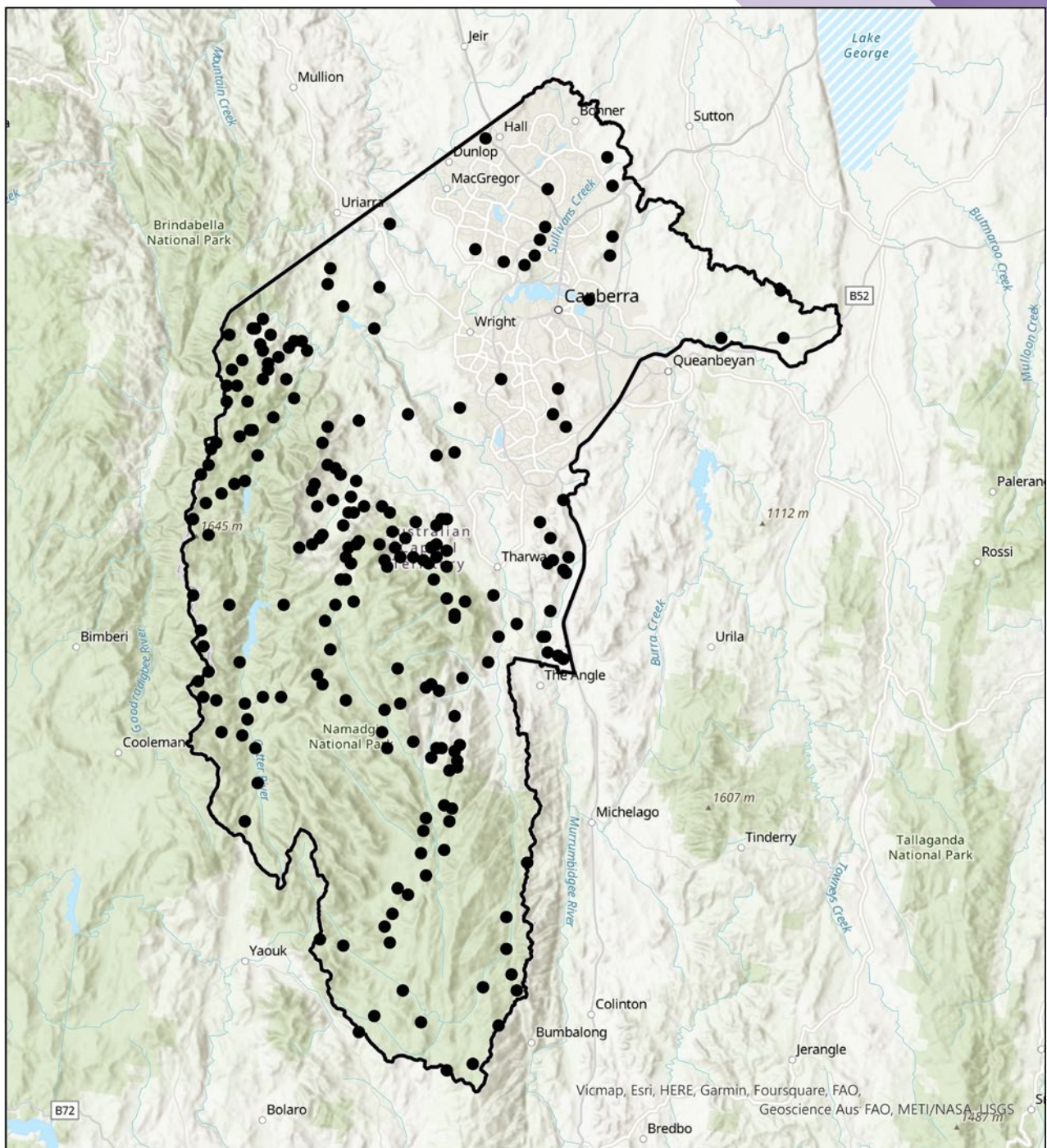



Figure 1: Monitoring sites provided by CSIRO as part of the National Koala Monitoring Program, vetted to include sites in the ACT containing *Gula* habitat and accessible via vehicle.



Koalas can be detected via a variety of methods and baseline monitoring will include traditional detection and monitoring methods chosen by the Ngunnawal Community. Traditional methods will focus on collecting and sharing information on Gula and Gula habitat from a Ngunnawal perspective, rather than scientific data. The details on traditional baseline monitoring will be established following a workshop with members of the Ngunnawal Community. After workshops, there will be opportunities for Ngunnawal people to undertake baseline monitoring on Country. Traditional baseline monitoring will complement scientific baseline monitoring and promote two-way knowledge sharing between the Ngunnawal Community and the ACT Government.

Passive acoustic monitoring is considered the most appropriate scientific method to assess Gula presence in the ACT. This method consists of installing a sound recorder in Koala habitat during the breeding season and leaving it to record on a nightly basis. It is estimated that only four (Law *et al.*, 2020) to seven (Hagens, Rendall and Whisson, 2018) nights are required to detect Koala via passive acoustic monitoring. In the ACT, devices will be set to record for two weeks at each site, from approximately sunset to sunrise each night during peak breeding season (approximately November to February). After the recorder is collected, the audio will be processed for male bellows, which are vocalisations emitted to attract females (Ellis *et al.*, 2011).

Passive acoustic monitoring is superior to some Koala detection techniques for several reasons. Firstly, sound recorders are relatively inexpensive (Law *et al.*, 2018, 2020), particularly when compared to thermal detection drones or the labour costs associated with direct observation surveys. Secondly, sound recorders can be deployed to sites that are difficult to survey using direct observation methods (e.g., sites with challenging terrain or dense vegetation). Thirdly, sound recorders can detect Koalas over a wider area than other techniques (e.g., scat or point count surveys), with an estimated detection radius of 300m (Law *et al.*, 2020). And finally, passive acoustic monitoring can yield Koala detections in low-density populations, whereas other methods (e.g., scat surveys) may not (Law *et al.*, 2018, 2020). Although Koala abundance cannot be estimated from passive acoustic monitoring (Youngentob, Marsh and Skewes, 2021), relative abundance can be, as bellow occurrence is positively associated with Koala density (Hagens, Rendall and Whisson, 2018). By deploying sound recorders to potential Gula habitat in the ACT, presence and relative abundance data can be easily obtained at several sites concurrently.

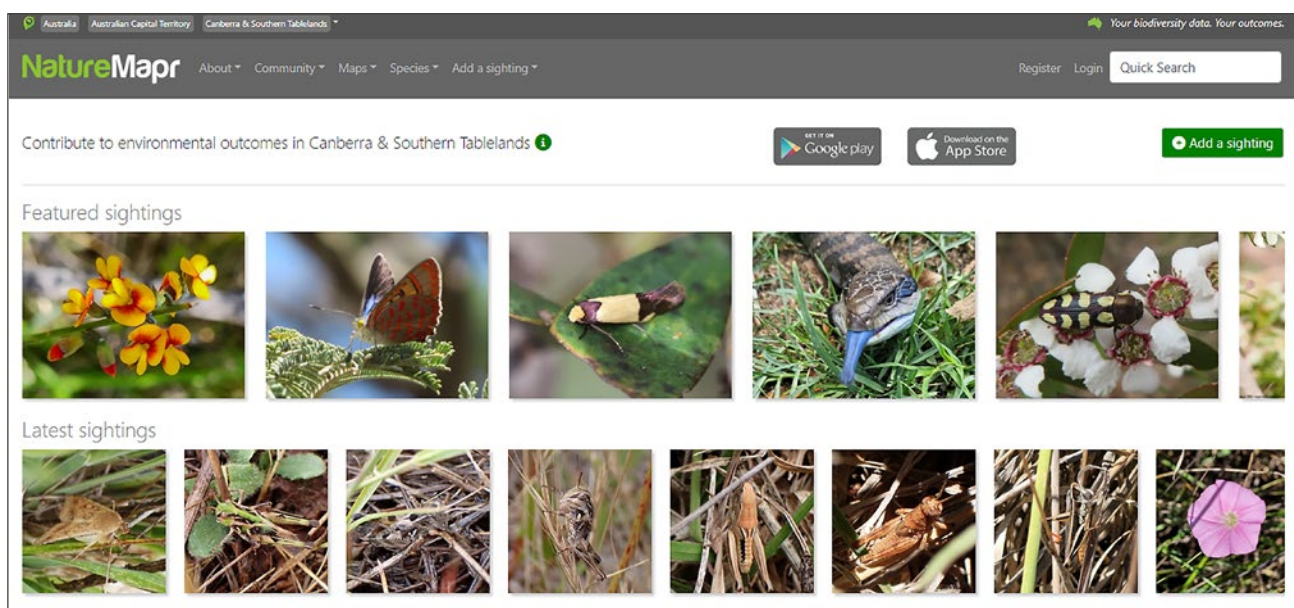
It is possible that passive acoustic monitoring will fail to detect Gula bellows on Ngunnawal Country. For true absence to be estimated, it is generally accepted that multiple detection methods are required (Youngentob, Marsh and Skewes, 2021). The prospect of using alternative methods (e.g., detector dogs or thermal imagery drones) will be further examined if bellows are not detected from passive acoustic monitoring.

The findings from Gula baseline monitoring will be important for establishing ongoing population monitoring protocols if Gula are detected. Once a baseline is established, the effectiveness of Gula conservation actions should be assessed with several monitoring methods. For example, continued passive acoustic monitoring would be useful for monitoring population relative abundance, genetic monitoring would be useful for assessing metapopulation connectivity and genetic diversity, and habitat monitoring would be useful for assessing habitat quality and quantity. Measuring effectiveness is a crucial component of conservation management, as it allows for change if targets are not being achieved.



Passive acoustic monitoring is an effective method of detecting Koalas.

Baseline monitoring also provides the opportunity for the greater community involvement in Gula conservation. For example, members of the community could contribute to citizen science by reporting to the ACT Government incidental Gula detections or Gula detections from community-led biodiversity monitoring (e.g., by “Mates of...” groups) across Ngunnawal Country.



[Nature MapR](#) is a useful platform for community reporting of Gula sightings.

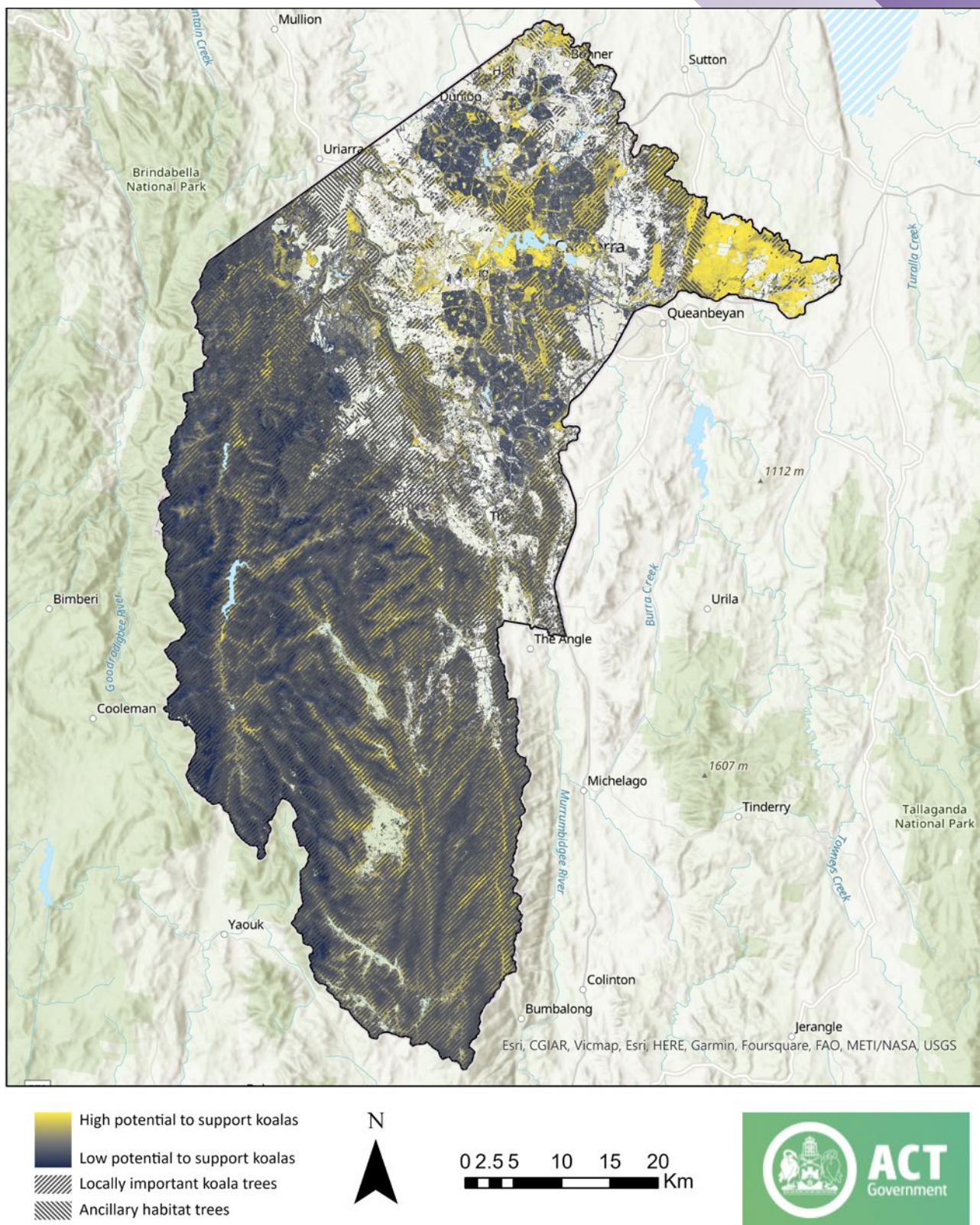
Objective 2 – Gula habitat assessment

The Koala climate envelope (i.e., its predicted potential distribution based on bioclimate; Nix, 1986) is predicted to contract southwards and eastwards in coming decades due to the effects of climate change (Adams-Hosking *et al.*, 2011; Briscoe *et al.*, 2016). Some areas that currently support important Koala populations, such as the NSW north coast, are predicted to become climatically unsuitable for Koalas by the year 2070. Parts of Ngunnawal Country are forecast to remain climatically suitable (Adams-Hosking *et al.*, 2011; Briscoe *et al.*, 2016), which means that conservation actions undertaken in the ACT may have important consequences for the national trajectory of the species. Knowing the quality, quantity and distribution of Gula habitat across Ngunnawal Country will help inform Gula conservation actions, particularly actions related to habitat protection and restoration. Gula habitat needs to be strategically assessed at a fine scale in the ACT, as this has not been done previously.

Knowledge and vision input from the Ngunnawal Community would be valuable in identifying potential Gula habitat for assessment on Ngunnawal Country, should the community wish to share such information. Ngunnawal people will be invited to attend a workshop aimed at improving Gula conservation, where key indicators of healthy Country can be discussed, and locations identified for on-Country assessment. The workshop may help to identify Gula habitat important to the Ngunnawal Community and such information could be used to guide habitat protection and restoration.

Koala habitat quality is largely influenced by the presence of tree species that Koalas rely on for food, resting (State of New South Wales and Office of Environment and Heritage, 2018; Youngentob, Marsh and Skewes, 2021), and shelter from extreme climates (Ellis *et al.*, 2010; Briscoe *et al.*, 2014). The relative use of tree species by Koalas varies amongst regions, so the term ‘locally important koala trees’ is used to define key tree species of a given region (McAlpine *et al.*, 2008; Youngentob, Marsh and Skewes, 2021). Recent research has helped to identify which species are locally important koala trees on Ngunnawal Country (e.g., State of New South Wales and Office of Environment and Heritage, 2018; State of New South Wales and Department of Planning Industry and Environment, 2019; Youngentob, Marsh and Skewes, 2021) and broad scale vegetation mapping has identified communities dominant in locally important koala trees on parts of Ngunnawal Country (ACT Government Environment Planning and Sustainable Development Directorate, 2018). Furthermore, modelling based on key environmental variables and species distribution modelling of locally important koala trees predicts that suitable Gula habitat exists in the ACT (State of New South Wales and Department of Planning Industry and Environment, 2019; Runge, Rhodes and Lopez-Cubillos, 2021).

Ground-truthing involves collecting data in the field to test the accuracy of predictions. To determine whether areas modelled as high likelihood Gula habitat actually contain Gula habitat, ground-truthing is required (Youngentob, Marsh and Skewes, 2021). The NSW Koala Habitat Suitability Model, which predicts the potential of locations to support Koalas across NSW and the ACT (State of New South Wales and Department of Planning Industry and Environment, 2019), and the ACT Vegetation Map 2018 (ACT Government Environment Planning and Sustainable Development Directorate, 2018) have been overlayed onto a map of the ACT, providing a visual representation of potential high-likelihood Gula habitat currently in the ACT (Figure 2). Once key areas (e.g., large patches and/or corridors connecting patches) of high-likelihood Gula habitat are identified from mapping and deemed accessible, they will be ground-truthed in the form of in-situ habitat assessments.



NSW Koala Habitat Suitability Model data provided by the State of New South Wales and Department of Planning Industry and Environment, 2019; ACT Vegetation Map 2018 data provided by the ACT Government Environment Planning and Sustainable Development Directorate, 2018.

Figure 2: Predicted potential of locations to support Koalas (Gula), as determined by the NSW Koala Habitat Suitability Model, and the distribution of locally important koala trees and ancillary habitat trees, as determined by the ACT Vegetation Map 2018.

Precise habitat assessment methods will be refined following consultation with Koala experts but will likely consist of examining food tree relative abundance, tree species diversity and other important environmental variables. Locally important koala trees or other environmental attributes may vary at fine scale (Youngentob, Marsh and Skewes, 2021), so it is important that habitat assessments accurately capture the complexity of habitats. In addition to key sites identified from mapping, habitat assessments will also occur in areas where Gula are detected during baseline monitoring (described earlier), if Gula are detected. Assessing habitat in Gula occupied areas will help in understanding the species' fine scale use of habitat in the ACT.

The predicted future distributions of locally important koala trees will be modelled under NARCLiM (NSW and ACT Regional Climatic Modelling) climate-change projections to help identify areas of habitat refugia predicted to persist under climate change scenarios. Several locally important koala trees have been identified for Ngannaw Country and surrounding areas. These include, but are not limited to, *Eucalyptus viminalis*, *E. mannifera*, *E. pauciflora*, *E. dives*, *E. stellulata*, *E. punctata*, *E. macrorhyncha* and *E. rossii* (State of New South Wales and Office of Environment and Heritage, 2018; Youngentob, Marsh and Skewes, 2021). These climate refugia predictions for these tree species will be combined with in-situ habitat assessments to create a map of current and predicted future distributions of Gula habitat across Ngannaw Country.

Once key patches of current and predicted future Gula habitat are identified, it is important to estimate carrying capacity (i.e., the maximum Gula population size the habitat can support; Verhulst, 1838). For Koalas, carrying capacity is largely influenced by nutritional quality and biomass of food trees. The chemical makeup of food tree leaves drives preference, with Koalas favouring particular species within a location, individual trees within a species, or certain leaves on a tree (Moore et al., 2010; Marsh et al., 2014; Youngentob, Marsh and Skewes, 2021). Although the presence of palatable trees is important, spatial heterogeneity in patch size and quality is also essential for the long-term sustainability of Koala populations and must be considered when assessing carrying capacity across the broader landscape (Youngentob, Marsh and Skewes, 2021). Protecting only discrete patches of high carrying capacity and neglecting interspersed low quality or small patches in a landscape may lead to Koala overcrowding and habitat degradation (Whisson et al., 2016).

Estimating carrying capacity will help determine the maximum target Gula population size in the ACT, but considering minimum viable population (i.e., the smallest number of individuals required sustain a healthy population; Shaffer, 1981) is also critical when generating population targets. Estimating minimum viable population is complex due to stochastic processes. For example, demographic stochasticity, environmental stochasticity, natural catastrophic events and genetic stochasticity (e.g., genetic drift and inbreeding) are unpredictable factors that can threaten the viability of a population (Shaffer, 1981). Population viability analysis is a useful tool for assessing minimum viable population and can also be used to examine other scenarios such as the probability of extinction. It uses genetic and demographic variability (ideally as related processes) as part of a qualitative assessment of threats to populations (Lacy, 2019). Once the Gula habitat distribution, connectivity, and carrying capacity have been determined for the ACT, population viability analysis will be used to assess the minimum viable population size. With both maximum and minimum Gula size targets estimated, decisions can be made on whether ACT habitats can support viable Gula populations and, if so, what the optimal population size target should be. Due to the complexity in assessing carrying capacity and minimum viable population size, experts in arboreal folivorous mammals will be engaged to help determine Gula population size targets in the ACT.

Objective 3 – Gula habitat protection and restoration

To provide areas for healthy, self-sustaining Gula populations in the ACT, Gula habitat must be protected and possibly restored. Currently, it is estimated that 87% of Gula habitat in the ACT is protected within public area reserves (national park, nature reserve, protection of water supply, special purpose reserve or wilderness area). Maintaining these areas in suitable condition will be key to safeguarding Gula habitat on Ngunnawal Country. The finer details on habitat protection and restoration actions will be established at a later stage of implementing this plan, as critical research needs to be undertaken first. Such research will include confirming that Gula habitat currently exists where it predicted to exist and determining if and where Gula populations occur in the ACT. Additionally, knowing where Gula populations and habitat are likely to exist in the future, as well as the carrying capacity of patches across the landscape will guide habitat restoration and protection decisions on Ngunnawal Country. For example, habitat can be protected from clearing and land use change in areas supporting Gula populations, and suitable areas between populations can be restored to function as corridors. Similarly, climate refugia can be protected to future-proof Gula habitat under climate change scenarios.

This plan aims to promote healthy Gula populations across Ngunnawal Country by incorporating traditional knowledge into habitat protection and restoration planning. The ACT Government will work with the Ngunnawal Community to identify areas to be targeted for Gula conservation efforts. To coordinate conservation actions across Ngunnawal Country, which extends into NSW, collaboration with NSW stakeholders is required. For example, the Ngunnawal Community may wish to protect and/or restore Gula habitat along culturally significant areas from the ACT into NSW. In such cases, the ACT Government and the Ngunnawal Community would work with the relevant NSW stakeholders to ensure a cohesive effort is maintained across Ngunnawal Country. Incorporating traditional knowledge into habitat protection and restoration processes would ensure healthy ecosystems that represent Ngunnawal values are promoted.



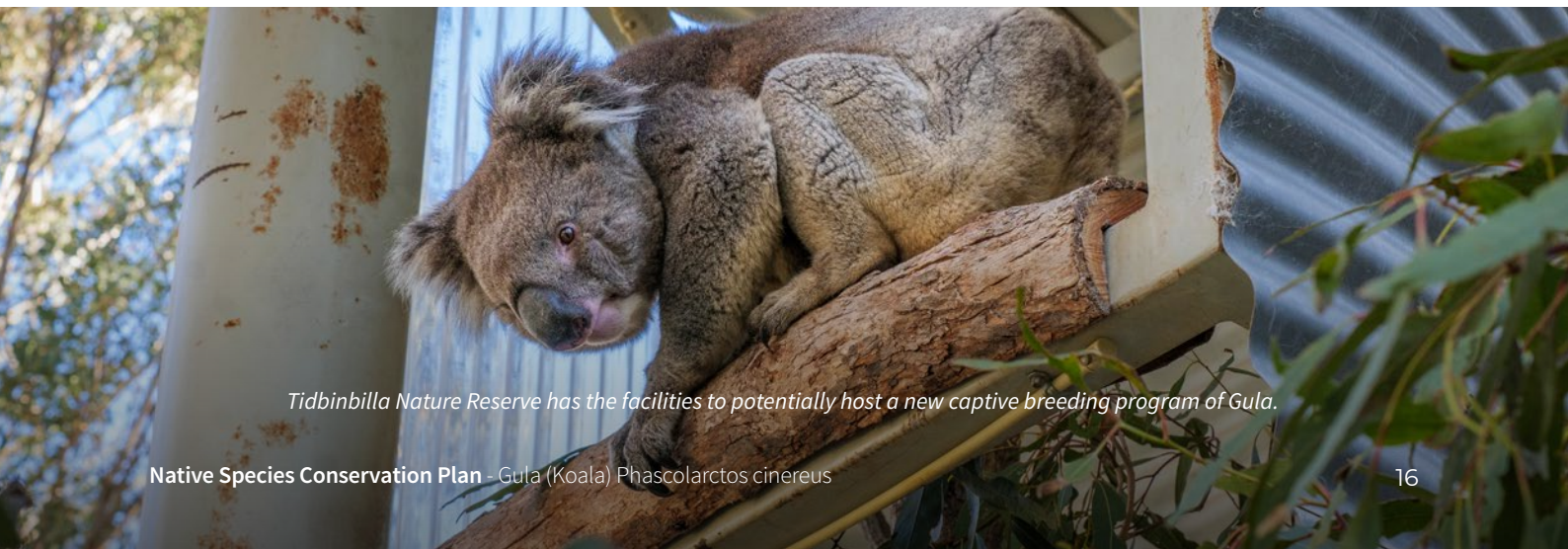
Restoration activities may occur as part of this plan to increase the quality and quantity of Gula habitat on Ngunnawal Country.

Objective 4 – Feasibility study for Gula captive breeding

Tidbinbilla Nature Reserve (TNR) is one of several Koala captive breeding facilities found across Australia, however TNR is the only facility found in the ACT/Southern NSW region. Koalas have been a feature of the captive wildlife collection at TNR since 1939 and today includes display animals (breeding program) as well as free-ranging animals (non-breeding) within a 16-hectare enclosure. The captive colony provides visitors with the opportunity for education about Koalas while enabling them to view the animals in a natural setting. The current captive colony was sourced from an overabundant Koala population from the Great Otway National Park, Victoria, and as such, these individuals have little conservation value for the recovery of the Gula in the ACT or NSW.

Genomic data support the existence of five Koala management units, or Clades, across the species range. The population of Gula in the ACT region falls within Clade D (Lott *et al.*, 2022). Lott *et al.* (2022) conclude that successful Koala conservation will largely depend on the development of strategies for restoring gene flow and maintaining population viability. With Koala habitat being fragmented or modified throughout its range maintaining or increasing ‘genetic connectivity’ is essential; conservation translocations of genetically suitable animals will be important for the persistence of wild Koala populations in conjunction with restoration of habitat and habitat connectivity. As such, captive breeding may have a major role to play in preserving or improving the genetic reservoir of genetically depauperate Koala populations, as well as a source of animals for conservation translocations. This is particularly relevant in the ACT where the Gula population may be extirpated: animals from a captive breeding program could be used for reintroductions.

With existing enclosures and potential to modify other enclosures, presence of Gula habitat and in-house expertise at TNR, there is potential to transition to a breeding program that contributes more meaningfully to Gula conservation in the ACT and across Ngannaw Country. Any captive breeding of Gula at TNR would be undertaken through engaging in best practice and will be supported through collaborations with external experts and stakeholders. Establishment of a colony needs to consider both the vision of Ngannaw people (and other Traditional Owners as appropriate, if animals are sourced externally) as well as encapsulate adequate genetic diversity across the clade’s range. A study exploring the feasibility of TNR to transition to a captive breeding program that contributes towards Gula conservation is being undertaken. This study will determine the capacity for TNR to transition to captive breeding colony with Gula sourced from Ngannaw Country, or other areas containing animals from Clade D. Such a program could provide an insurance population of genetically robust Gula that can also be used in conservation translocations.



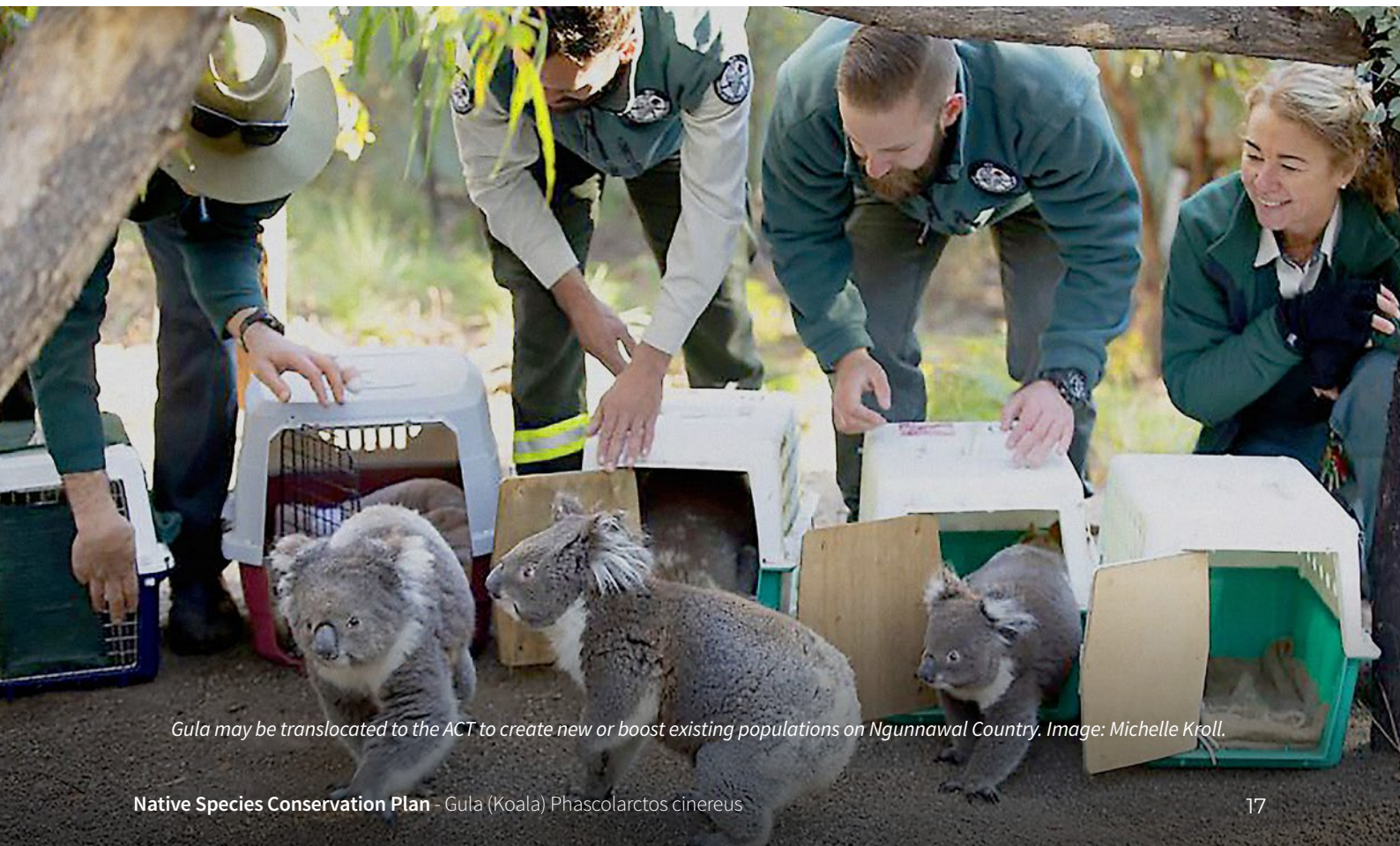
Tidbinbilla Nature Reserve has the facilities to potentially host a new captive breeding program of Gula.

Objective 5 – Gula conservation translocations (if feasible)

The National Recovery Plan highlights that it is important to have “*resilient, connected and genetically healthy metapopulations*” for the recovery of the species (Department of Agriculture Water and the Environment, 2022). Given that there are no documented Gula populations in the ACT, it is likely that conservation translocations would be required to achieve resilient, connected and genetically healthy metapopulations in the ACT and across Ngunnawal Country into NSW.

One goal of establishing a captive breeding Gula population at TNR would be to provide a source of genetically diverse and healthy animals for release. Translocation of animals from other captive or wild populations will also be considered. The outcomes of baseline monitoring and the captive breeding feasibility study will be used to inform decision making around sourcing animals for translocation and release locations. For example, baseline monitoring will help to determine whether new Gula populations should be established in the ACT, or whether supplementation of existing populations is required to maintain or increase genetic diversity.

If translocations are considered a viable conservation strategy in the ACT, Gula release protocols will need to be established. Due to the complexities around translocations, protocols will be stipulated in a separate document to this current document. Protocols will be informed by Gula population and habitat status on Ngunnawal Country once this is better understood, and developed in collaboration with experts in Koala translocation to ensure best practices are used. When planning releases, consideration will be given to minimum viable populations size, genetic diversity, and threats such as vehicle strikes and predation from wild dogs and dingoes. Where foreseeable, threat mitigation measures will be implemented as appropriate. To manage unforeseen threats, Gula releases will be staged and monitored, with findings used to inform an adaptive management framework aimed to improve release success.



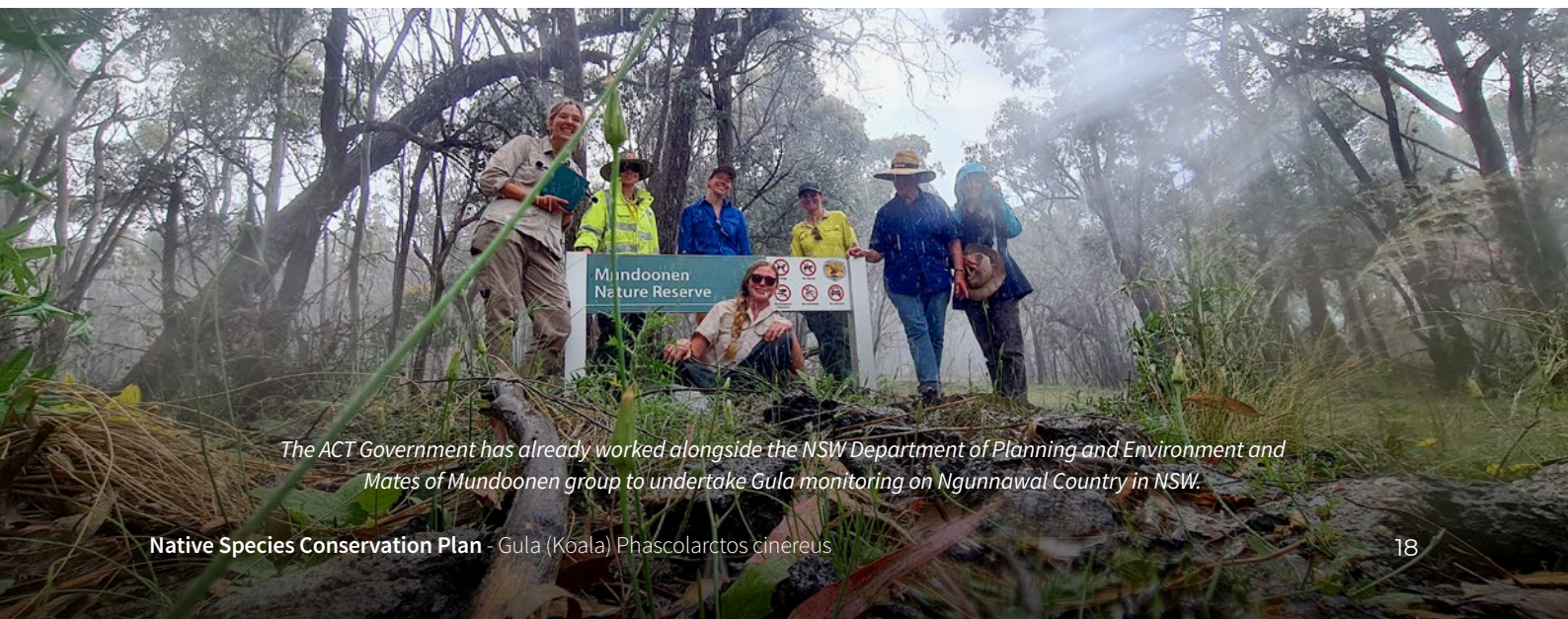
Gula may be translocated to the ACT to create new or boost existing populations on Ngunnawal Country. Image: Michelle Kroll.

Objective 6 – Community engagement

The Koala is an iconic species that is valued by Indigenous and non-Indigenous Australians. Many members of the ACT community have voiced concern over Gula population declines, with some even offering their time towards Gula conservation actions. Significantly, the Ngunnawal Community holds a strong connection to Country and a founded belief that ecosystems should be restored to their natural states, that is, the states they existed in prior to European settlement. The ACT Government recognises the Ngunnawal people as Traditional Custodians of the ACT and surrounding region. The Government acknowledges that other people and families also have a traditional connection to the lands of the ACT and region, and we respect this connection to country. Given the strong interest in Gula conservation from both the Ngunnawal Community and the greater ACT community more generally, active engagement with community will help ensure the success of this current plan.

The activities stated within this plan will be refined in collaboration with interested members of the Ngunnawal Community. The ACT Government wishes to support Ngunnawal people in their role as caretakers of Country by facilitating knowledge sharing and by providing Ngunnawal people with channels to engage in traditional practices. As well as collaborating on the creation of a vision and objectives within this plan, it is hoped that Ngunnawal people will collaborate with the ACT Government on coordinating and undertaking actions identified within the plan. It will be up to individual members of the Ngunnawal Community to choose how they would like to engage; some suggestions have been identified in the above sections as to how this might be undertaken. For example, surveys of Gula and other native species lead by Ngunnawal people using traditional methods of detection may be one way that Ngunnawal people can connect to Country and share and grow knowledge within the community.

In addition to supporting the Ngunnawal Community, this plan also aims to engage citizen science or other community groups interested in contributing to Gula conservation. In collaboration with the NSW Department of Planning and Environment, the ACT Government has already worked alongside the 'Mates of Mundoonen' group to conduct Gula monitoring on Ngunnawal Country in NSW. The ACT Government will continue to seek out collaboration opportunities with groups already engaged in habitat protection and restoration activities, to build on and strengthen existing programs (e.g., Million Tree Program). Focused engagement with community groups around monitoring Gula and restoring habitat across Ngunnawal Country will continue to be undertaken in the spirit of sharing skills and data and generating interest in Koala conservation more generally.



The ACT Government has already worked alongside the NSW Department of Planning and Environment and Mates of Mundoonen group to undertake Gula monitoring on Ngunnawal Country in NSW.



Community engagement activities, such as tree planting days, will provide opportunities for members of the community to gain hands-on experience in Gula conservation.

The roll out of this plan provides opportunities for general community engagement. Given the strong community desire for Gula to be restored to the ACT, it is fitting that the community be involved in conservation actions. This plan will provide opportunities for the community to participate in activities aimed to improve conservation outcomes for Gula, such as tree planting events and habitat restoration. The ACT Government also intends to engage with school communities by visiting schools and talking to students about Gula conservation, and providing information to families about community events. In addition to achieving conservation outcomes, community engagement may also help develop a greater appreciation and understanding of Gula conservation efforts in the ACT and across Australia more generally.

Gula habitat mapping (an action under Objective 2 in this plan) seeks to define areas for both habitat protection and restoration (an action under Objective 3). Through this process, it is likely that some identified areas of suitable Gula habitat will occur on rural lands. It is important to establish positive relationships with landholders early to ensure habitat protection and adequately plan restoration activities. One way this may be achieved is by providing support to rural landholders. For example, the ACT Government is currently investigating the feasibility of incentive programs to support rural landholders in the protection of high value natural areas on land they manage. This work will consider the activities in other States and Territories to examine what might be feasible in the ACT.

Finally, the ACT Government will collaborate with research institutions to ensure expert advice underpins all Gula conservation actions. There is considerable expertise on the species within the research community, and the ACT Government has worked with experts from universities, CSIRO, and other research institutions, and will continue to do so. This plan will provide research opportunities by identifying knowledge gaps in Koala ecology and conservation and collaborating with experts on research projects.

A close-up photograph of a koala and its joey on a tree branch. The adult koala is at the top, with its head and front paws visible. The joey is clinging to its mother's belly, looking towards the camera. The background shows the rough bark of the tree and some green foliage.

Implementation, monitoring and review

Section 124 of the NC Act requires the Conservator, the lessee of leased land (if applicable) and the custodian of the land (if applicable) to implement a native species conservation plan. This plan will be implemented by agency staff with expertise in ecological monitoring and conservation practices, under the supervision of the Conservator. Section 125 of the NC Act requires the Conservator to “monitor the effectiveness of a native species conservation plan”. The legislation does not stipulate a statutory timeframe for monitoring and review; however, the plan should be reviewed frequently to ensure it is meeting its objectives and adjusted with an adaptive management framework as required.

[Appendix A](#) summarises the objectives and corresponding indicators of success for this plan. It also includes timeframes and milestones that trigger review against each objective.

The implementation of the Native Species Conservation Plan for the Gula (Koala) will be monitored and reviewed with an adaptive management framework to ensure conservation goals are progressing.

Additional background information

Biology and ecology

The Koala is a mostly nocturnal, solitary and semi-arboreal marsupial that lives in forest and woodland habitats across parts of eastern Australia. Habitat suitability is largely influenced by the availability and nutritional quality of locally important koala trees, which vary in species composition across the Koala's range (McAlpine *et al.*, 2008; Youngentob, Marsh and Skewes, 2021; Department of Agriculture Water and the Environment, 2022). This means that a tree species that is locally important one area may be less important in another. The State of New South Wales and Office of Environment and Heritage (2018) and Youngentob *et al.* (2021) have developed lists of locally important tree species for each of the NSW Koala Management Areas. These lists include trees of the central and southern tablelands, the management area in which the ACT is geographically located.

Trees provide Koalas with food, water (Beale *et al.*, 2018), shelter and relief from hot conditions (Ellis *et al.*, 2010; Briscoe *et al.*, 2014; Youngentob, Marsh and Skewes, 2021). Koalas use small and larger sized trees, and eat the leaves of more than 100 *Eucalyptus* species (Youngentob, Marsh and Skewes, 2021) and several *Corymbia* and *Angophora* species (Threatened Species Scientific Committee, 2021). Leaf Palatability can vary amongst species and individual trees (Youngentob, Marsh and Skewes, 2021). It is related to nutritional quality, which is influenced by chemical properties (Moore *et al.*, 2010; Marsh *et al.*, 2014) and determined by tree genetics rather than soil or substrate characteristics (Youngentob, Marsh and Skewes, 2021). Koalas favour leaves higher in digestible nitrogen and lower in plant secondary metabolites (Moore and Foley, 2000, 2005; Youngentob, Marsh and Skewes, 2021), even when they exist in low-density populations (Stalenberg *et al.*, 2014). These preferences affect the movement of individuals Koalas within their home ranges and the distribution of Koala populations across a larger regional scale (Au, 2018).

Koalas move within their home ranges and beyond to access resources (Department of Agriculture Water and the Environment, 2022). Home ranges can be as low as less than one hectare, as high as over 100 hectares and can vary across an individual's lifetime (Youngentob, Marsh and Skewes, 2021; Department of Agriculture Water and the Environment, 2022). Koalas can move up to ten kilometres from home ranges by walking along the ground, which exposes them to vehicle strike or dog attack (Youngentob, Marsh and Skewes, 2021). Due to large home ranges and high movement during breeding season, males are especially vulnerable (Melzer, 2011; Whisson *et al.*, 2016), particularly subadult males dispersing from natal areas (Dique *et al.*, 2003). Corridors free of pests and traffic are, therefore, critical components of Koala habitat (Youngentob, Marsh and Skewes, 2021; Department of Agriculture Water and the Environment, 2022).

The onset of the Koala breeding season is influenced by factors such as food availability, population density and climate (McLean and Handasyde, 2006; Ballantyne *et al.*, 2015). Mature females typically produce one young per year, however, unsuitable conditions may see individuals forego reproduction (McLean and Handasyde, 2006). There are subtle geographic differences in the seasonality of breeding (Ellis, Bercovitch and Melzer, 2010), with southern Koalas typically breeding August to January (McLean and Handasyde, 2006; Whisson and Carlyon, 2010) and northern Koalas September to February (Ellis, Bercovitch and Melzer, 2010; Melzer, 2011; Ballantyne *et al.*, 2015). During the breeding season, male Koalas produce acoustic signals in the form of vocal bellows. Because male bellowing is positively associated with female movement, it is thought that bellowing functions as a sexual advertisement signal (Ellis *et al.*, 2011).

Distribution

National

The total extent of the Koala's distribution prior to European settlement has not been established with confidence (Phillips, 1990; Melzer *et al.*, 2000). Historically, Koalas were estimated to be relatively common throughout their range, which extended from approximately from north-eastern Queensland to south-eastern South Australia (Phillips, 1990; ANZECC, 1998). However, Koala hunting (for pelts) became popular in 1890 and by the turn of the century, Koala populations had declined significantly (Phillips, 1990; Hrdina and Gordon, 2004). Populations declines continued into early 1900s due to habitat loss, disease, and extreme climatic events, and the distribution of the Koala was significantly reduced by 1930 (ANZECC, 1998; Melzer *et al.*, 2000; Adams-Hosking *et al.*, 2016). Today, the Koala is still broadly distributed from approximately north-eastern Queensland to south-eastern South Australia, albeit fragmented and in lower densities (ANZECC, 1998; Department of Agriculture Water and the Environment, 2022). It is estimated that approximately 36,800 km² or 9% of the endangered species of Koala's habitat was burned during 2019-2020 bushfires, further reducing distribution and abundance (Threatened Species Scientific Committee, 2021).



*The 2019-2020 black summer bushfires burned significant amounts of Koala habitat, including in Namadgi National Park, ACT.
Image: Mark Jakobsons.*

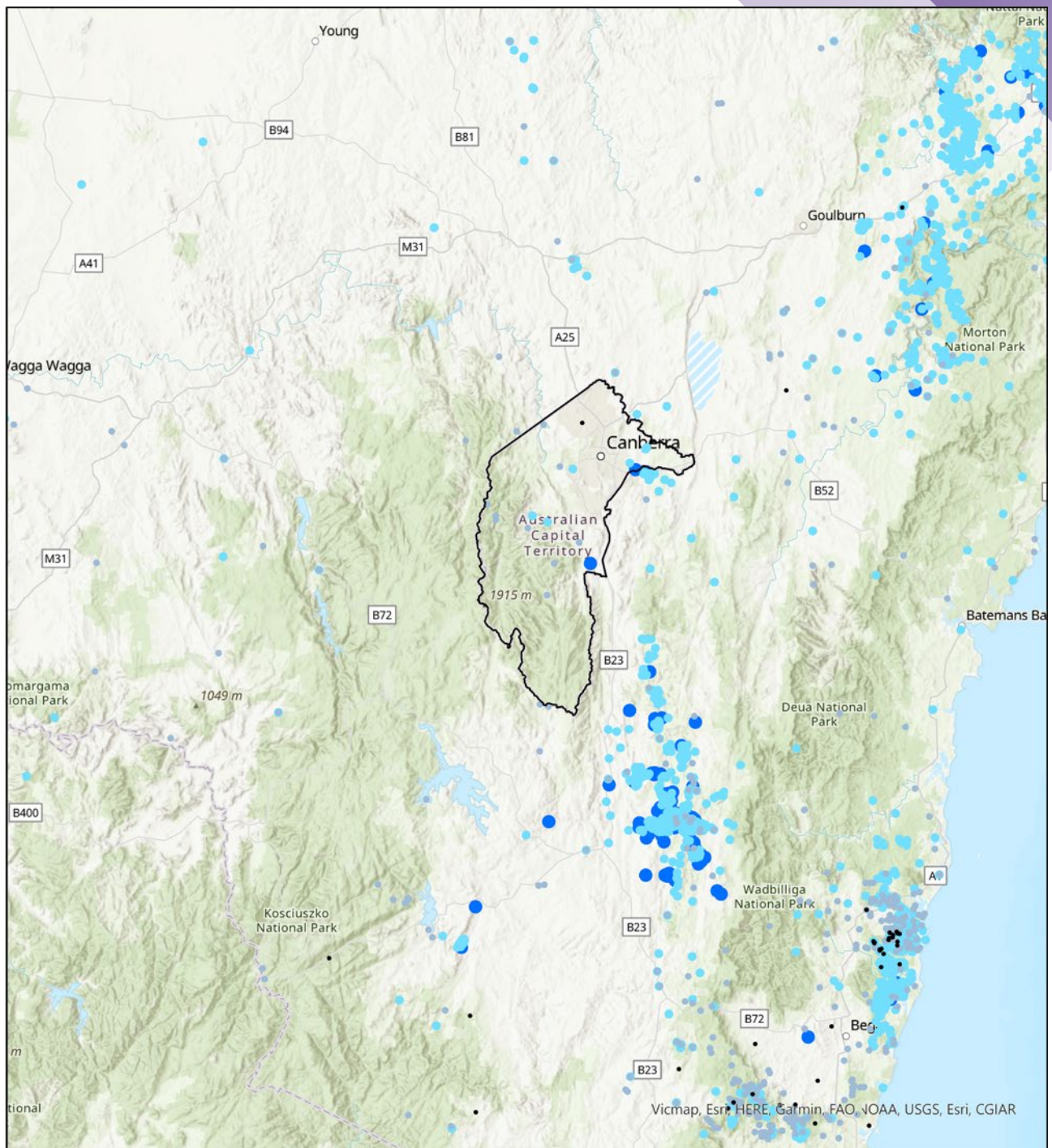
Australian Capital Territory

In the ACT, Gula are presumed locally extinct or occurring at such low densities that they are virtually undetectable. They were reportedly once so common in the greater region that they were the subject of a Banjo Patterson poem that spoke of “bears being killed in Gundaroo”. There are also several anecdotes of Gula being killed around Bungendore and Lake George in their hundreds. By 1901, Gula had declined significantly in the region due to pressures from hunting, bushfires and habitat clearing (Phillips, 1990). Since the early 1900s, reports of Gula in the ACT and surrounding regions are rare, often coming from members of the public, and are summarised below and in Figure 3.

Gula were reportedly seen near Ginninderra in the early 1900s, and between Narrangullen and Wee Jasper, NSW in 1912. Following the establishment of the captive breeding colony at Tidbinbilla Nature Reserve in 1939, which consisted of individuals translocated from interstate, it became unclear whether sightings of animals in the ACT were of local Ngunnawal Gula, or non-Ngunnawal Koalas originating from the TNR population. Several Koalas escaped the TNR enclosure from 1939 to the 1980s, and others were deliberately introduced to Orroral Valley and Bushfold Flats in 1978 (Phillips, 1990). From approximately 1969 to 1972, at least two Koala/Gula were observed around Bendora Dam in the Brindabella Ranges. Several individuals were also spotted at the Wee Jasper end of the Brindabella Ranges in 1978. Between 1980 and 1990, Koalas/Gula were recorded around Orroral Valley and Bushfold Flats in Namadgi National Park, nearby 1978 Koala release sites (Phillips, 1990; Australian Capital Territory Scientific Committee, 2019). Lone Koalas/Gula have reportedly been seen in the Uriarra area in 1983, near TNR in 1984, in Tharwa in 1986, in Holder in 1991 and near Sutton Road in 1992. Two more were observed in Stromlo Pine Forest in 1986. Fauna surveys following the 2003 bushfires located one dead Koala/Gula on the slopes of Gibraltar Creek Valley near TNR (Carey *et al.*, 2003). More recently, a Gula was seen crossing the road near Canberra airport in 2014 (<http://bioacoustics.cse.unsw.edu.au/archives/html/canberrabirds/2014-06/msg00034.html>). Another individual was observed in Oaks Estate in 2021 (K. Marsh, pers comm), which is separated from Queanbeyan by the Molonglo River. Also in 2021, a lone Gula was seen in the Tennent area. It is likely these recent sightings (i.e., since 2014) represent Gula that have dispersed across from NSW, rather than current, sustaining populations in the ACT.

Current Koala/Gula populations are documented in the areas surrounding the ACT, including on Ngunnawal Country (Figure 3). East and south of the ACT, Gula occur in Queanbeyan and in forests from Tinderry Nature Reserve in the north to Dangelong Nature Reserve in the south. A few individuals and potential Koala scats have also been observed just east of Jindabyne in recent decades (State of New South Wales and Department of Planning and Environment, 2010). Further south in Kosciuszko National Park, Koala bellows were detected in the south-eastern section of Byadbo Wilderness area, which borders Victoria south of the lower Snowy River area. Koala presence was not, however, detected from Tumut River in the north to the lower Snowy River in the south during those same surveys (Marsh, Skewes and Lindenmeyer, 2022). To the north of the ACT, five Gula were detected during Dan Lunney’s Community Wildlife Survey in 2004 near Yass. West of the ACT, no Gula have been sighted in nearby regions in recent decades (State of New South Wales and Department of Planning and Environment, 2010).

Today, the only known Koalas in the ACT are from the protected captive population at TNR. These animals are from the Otway population in Victoria and are not representative of local Ngunnawal Gula.



Year of record

- 1883 - 1930
- 1931 - 1990
- 1991 - 2020
- 2021 - 2023



0 12.5 25 50 75 100 Km



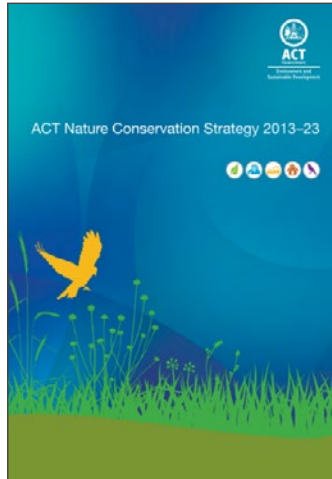
Data contributed by: ACT Wildlife Atlas; ALA species sightings and OzAtlas; Atlas of Life in the Coastal Wilderness; Australian Museum; Australian Museum Mammalogy Collection; Australian National Wildlife Collection; Budawang Coast Nature Map; Canberra Nature Map; Citizen Science - ALA Website; Commonwealth Scientific and Industrial Research Organisation; Department of Planning, Industry and Environment representing the State of New South Wales; Earth Guardians Weekly Feed; Encyclopedia of Life Images - Flickr Group; FieldData / Biological Data Recording System; Flickr; iNaturalist Australia; Koala Quest 2015; National Parks Association of NSW Great Koala Count; NatureMapr; NSW BioNet Atlas; OZCAM (Online Zoological Collections of Australian Museums) Provider; Questagame; South Australian Museum; Australian Museum Mammalogy Collection; Southern Highlands Nature Map

Figure 3: Gula (Koala) records from the ACT and surrounds. Atlas of Living Australia occurrence download at <https://biocache.ala.org.au/occurrences/search?q=qid%3A1679445948060&disableAllQualityFilters=true&wkt=POLYGON%28%28147.1014404296875+-36.89026151420104%2C151.1224365234375+-36.89026151420104%2C151.1224365234375+-34.31813241305067%2C147.1014404296875+-34.31813241305067%2C147.1014404296875+-36.89026151420104%29%29> accessed on 22 March 2023.

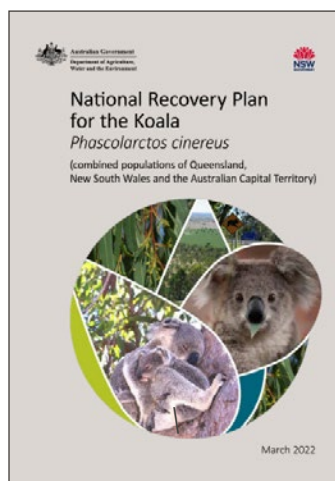
Alignment with other plans and strategies

The objectives of the Native Species Conservation Plan for the Gula (Koala) align with the following plans and strategies. This information is summarised in [Appendix B](#).

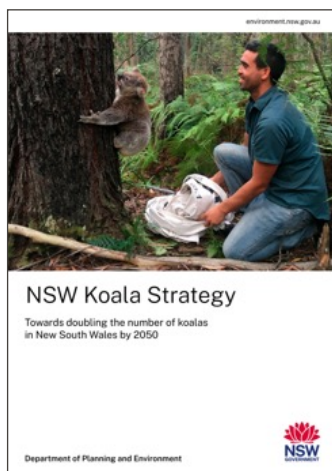
ACT Nature Conservation Strategy 2012-23



National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory)



NSW Koala Strategy



Conclusion

The Draft Native Species Conservation Plan for the Gula (Koala) has been created to gain a better understanding of Gula population and habitat status in the ACT, and from that understanding, develop strategies to improve the conservation trajectory of the species. The objectives outlined in this document describe how the ACT Government intends to deliver on the proposed actions that are identified within this plan.

The ACT Government is committed to conserving the Gula for the sake of the national recovery of the species. Significantly, the ACT Government also recognises and respects the close relationship Nggunawal people have with Country, including an intimate knowledge and connection to the flora and fauna of the region. The ACT Government is dedicated to working side-by-side with the Nggunawal Community to protect and restore Country for all to enjoy the presence of this iconic species for decades to come.



The Native Species Conservation Plan for the Gula (Koala) will bring together scientific and traditional practices to conserve the Gula on Nggunawal Country.

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Appendix A:

Objectives and corresponding indicators of success and timeframes to be assessed during monitoring and review of the Draft Native Species Conservation Plan for the Gula (Koala).

Objective	Indicator of success	Timeframe and milestone triggers for review
1. Establish a baseline monitoring project to identify sites with Gula presence in the ACT. 1a. Monitor potential Gula habitat to assess Gula presence, with a focus on areas significant to the Ngannawal Community and in alignment with the National Koala Monitoring Program. 1b. Record any sites with Gula presence. 1c. If Gula are detected, use more intensive monitoring to identify if a population exists at the site.	→ Surveys targeted towards detecting Gula in suitable habitat across Ngannawal Country (i.e., the stated land) are complete. → Surveyed locations include areas selected by the National Koala Monitoring Program as well as areas prioritised by the Ngannawal Community. → The presence or absence of Gula populations and populations strongholds can be determined from survey findings. → Ongoing monitoring protocols are developed if Gula are detected during baseline monitoring.	→ By March 2026, a minimum of 200 sites will be surveyed across Ngannawal Country. Survey data will be analysed for Gula presence. → By 2024 sites prioritised by the Ngannawal Community will be monitored for Gula presence. → Future monitoring protocols, if needed, are developed by 2026 following completion of baseline presence surveys.
2. Assess quality, quantity and distribution of Gula habitat in the ACT, including linkages with habitat across the borders into NSW (i.e., encompassing Ngannawal Country). 2a. Using best available knowledge, identify current and future Gula habitat distribution across Ngannawal Country by undertaking fine-scale modelling of key environmental variables, including locally important koala trees and NARCLiM predictions. 2b. Characterise habitat at sites where Gula are detected during baseline monitoring surveys (if they are detected), to better understand Gula use of habitat in the ACT. 1c. Ground-truth current and potential Gula habitat by undertaking in-situ habitat assessments, including estimates of carrying capacity of habitats.	→ Habitat suitability modelling is completed based on best available knowledge, and includes predicted current and future habitat distribution under climate change scenarios. → Habitat assessments are conducted at sites where Gula are detected in the ACT (if Gula are detected), providing a better understanding of local habitat use by Gula in the ACT. → Ground-truthing assessment of current and model-predicted key Gula habitat areas (e.g., climate refugia, high-quality habitat, corridors) is undertaken, including an assessment of carrying capacity for discrete areas.	→ Predicted habitat suitability modelling completed by 2025, and updated when baseline monitoring is complete. → Modelling of climate refugia and on-ground habitat assessments, including ground-truthing and carrying capacity estimation completed by 2027.

Objective	Indicator of success	Timeframe and milestone triggers for review
<p>3. Following habitat assessment, identify critical gaps for the management and conservation of key habitat refugia and any restoration opportunities.</p> <p>3a. Using identified current and potential Gula habitat, prioritise areas for corridor enhancement, restoration and climate refugia protection.</p> <p>3b. Protect identified key habitat areas where applicable.</p> <p>3c. Undertake habitat and corridor restoration activities (e.g., land rehabilitation, tree planting).</p>	<p>→ Identification of areas for habitat protection and restoration is completed in collaboration with the Ngunnawal Community.</p> <p>→ Habitat restoration is undertaken in priority areas, as appropriate for increasing condition and suitability.</p>	<p>→ Completion of identification of priority habitat restoration areas by 2026 following Ngunnawal Community workshop and in-situ habitat assessments.</p> <p>→ Restoration of priority habitats by 2028 following designation of areas for habitat protection and restoration.</p>
<p>4. Undertake a feasibility study into establishing a Gula captive breeding program at Tidbinbilla Nature Reserve that contributes to the recovery of wild populations of the species in ACT and across Ngunnawal Country.</p> <p>3a. Consider source animals, genetics of source animals, disease, diet and microbiome, breeding options, colony size and resource requirements for captive population.</p> <p>3b. Assess the suitability of the TNR facilities for hosting a captive breeding program.</p> <p>3c. If feasible, introduce genetically suitable Gula to TNR, to establish a genetically robust insurance population and a source of animals for release.</p>	<p>→ A study into the feasibility of using TNR enclosures to establish a captive breeding Gula population is complete.</p> <p>→ The Ngunnawal Community has been consulted and research into population genetics of Gula is reviewed, thus ensuring any captive population is representative of Ngunnawal animals and genetically diverse and healthy.</p> <p>→ Consultation with other jurisdictions and captive breeding facilities is undertaken to ensure TNR animals are part of meta-population and collaborative breeding program that delivers against objectives within the National Recovery Plan.</p> <p>→ If feasible, a Gula a founding population containing Ngunnawal genetic makeup is introduced to TNR enclosures.</p> <p>→ Individuals remain in good health and breed.</p>	<p>→ Timeframe for completion of a feasibility study is April 2023, and pending the outcomes of this, consultation on the development of TNR as a captive breeding facility for to establish a captive breeding population will be complete by 2024.</p> <p>→ If feasible and funding is secured, captive breeding will commence late 2025 following completion of feasibility study and acquisition of resources required to undertake a breeding program.</p> <p>→ Annual reports will provide information on the status of the captive breeding population.</p>

Objective	Indicator of success	Timeframe and milestone triggers for review
<p>5. If viable, establish a conservation translocation and supplementation plan to release Gula across Ngunnawal Country.</p> <p>5a. Working within the National Recovery Plan framework, use findings from baseline monitoring and habitat assessments to explore options for translocating Gula to the ACT and Ngunnawal Country in nearby NSW.</p> <p>5b. Consider the viability of translocating the TNR captive population (described in objective 4) or animals from other captive or wild populations to the wild on Ngunnawal Country.</p> <p>5c. Determine the minimum viable population size required for translocated or supplemented populations.</p> <p>5d. Consider and mitigate threats to Gula survival (where feasible).</p> <p>5e. Stage releases and apply adaptive management framework to increase success of translocated or supplemented populations.</p>	<p>→ Work within the National Recovery Plan framework and with other jurisdictions to explore the need for, and feasibility of, undertaking reintroductions of Gula into Ngunnawal Country.</p> <p>→ If feasible and desirable, identify potential reintroduction sites for Gula across Ngunnawal Country, based on habitat assessments, carrying capacity, climate change refugia, current distribution and best practice guidelines as per the National Recovery Plan framework.</p> <p>→ Protocols for re-introduction to the wild are established in collaboration with experts.</p>	<p>→ By 2026 following the completion of the captive breeding feasibility study, baseline monitoring and habitat assessments.</p>
<p>6. Engage strongly with community and stakeholders to promote collaborations, knowledge sharing, skill development and a greater overall interest in wildlife conservation, thus empowering the community to continue engaging in conservation activities beyond those in this plan.</p> <p>6a. Collaborate with the Ngunnawal Community on all aspects of this plan, thus ensuring the plan encompasses Ngunnawal values and vision. Ensure Ngunnawal people are involved in coordinating and carrying out the plan, ecological skills are developed in the Ngunnawal Community and traditional knowledge is shared and grown amongst Ngunnawal people.</p> <p>6b. Create citizen science projects within the Gula monitoring and habitat restoration parts of this plan to facilitate knowledge sharing and skill development within the wider community.</p> <p>6c. Build relationships with rural leaseholders in order to protect and restore Gula habitat on rural land.</p> <p>6d. Collaborate with other stakeholders, such as other government agencies and research institutions, to undertake research and address knowledge gaps.</p>	<p>→ Members of the Ngunnawal Community are engaged through workshops to ensure Ngunnawal values, perspectives and practices are incorporated into practical components within, and overall vision of this plan.</p> <p>→ Members of the Ngunnawal Community are provided opportunities to carry out Gula conservation practices on Country.</p> <p>→ Members of the broader ACT community are provided opportunities to engage in on-ground actions as part of the delivery of this plan.</p> <p>→ Positive partnerships are built with rural leaseholders who manage properties that contain Gula populations and/or important Gula habitat, thus ensuring collaborative partnerships in Gula conservation actions across tenure.</p> <p>→ Ongoing collaboration with partners, institutions, and other government agencies are facilitated through connections across Ngunnawal Country and the National Recovery Plan framework, including participation in relevant technical and strategic groups.</p>	<p>→ Workshops to enable knowledge sharing, skill development and on Country practice by the Ngunnawal Community completed by 2024.</p> <p>→ Broader community engagement activities undertaken after identification and prioritisation of areas for habitat restoration by 2026.</p> <p>→ Positive partnerships developed with leaseholders by 2026 following baseline monitoring and identification of key habitat areas.</p>

Appendix B:

Alignment of the Draft Native Species Conservation Plan for the Gula (Koala) actions and other plans and strategies

Native Species Conservation Plan for the Gula (Koala) objectives	Alignment with ACT Nature Conservation Strategy 2013-2023 strategies	Alignment with National Recovery Plan for the Koala objectives	Alignment with NSW Koala Strategy actions
<p>1. Establish a baseline monitoring project to identify sites with Gula presence in the ACT.</p> <p>1a. Monitor potential Gula habitat to assess Gula presence, with a focus on areas significant to the Ngunnawal Community and in alignment with the National Koala Monitoring Program.</p> <p>1b. Record any sites with Gula presence.</p> <p>1c. If Gula are detected, use more intensive monitoring to identify if a population exists at the site.</p>	<p>Strategy 4: Enhance biodiversity value of urban areas.</p> <p>→ Monitor in urban reserves for Gula, which will provide an understanding on whether Gula are present in urban ACT.</p>	<p>Objective 1: Stabilise, maintain, and/or increase Koala occupancy and population size.</p> <p>→ Research the current state of Gula populations and habitat in the ACT as a starting point for improving Gula abundance and distribution.</p> <p>Objective 2: Maintain, or improve metapopulation processes.</p> <p>→ Determine metapopulation connectivity, which will in turn inform conservation management strategies.</p>	<p>Action 4.1: Implementing a statewide monitoring program; and</p> <p>Action 4.2: Establish baseline information about koalas.</p> <p>→ Undertake baseline monitoring to determine the presence, relative abundance and distribution of Gula in the ACT.</p>
<p>2. Assess quality, quantity and distribution of Gula habitat in the ACT, including linkages with habitat across the borders into NSW (i.e., encompassing Ngunnawal Country).</p> <p>2a. Using best available knowledge, identify current and future Gula habitat distribution across Ngunnawal Country by undertaking fine-scale modelling of key environmental variables, including locally important koala trees and NARCLIM predictions.</p> <p>2b. Characterise habitat at sites where Gula are detected during baseline monitoring surveys (if they are detected), to better understand Gula use of habitat in the ACT.</p> <p>2c. Ground-truth current and potential Gula habitat by undertaking in-situ habitat assessments, including estimates of carrying capacity of habitats.</p>	<p>Strategy 1: Enhance habitat connectivity and ecosystem function.</p> <p>→ Provide data to better inform decision-making relating to improving habitat connectivity and enhancing regional connectivity by undertaking assessments of Gula habitat suitability in the ACT.</p> <p>Strategy 3: Protect species and ecological communities.</p> <p>→ Safeguard climate refugia by identifying priority Gula habitats now and under climate scenarios.</p> <p>Strategy 4: Enhance biodiversity value of urban areas.</p> <p>Identify potential wildlife corridors through urban areas for habitat protection and/or restoration.</p>	<p>Objective 1: Stabilise, maintain, and/or increase Koala occupancy and population size.</p> <p>→ Provide data to better inform decision-making relating to improving habitat connectivity and enhancing regional connectivity by undertaking assessments of Gula habitat suitability in the ACT.</p> <p>Objective 2: Maintain, or improve metapopulation processes.</p> <p>→ Safeguard climate refugia by identifying priority Gula habitats now and under climate scenarios.</p>	

Native Species Conservation Plan for the Gula (Koala) objectives	Alignment with ACT Nature Conservation Strategy 2013-2023 strategies	Alignment with National Recovery Plan for the Koala objectives	Alignment with NSW Koala Strategy actions
<p>3. Following habitat assessment, identify critical gaps for the management and conservation of key habitat refugia and any restoration opportunities.</p> <p>3a. Using identified current and potential Gula habitat, prioritise areas for corridor enhancement, restoration and climate refugia protection.</p> <p>3b. Protect identified key habitat areas where applicable.</p> <p>3c. Undertake habitat and corridor restoration activities (e.g., land rehabilitation, tree planting).</p>	<p>Strategy 1: Enhance habitat connectivity and ecosystem function.</p> <p>→ Improve habitat connectivity and enhance regional connectivity by undertaking habitat protection and restoration actions.</p> <p>Strategy 3: Protect species and ecological communities.</p> <p>→ Maintain and/or increase Gula distribution and abundance in the ACT by, for example, protecting and restoring habitat to improve connectivity amongst populations, protecting climate refugia, and, if appropriate, boosting Gula populations with a captive breed-and-release program.</p> <p>Strategy 4: Enhance biodiversity value of urban areas.</p> <p>→ Safeguard climate refugia and corridors through urban areas by undertaking habitat protection and restoration actions.</p>	<p>Objective 1: Stabilise, maintain, and/or increase Koala occupancy and population size.</p> <p>→ Maintain and/or increase Gula distribution and abundance in the ACT by, for example, protecting and restoring habitat to improve connectivity amongst populations, protecting climate refugia, and, if appropriate, boosting Gula populations with a captive breed-and-release program.</p> <p>Objective 2: Maintain, or improve metapopulation processes.</p> <p>→ Target management strategies towards improving population connectivity and, thus increasing genetic diversity of Ngunnawal Gula, as well as increasing the carrying capacity and health of habitat.</p>	<p>Action 1.4: Restoring and managing koala habitat; and</p> <p>Action 1.8: Box-gum woodland restoration and rewilding.</p> <p>Restoring important Gula habitat areas (e.g., climate refugia, corridors) to support Gula populations, including box-gum woodlands.</p>

Native Species Conservation Plan for the Gula (Koala) objectives	Alignment with ACT Nature Conservation Strategy 2013-2023 strategies	Alignment with National Recovery Plan for the Koala objectives	Alignment with NSW Koala Strategy actions
<p>4. Undertake a feasibility study into establishing a Gula captive breeding program at Tidbinbilla Nature Reserve that contributes to the recovery of wild populations of the species in ACT and across Ngunnawal Country.</p> <p>4a. Consider source animals, genetics of source animals, disease, diet and microbiome, breeding options, colony size and resource requirements for captive population.</p> <p>4b. Assess the suitability of the TNR facilities for hosting a captive breeding program.</p> <p>4c. If feasible, introduce genetically suitable Gula to TNR, to establish a genetically robust insurance population and a source of animals for release.</p>	<p>Strategy 3: Protect species and ecological communities.</p> <p>→ If feasible, establish a captive breeding population of genetically diverse.</p>	<p>Objective 1: Stabilise, maintain, and/or increase Koala occupancy and population size.</p> <p>→ If feasible, establish a captive breeding population of genetically diverse Gula.</p>	<p>Action 3.9: Translocation program.</p> <p>→ If feasible, establish a captive breeding population of genetically diverse Gula.</p>
<p>5. If viable, establish a conservation translocation and supplementation plan to release Gula across Ngunnawal Country.</p> <p>5a. Working within the National Recovery Plan framework, use findings from baseline monitoring and habitat assessments to explore options for translocating Gula to the ACT and Ngunnawal Country in nearby NSW.</p> <p>5b. Consider the viability of translocating the TNR captive population (described in objective 4) or animals from other captive or wild populations to the wild on Ngunnawal Country.</p> <p>5c. Determine the minimum viable population size required for translocated or supplemented populations.</p> <p>5d. Consider and mitigate threats to Gula survival (where feasible).</p> <p>5e. Stage releases and apply adaptive management framework to increase success of translocated or supplemented populations.</p>	<p>Strategy 3: Protect species and ecological communities.</p> <p>→ If feasible, release Gula to the wild to establish new and/or supplement existing populations.</p>	<p>Objective 1: Stabilise, maintain, and/or increase Koala occupancy and population size.</p> <p>→ If feasible, release Gula to the wild to establish new and/or supplement existing populations in the ACT to increase Gula occupancy and population size.</p>	<p>Action 3.9: Translocation program.</p> <p>→ If feasible, release Gula to the wild to establish new and/or supplement existing populations.</p>

Native Species Conservation Plan for the Gula (Koala) objectives	Alignment with ACT Nature Conservation Strategy 2013-2023 strategies	Alignment with National Recovery Plan for the Koala objectives	Alignment with NSW Koala Strategy actions
<p>6. Engage strongly with community and stakeholders to promote collaborations, knowledge sharing, skill development and a greater overall interest in wildlife conservation, thus empowering the community to continue engaging in conservation activities beyond those in this plan.</p> <p>6a. Collaborate with the Ngunnawal Community on all aspects of this plan, thus ensuring the plan encompasses Ngunnawal values and vision. Ensure Ngunnawal people are involved in coordinating and carrying out the plan, ecological skills are developed in the Ngunnawal Community and traditional knowledge is shared and grown amongst Ngunnawal people.</p> <p>6b. Create citizen science projects within the Gula monitoring and habitat restoration parts of this plan to facilitate knowledge sharing and skill development within the wider community.</p> <p>6c. Build relationships with rural leaseholders in order to protect and restore Gula habitat on rural land.</p> <p>6d. Collaborate with other stakeholders, such as other government agencies and research institutions, to undertake research and address knowledge gaps.</p>	<p>Strategy 5: Strengthen community engagement.</p> <p>→ Provide opportunities for the community to participate in Gula research and conservation, including monitoring and habitat restoration activities.</p> <p>→ Support Ngunnawal Community members in their role as caretakers of Country, for example, by facilitating workshops for Ngunnawal people to create a Gula population and habitat monitoring and restoration plan, and by funding Ngunnawal people to undertake population and habitat monitoring and restoration.</p>	<p>Objective 3: Partners, communities and individuals have a greater role and capability in listed Koala monitoring, conservation and management.</p> <p>→ Provide opportunities for the community to participate in Gula research and conservation, including monitoring and habitat restoration activities.</p> <p>→ Support Ngunnawal Community members in their role as caretakers of Country, for example, by facilitating workshops for Ngunnawal people to create a Gula population and habitat monitoring and restoration plan, and by funding Ngunnawal people to undertake population and habitat monitoring and restoration.</p>	<p>Action 1.2: Partnering with landholders to protect koala habitat on private land.</p> <p>→ Engage and build partnerships with rural leaseholders to protect key Gula habitat on rural lease properties.</p> <p>Action 2.2: Engaging the community.</p> <p>→ Provide opportunities for the community to participate in Gula research and conservation, including monitoring and habitat restoration activities.</p> <p>Action 2.4: Partnering with the Australian Government and other states.</p> <p>→ Continue to collaborate with the Australian and NSW governments on Gula monitoring and habitat protection and restoration.</p> <p>Action 4.6: Integrating traditional ecological knowledge.</p> <p>Support Ngunnawal Community members in their role as caretakers of Country, for example, by facilitating workshops for Ngunnawal people to create a Gula population and habitat monitoring and restoration plan, and by funding Ngunnawal people to undertake population and habitat monitoring and restoration.</p>

