



Private Native Forestry Monitoring, Evaluation and Reporting

Guidance for identifying high value koala habitat for private native forestry purposes

This factsheet outlines guidance for identifying high value koala habitat for private native forestry (PNF) purposes (**Box 1**). This guidance has been developed by the Natural Resources Commission for use in the [process to verify and improve the PNF Koala Prescription Map and underlying models](#).

The guidance:

- recognises the importance of scale when considering koala persistence from the site, landscape, or regional level (**Box 2**)
- needs to be applied considering the resilience of the landscape in question (**Box 3**).



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Background

In May 2022, the NSW Government released revised Private Native Forestry codes of practice (PNF codes). Under the new PNF codes, additional prescriptions apply to private native forestry operations on any land mapped as 'high koala habitat suitability'.

The PNF codes include PNF koala prescription maps (the maps), which show areas of high koala habitat suitability. Habitat suitability was used to prepare the maps as, at the time, there was no agreed definition for high value koala habitat.¹

The [NSW Forest Monitoring Steering Committee](#), independently chaired by the Natural Resources Commission, is overseeing a process to refine and improve the maps, and underlying models. The Committee endorsed the guidance in December 2022 for use in this process.

A cross-agency technical review team and independent experts provided input to develop this guidance, including:

- independent experts Professor (Honorary) Jane Elith (University of Melbourne) and Dr Alistair Melzer (Central Queensland University)
- representatives from Local Land Services, Department of Primary Industries (Forest Science Unit), Environment Protection Authority, Department of Planning and Environment (Environment and Heritage Group), Forestry Corporation of NSW and the Natural Resources Commission.

1: See section 4.4.1 in Natural Resources Commission (2022) [Final report: Advice on finalising Draft Private Native Forestry Codes of Practice](#).

Box 1: Guidance for PNF purposes for identifying ‘high value koala habitat’

“**High Value Koala Habitat**” for PNF purposes, is koala habitat that provides for a high likelihood of koala persistence, is resilient to pressures, and has resources and conditions that enable koala survival and reproduction over a long timeframe. Further, this recognises that:

- koalas must be present but there is not a requirement for them to be continually present or to be present in high densities
- feed tree species must be present
- shelter tree species must be present where koala thermoregulation needs are critical to be met (e.g. for cooling and shade in high temperatures or warming surface temperatures in colder climate regions) and refuge from predators
- incidental use tree species should also be present but these resources may be satisfied by the feed and shelter trees present, or other vegetation associated with the feed and shelter trees
- water must be available through leaf moisture content and free water (wet foliage from dew or precipitation and rainfall stem flow)
- daily temperatures must be within the suitable range for the koala, including nocturnal temperatures when animals are most active
- in non-contiguous forest or fragmented landscapes, koala habitat patches must be adequately connected, recognising that koalas can travel reasonable distances across open paddocks and may rest in isolated paddock trees
- the current value of the habitat is considered, noting that habitat value may alter over time due to climate change
- threats to koala survival in suitable habitat do not pose a localised extinction risk in the long-term
- if a localised extinction event has occurred (e.g. following bushfire or drought), there must be a high likelihood that koalas could repopulate the location in the future
- a long timeframe in the context of high value koala habitat is multiple decades
- resources and conditions are described in **Table 1**
- example factors influencing koala survival and reproduction are described in **Table 2**.

Box 2: Considerations of scale for identifying ‘high value koala habitat’²

At a broad scale (landscape, local or regional scale) koala persistence can be viewed in terms of a meta-population that exists within a large-scale habitat that is a mosaic of eucalypt assemblages, hydrological regimes, weather and environmental patterns and land-use practices; all of which are changing spatially and temporally.

Over time individual koala populations increase or decrease in abundance and extent or become locally extinct. There is a background of koala movement between local habitat patches within the mosaic, operating at different temporal scales, that maintains gene flow, and allows potential habitat to be recolonised.

At the scale of any PNF operation the habitat is at the scale of one or at best a few habitat elements within the meta-population habitat mosaic. At this scale connectivity and landscape context become extremely important.

2: Dr Alistair Melzer, personal communication, 16 August 2022.

Box 3: Considerations of resilience for identifying ‘high value koala habitat’³

The resilience of habitat is an important factor that plays out at various scales and has the potential to increase the value of koala habitat.

At a landscape or local scale, an area of habitat that provides drought or fire refugia for a local or regional koala population provides habitat that is of very high importance to that population.

From another perspective a habitat’s resilience in the face of forest dieback, disease or defoliation may be derived from the richness of food tree species present.

Persistent aquifers providing adequate leaf moisture during regional drought may provide increased drought resilience to the local koala population.

Other matters considered

To identify ‘high value koala habitat’, it is first necessary to consider what is ‘habitat’ and ‘koala habitat’. Hall et al (1997) was used as a source of foundational terms to consider and adapt, including the following:⁴

- **“Habitat”** means *‘the resources and conditions present in an area that produce occupancy-including survival and reproduction-by a given organism’*
- **“Habitat quality”** means *‘the ability of the environment to provide conditions appropriate for individual and population persistence’*

Hall et al (1997) further note that:

- *‘habitat is organism-specific; it relates the presence of a species, population, or individual (animal or plant) to an area’s physical and biological characteristics*
- *habitat implies more than vegetation or vegetation structure; it is the sum of the specific resources that are needed by organisms. Wherever an organism is provided with resources that allow it to survive, that is habitat*
- *migration and dispersal corridors and the land that animals occupy during breeding and nonbreeding seasons are habitat*

- *habitat quality should be considered a continuous variable, ranging from low to medium to high, based on resources available for survival, reproduction, and population persistence, respectively.’*

In addition, Bamford and Calver (2014) proposed that a definition for habitat must make it clear that habitat is a function of the species, and discussed that a species may occupy habitat continuously, periodically or occasionally.⁵

Noting that ‘occupancy’ has taken on various meanings since Hall et al (1997)’s foundational definitions, where ‘occupancy’ is used in this document, it simply means that the species is there (allowing for population fluctuations over time). Given that occupancy can be indicated by a single individual koala moving through a landscape, or by koalas in an area that supports a breeding population, habitat that enables survival and reproduction of the species is of critical importance.

Further, persistent koala populations can exist in various forms, including scattered, low-density populations.⁶

From these considerations ‘koala habitat’ was explored:

3: Dr Alistair Melzer, personal communication, 16 August 2022.

4: Hall, L.S., Krausman, P.R. and Morrison, M.L. (1997) *‘The habitat concept and a plea for standard terminology.’* Wildlife Society Bulletin 25:171–182.

5: Bamford M.J. and Calver M.C. (2014) *‘A precise definition of habitat is needed for effective conservation and communication.’* Australian Zoologist, 37(2), 245–247.

6: Close, R., Ward, S., and Phalen, D. (2017) *‘A dangerous idea: that Koala densities can be low without the populations being in danger.’* Australian Zoologist, 38(3): 272–280.

“Koala Habitat” is habitat where the resources and conditions (**Table 1**) present enable survival and reproduction of the koala, and:

- relates the presence of the koala (population or individual animal) to an area’s physical and biological characteristics
- is more than vegetation or vegetation structure and is the sum of the specific resources that the koala needs
- provides the resources that allow a koala to survive recognising different physiological needs of individual koalas or populations
- includes migration and dispersal corridors and the land that koala occupy during breeding and non-breeding seasons

- provides for either continuous, periodic or intermittent persistence
- resilient in the face of environmental, climatic and other pressures.

In this context, ‘koala habitat’ recognises the potential for boom-bust cycles in koala populations and the importance of refugial areas during extreme events that koala may recolonise from when conditions improve. It recognises the highly variable physiology of the koala and differentiates potential habitat from koala habitat.

While potential habitat provides resources and conditions that would enable a koala (individual or population) to survive, koalas may or may not be present. The key differentiating factor is that koala habitat must support koalas, either continually, periodically or intermittently.

Table 1: Resources and conditions needed for koala to survive and reproduce^{7,8,9}

Resources	Conditions
<ul style="list-style-type: none"> • Feed trees • Shelter trees for thermoregulation and refuge from predators • Incidental use trees (e.g. for resting or social interactions) • Water including free water (dew, rainwater as stem flow and drops on foliage) and groundwater (availability especially during drought) • Space that is needed for a koala individual or population home range (linked to habitat quality) 	<ul style="list-style-type: none"> • Suitable weather and climate, including temperature ranges and daily conditions over multiple days • Rainfall • Connectivity – size, shape and degree of connectivity between patches of habitat • Absence or limited presence and/or severity of threats (Table 2) • Refugial areas during drought or heatwaves

7: Youngentob, K.N, Marsh, K.F. and Skewes, J. (2021) *A review of koala habitat assessment criteria and methods*. Report prepared by the Australian National University for the Department of Agriculture, Water and the Environment, Canberra, Australia.

8: Department of Agriculture, Water and the Environment (2022) *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory*. Australian Government.

9: Briscoe, N.J., Kearney, M.R., Taylor, C.A. and Wintle, B.A. (2016), *Unpacking the mechanisms captured by a correlative species distribution model to improve predictions of climate refugia*. *Glob Change Biol*, 22: 2425-2439.

In addition, there are many factors that influence koala survival and reproduction (**Table 2**).

Table 2: Example factors influencing koala survival and reproduction^{10,11,12,13}

Category	Factors
Physiological	Genetic diversity Capacity of an animal to deal with disease Nutritional requirements The area an individual needs to survive (i.e. home range) is highly variable and dependant on, for example, life history stage, reproductive status (e.g. a lactating female will have seasonally higher nutritional requirements), habitat quality, relative proportion of plants with appropriate levels of secondary metabolites, and nutritional requirements
Threats	Increasing temperatures or changing rainfall associated with climate change Car strike Habitat fragmentation and loss Low habitat resilience Insect defoliation or forest disease/dieback Dog attack Catastrophic bushfires or fires that affect canopy Overgrowth or conditions that limit eucalyptus germination and establishment and/or koala movement Disease Heatwaves

Where to find more information?

More information about our work relating to private native forestry and koala prescription mapping can be found on the [Commission’s website](#).

10: Youngentob, K.N., Marsh, K.F. and Skewes, J. (2021) *A review of koala habitat assessment criteria and methods*. Report prepared by the Australian National University for the Department of Agriculture, Water and the Environment, Canberra, Australia.

11: Australian Government Department of Agriculture, Water and the Environment (2022) *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory*.

12: NSW Department of Planning, Industry and Environment (2019) *Koala Habitat Information Base and Technical Guide*.

13: NSW Natural Resources Commission (2022) *Summary paper – koala and habitat response after the 2019-20 wildfires in north east NSW*. Report prepared by the NSW Forest Monitoring and Improvement Program.